Confederation of Indian Industry

Green Company Rating System

Version 2

Reference Guide

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Contents

I Introduction

Businesses across the globe have begun to realize the impending impact of their actions on the environment and its contribution to the phenomenon of climate change. The achievement of higher growth with optimal use of resources and better emission and discharge standards is need of the hour.

Several companies have taken proactive initiatives to integrate environmental concerns in their businesses and have improved the environmental performance and business competitiveness.

Pursuing "Green" has become the new driver for companies on the quest towards growth, competitiveness and global excellence. Numerous benefits have been achieved by companies restructuring their various business processes towards ecological sustainability.

Need for Development of Green Company Rating System

Companies across the globe have taken many initiatives to reduce their ecological footprint, in several areas such as energy efficiency, water, GHG, waste reduction, etc.

With number of businesses going green on the rise and several initiatives on different areas evokes a spark in an individual's mind on "How Green is the Company". A clear holistic mechanism is presently not available for evaluating the performance of companies on the ecological front. Against this background, CII, through an extensive stakeholder consultation and interaction with experts have developed the 'GreenCo rating' system for evaluating the 'greenness of companies'.

The Green Rating System will act as a milestone for companies pursuing green to assess where they stand and help in defining the path forward.

Scope of the Rating System

The GreenCo rating system would cover both

- Manufacturing and
- Service sectors

The rating is implemented at individual manufacturing unit / service facility which are in operation for a minimum period of 3 years.

In case of new plants / facilities a miminum of 2 years operational data is required.

Sector Coverage

The sectors that will be covered under this system are:

Manufacturing Sector

- Automobile & Engineering
- Cement
- FMCG
- Fertilizers
- Foundry
- Glass
- Iron, Steel & Non Ferrous Metals
- Pharmaceutical & Chemicals
- Pulp & Paper
- Refineries & Petrochemicals
- Tyre & Textile

Service Sector

- IT & IT Services
- Logistics
- Corporate Houses
- Airports
- Hospitals
- Hotels

II Background of the Rating System

CII has been the pioneer organization in promoting green concepts across the country. To encourage industry tread this path, CII initiated the voluntary programme "Mission on Sustainable Growth" to facilitate ecologically sustainable business growth.

As a first step towards this direction, a CII - Code for Ecologically Sustainable Business Growth was developed aiming to involve the top management of companies and seek voluntary commitments towards reducing intensity of the consumption of energy, water and other natural resources and promote ecologically sustainable growth in their companies.

The initiative launched by CII in 2008 has evoked great interest from the Indian Industry. More than 450 organizations in India are voluntarily committed to this initiative.

This clearly indicates an increasing trend of companies adopting measures towards reducing their ecological intensity in the years to come.

Off late there has been a continuous demand from companies to formulate a system to evaluate the actual performance of companies pursuing ecologically sustainable growth.

This rating system will act as a holistic framework to assess and evaluate the performance of the company's activities on the green front.

The GreenCo rating system, Version 1 has been launched based on the experience and success of the GreenCo Pilot Version

III Benefits of the Green Company Rating System

Application of GreenCo rating would address national priorities leading to benefits, such as energy efficiency, water conservation, renewable energy, waste management, green supply chain, etc., Some of the major benefits are highlighted below:

- Energy Efficiency- Businesses consume energy for various reasons like operating machinery, running computers, office maintenance etc. The GreenCo rating system calls for energy monitoring and accounting system as well as technology that is less energy intensive. The rating system would help the organizations to benchmark themselves at the national / international level, guides them towards becoming national / global levels of energy efficiency. Involvement of employees and building capacity of them are also part of the rating system.

- Water Conservation- Our requirements for water to meet our fundamental needs and our collective pursuit of higher living standards, coupled with the need for water to sustain our planet's fragile ecosystems, make water unique among natural resources. The increase in global population coupled with the rising economy increase the demand for water exponentially. According to World Bank estimates, today about 700 million people live in countries experiencing water stress or scarcity. By 2035, it is projected that 3 billion people will be living in conditions of severe water stress. Many countries with limited water availability depend on shared water resources, increasing the risk of conflict over these scarce resources. Effective water management strategies are the call of the hour to address the water crisis. The green business rating promotes sustainable use of water through "reduce, recycle, reuse and reclaim" strategies. It prescribes metering to monitoring water consumption, rain water harvesting and water use reduction strategies. Overall, this has the effect of reducing utility costs for businesses. The rating system also encourages companies to take efforts for groundwater recharge beyond the fence.

- Renewable Energy- The adverse effects on environment caused by the production and consumption of energy have resulted in severe environmental impacts across the globe. With world economies taking commitments to reduce their share of carbon emissions contributing to the global warming; it requires countries to look at alternate sources of energy meet their growing energy demands. This not only allows for use of energy that is clean but also reduces the dependence on fossil fuels, which are major contributors of Green House Gases. Similarly, there are other sources of renewable energy that need to be explored and utilized. The Green Company Rating System encourages businesses to employ clean and renewable energy. The ultimate goal is to offset 100% of the electrical energy / thermal by renewable energy. Although the initial investment on installing equipment for generating renewable energy is relatively high, the long term benefits of reduced maintenance cost, low operating costs and cost savings on fossil fuels makes it a lucrative proposition for businesses.

- Waste Management- The waste management sector is contributing 3-5 per cent of global man-made greenhouse gas (GHG) emissions, equal to around the current emissions from international aviation and shipping, according to some estimates. Since the waste collection and disposal facilities are not very good, most of the waste stagnates at its place of origin. This leads to hazardous materials getting disposed off to the environment and causing grave danger to living beings. The Green Company Rating System recommends waste management strategies that enable businesses to identify and segregate different types of waste. The system presents guidelines on waste inventory study to enable businesses to quantify data on amount of waste generated and hence empower them to adopt suitable waste disposal strategies. The rating system also recommends waste reduction strategies. For businesses, this means that the work area is healthy and the clean surroundings present an inviting ambience for prospective customers. The reduction of waste generation also presents an excellent business case for the organization to pursue.

- Material Conservation, Recycling and Recyclability- Material conservation and recycling is closely related to waste management. It is self-evident that the more we conserve and recycle/ re-use, the less waste we generate. Apart from this, by reusing materials there is a definite saving in costs. The cost savings is in the form of reduced material costs (as we reuse the same material) as well reduced waste disposal cost (since lesser waste is generated). The rating system promotes reuse and recycling of raw materials and discourages use of virgin materials. It even goes a step further in encouraging businesses to ensure that not only they reuse/ recycle raw materials but their product too should be recyclable/ bio-degradable.

- Green Supply Chain- As environmental awareness among consumers increase, the demand for products with lower environmental footprint will also increase. In keeping with consumer sentiments, businesses will have to not only green their operations, but also across their supply chain. This calls for a rethink of the business's current procurement process. Studies have shown that improved green supply chain processes means lower waste-disposal, lower environmental impact at the vendor premises and, often, reduced materials costs. The green rating system aims to make businesses aware of these benefits to their bottom-line so that they are encouraged to implement green supply chain processes.

- Green House Gases Reduction - The global average concentrations of various greenhouse gasses in the atmosphere reached their highest levels ever recorded, and continue increasing. The combustion of fossil fuels from human activities and land-use changes are largely responsible for this increase. The ill effects of green house gases generated by the consumption of fossil fuels are very well known. The green rating system guides businesses on reducing their Green House Gas emission by setting short term goals while working on a long term strategy. The ultimate goal is to make businesses "Carbon Neutral" i.e. they should be able to remove as much carbon dioxide from the atmosphere as they generate.

- Product Stewardship- Product Stewardship is 'Extended Producer Responsibility' over the Life cycle of a product beyond production, during distribution, use and disposal of products. The rating system encourages businesses to design and develop a product that has 'Nil/Least' environmental impact (CO2, Water, material and Toxic content) during its lifecycle. It guides businesses to perform a comprehensive analysis of all their products on environmental impacts over the lifecycle of the product and explore options for reducing such impacts

- Life Cycle Assessment – Several initiatives are being taken to reduce the environmental impact of products at different stages – production, distribution, use and disposal. There is a need to have an evaluation of the impact of the product throughout its life cycle, so that ultimately, only those with minimum life-cycle impact are made available. The life-cycle assessment parameters such as GHG, toxicity, material and water can guide organizations to move towards products of lower impact. The rating system facilitates in this direction.

Benefits:

1. Communicates the corporate commitment towards environmental sustainability to all stake holders
2. Enhances the competitiveness of the company through resource conservation and improved efficiency
3. Current Standing- The rating system is an easy way for businesses/ companies to compare themselves against their peers or competitors
4. Businesses can use the recommendations of the rating system to develop a long term plan to improve competitiveness as well as ecologically sustainable
5. Most governments are prescribing strict environmental compliance guidelines for companies. Companies that accept the green rating system will have a 'head start' in complying with these requirements and thus have an advantage over non-complying competitors
6. With consumer awareness related to the environment growing at a fast pace, green rated companies will enjoy considerable consumer support and goodwill
7. Many business owners/ managers wish to adopt environmentally healthy practices but are not aware of what needs to be done. The rating system can act as an excellent guide for such businesses

GreenCo rating helps to drive excellence and build global competitiveness in the following areas of ecological sustainaility

IV Green Rating System: Overview & Process

The objective of GreenCo, Green Company Rating System is to create a holistic framework to define and assess "how Green" a company is and highlight the way forward to become globally competitive in green.

The Green Company Rating System advocates a performance based approach. It is unique as it is highly performance oriented and significant weightage is provided for the performance / results achieved (70 %). The company has to perform and achieve superior performance in most of the Green parameters to reach highest rating level. The rating system evaluates green features for companies against the following performance parameters:

- Energy Efficiency
- Water Conservation
- Renewable Energy
- Greenhouse Gas Emission
- Waste Management
- Material Conservation, Recycling and Recyclability
- Green Supply Chain
- Product Stewardship
- Life Cycle Analysis
- Other Areas (Ventilation, Surroundings, Site Location & Innovation)

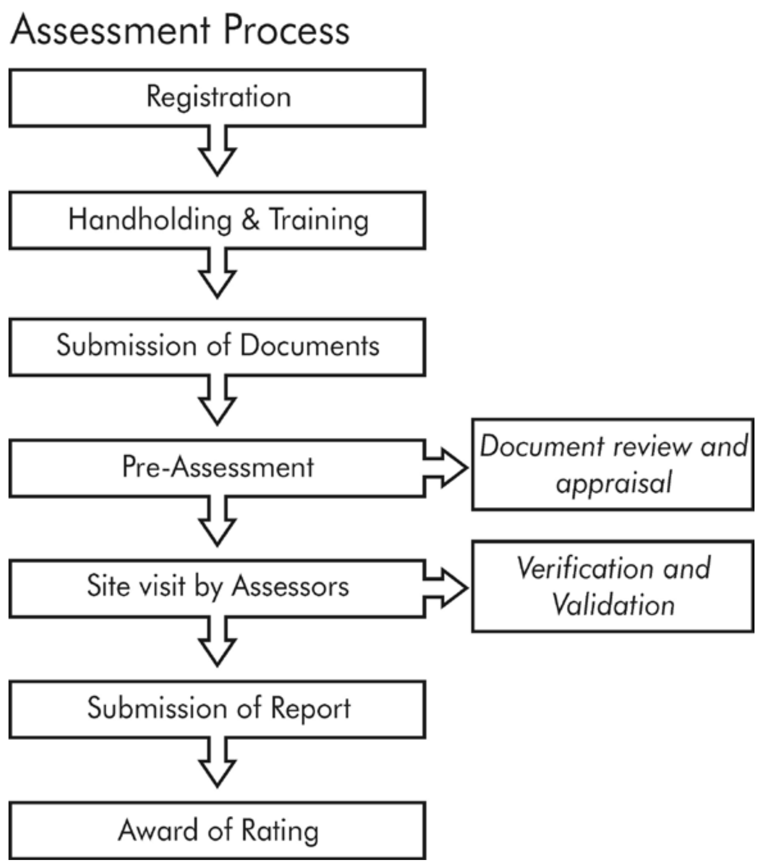
Weightages (points) are assigned to varying degrees of goals that are set for each of these parameters. For example, the points are awarded for reducing energy consumption. But points awarded will be higher for a business that demonstrates a higher degree of reduction in energy consumption compared to another business that demonstrates a lower degree of reduction in energy consumption. The companies at various levels of efficiency (for example; Top 5 energy efficient plants in the world) are also suitably recognized in this rating system.

Green Company Rating System Registration

Companies interested participating in GreenCo Certification must first register with CII Godrej GBC. Projects can be registered on CII – Godrej GBC website (www.greenco.in) under ‘Green Company Rating System ’. Registration is the initial step, which helps establish contact with CII – Godrej GBC andprovides access to the required documents, templates, important communications and other necessary information.

- Assessment Process

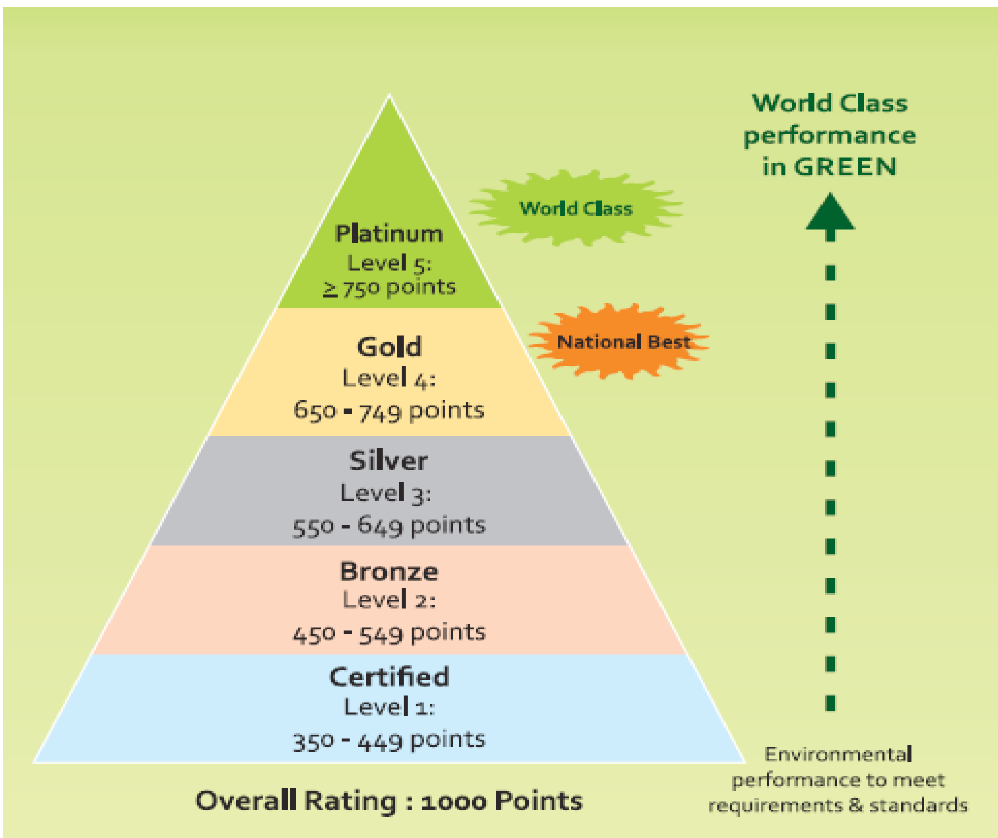
Subsequent to the registration, the CII team will communicate with the plant team to explain the detailed process of the assessment. The various steps involved in the assessment process are detailed as under:



- **Threshold criteria for certification levels are as following:**

Level	Points	GreenCo Rating
Level 1	350 – 449 points	Certified
Level 2	450 – 549 points	Bronze
Level 3	550 – 649 Points	Silver
Level 4	650 – 749 Points	Gold
Level 5	> 750 points	Platinum

- **GreenCo Rating Levels :**



♦ Criteria and Weightages

Manufacturing Sector

S. No	Parameters	Suggested Weightages (Points)
1	Energy Efficiency	150
2	Water Conservation	100
3	Renewable Energy	100
4	GHG Emission Reduction	100
5	Waste Management	100
6	Material Conservation, Recycling & Recyclables	100
7	Green Supply Chain	100
8	Product Stewardship	75
9	Life Cycle Assessment	75
10	Others (Ventilation, Site Location & Innovation)	100
	Total	**1000**

Service Sector

S. No	Parameters	Suggested Weightages (Points)
1	Energy Efficiency	150
2	Water Conservation	100
3	Renewable Energy	100
4	GHG Emission Reduction	100
5	Waste Management	100
6	Material Conservation, Recycling & Recyclables	75
7	Green Supply Chain	75
8	Others (Ventilation, Site Location & Innovation)	100
	Total	**800**

* For service sector, GreenCo Rating Level will be arrived after extrapolating the total score to 1000 points.

Assessment Process

A training program would be organised for the companies registered for the GreenCo Rating. The objective of the training program is to aid the companies understand the rationale behind the various credit points, explain them which are relevant to the company and make the process of assessment easier for the company. The company submits the filled up rating questionnaire to CII.

Subsequent to the receipt of the assessment questionnaire, site visit will be conducted by a team of independent assessors and representatives of CII. The number of site visits and assessors will be decided based on the size of the company / unit being assessed. The objective of site visit is to validate the data submitted as well as present to the company on improvement areas and opportunities.

The assessor team will report their findings to the judges' panel, which will review and award the rating to the company. The company also will have an opportunity to appeal once for a higher rating with the judges' panel. The judges' panel will then revisit the assessment and award the final rating. The rating awarded will be final.

The rating will be periodically communicated and will be in the website of CII – Godrej GBC. There would also be an annual review to revalidate the rating as well as guide the organisation towards improvement. The rating is valid for 3 years and at the end of 3 years the companies will have to apply for the rating again. In between, if the company feels that they have improved their performances they can apply for a fresh rating. During the period of rating, the companies can use 'GreenCo' certified company in their letterheads and other corporate communications.

Green Company Rating System - Checklist			
Energy Efficiency (Max: 150 Points)			
	Parameters	**Points**	
EE Mandatory Requirement -1	**Energy Policy**		
EE Mandatory Requirement -2	**Energy Management Cell & Energy Manager**		
EE Credit 1	**Leadership and Strategy**	**20**	
EE Credit 1.1	Monthly reviews pertaining to Energy Efficiency		5
EE Credit 1.2	Target Setting -Internal benchmarking - 5 points National/World class benchmarks - 5 points		10
EE Credit 1.3	Financial Resource Allocation at the beginning of the year		5
EE Credit 2	**Employee Involvement & Capacity Building**	**15**	
EE Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
EE Credit 2.2	Training programs and capacity building		5
EE Credit 2.3	Energy scorecard		5
EE Credit 3	**Energy Monitoring & Management Systems**	**15**	
EE Credit 3.1	Energy monitoring for equipment (Electrical & thermal) having ≥ 10% of total energy consumption - 5points Energy monitoring for equipment (Electrical & thermal) having ≥ 5% of total energy consumption - 10 points		10
EE Credit 3.2	Daily variance analysis and correction		5
Option -1 Plant with SEC	**Reduction in SEC in the last 3 years**	**100**	
EE Credit 4	**Reduction in SEC in last 3 years**	**50**	
EE Credit-5	**Energy Efficiency improvement in Equipment**	**25**	
EE Credit 6	**Benchmarking with World Class Performance**	**25**	
	Among top 10 Units / Top 10% of the units at national level		5
	Among top 5 units / Top 5% of the units at national level		10
	Among top 20 Units / Top 20% of the units at international level		15
	Among top 10 units / Top 10% of the units at international level		20
	Among top 5 units / Top 5% of the units at international level		25
Option -2 Plant without SEC	**Reduction in SEC in the last 3 years**	**75**	
EE Credit 4	**Projects implemented (Last 3 Years)**	**50**	
EE Credit-5	**Equipment wise efficiency improvement**	**25**	
	Sub total	**150**	

Water Conservation (Max: 100 Points)			
WC Mandatory Requirement-1	**Water Policy**		
WC Mandatory Requirement-2	**Water Manager & Accountability**		
WC Credit 1	**Leadership and Strategy**	**10**	
WC Credit 1.1	Target setting & action plan		5
WC Credit 1.2	Monthly reviews		5
WC Credit 2	**Employee Involvement & Capacity Building**	**10**	
WC Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
WC Credit 2.2	Training programs and capacity building		5
WC Credit 3	**Metering & Overall Monitoring**	**5**	
WC Credit 3.1	Water Metering at critical locations		5
WC Credit 4	**Reduction in Specific Fresh Water Consumption in Last 3 years**	**30**	
Option-1	**Reduction in spcific fresh water consumption**		
	≥ 5% reduction		5
	≥ 10 % reduction		10
	≥ 15% reduction		15
	≥ 20% reduction		20
	≥ 25% reduction		25
	≥ 30% reduction		30
Option-2	**Reduction in total fresh water consumption based on the water projects implemented in the past 3 years**		
	≥5% reduction		5
	≥ 10 % reduction		10
	≥15% reduction		15
	≥ 20 % reduction		20
Option-3	**International Benchmarking**		
	Among top 10 units / Top 10% of the units at international level		25
	Among top 5 units / Top 5% of the units at international level		30
WC Credit 5	**Rain water Harvesting in roof and non-roof areas**	**20**	
WC Credit 5.1	Implementation of RWH Structures		
	≥ 10% potential captured		2.5
	≥ 25% potential captured		5
	≥ 50% potential captured		7.5
	≥ 75% and above potential captured		10
WC Credit 5.2	Substituting with fresh water		10
WC Credit 6	**Augmentation of ground water beyond fence**	**25**	
	At least 1 project implemented on augmentation of ground water		5
	1: 1 recharge/withdraw		10
	1: 2 recharge/withdraw		15
	1 : 3 recharge/withdraw		20
	1: 4 recharge/withdraw		25
	Sub total	**100**	

Renewable Energy (Max: 100 Points)			
RE Mandatory Requirement - 1	**Renewable Energy Policy**		
RE Credit 1	**Leadership and Strategy**	**10**	
RE Credit 1.1	Short term & long term targets and action plan		5
RE Credit 1.2	Approved budget allocation for current & ensuing year and monitoring mechanism		5
RE Credit 2	**On-site Renewable Energy Generation (Both Electrical & Thermal Energy)**	**25**	
	≥ 1% substitution		5
	≥ 2% substitution		10
	≥ 3% substitution		15
	≥ 4% substitution		20
	≥5% substitution		25
RE Credit 3	**Offsetting both Electrical & Thermal energy through Renewable Energy Sources**	**65**	
Category 1	Less Energy Intensive Sector > 80% Offset		65
Category 2	Energy Intensive Sector > 30% Offset		65
Category 3	High Energy Intensive > 20% Offset		65
	Sub-Total	**100**	
Greenhouse Gas Emission (Max: 100 Points)			
GHG Mandatory Requirement - 1	**GHG Emission inventorisation**		
GHG Credit 1	**GHG emission intensity reduction targets**	**10**	
GHG Credit1.1	Setting short term & Long term GHG targets		5
GHG Credit1.2	Developing detailed action plan for achieving the targets		5
GHG Credit 2	**Employee Involvement & Capacity Building**	**10**	
GHG Credit 2.1	Awareness creation and employee involvement		5
GHG Credit 2.2	Training programs and capacity building		5
GHG Credit 3	**GHG Management Systems**	**10**	
GHG Credit 3.1	Quality Management - GHG Emission Inventorisation		5
GHG Credit 3.2	Monitoring system for mitigation efforts		5
GHG Credit 4	**GHG Emission Intensity Reduction**	**20**	
Option-1	**Internal Performance Approach**		
	≥ 5% reduction in GHG intensity in last 3 years		5
	≥ 10% reduction in GHG intensity in last 3 years		10
	≥ 20% reduction in GHG intensity in last 3 years		15
	≥ 30% reduction in GHG intensity in last 3 years		20
Option-2	**National & International Benchmarking GHG emission intensity in the same sector**		
	Company is among the top 10% of lowest GHG emission intensity companies in the country		5
	Company is among the top 5% of lowest GHG emission intensity companies in the country		10
	Company is among the top 10% of lowest GHG emission intensity at global level		15
	Company is among the top 5% of lowest GHG emission intensity at global level		20

GHG Credit 5	**Carbon Neutral Approach**	**30**	
Option 1	**GHG Intensive Industries - Offset/Sequestration as a percentage of total GHG emissions**		
	≥ 5% of total GHG emission		5
	≥ 10% of total GHG emission		10
	≥ 15% of total GHG emission		15
	≥ 20% of total GHG emission		20
	≥ 25% of total GHG emission		25
	≥ 30% of total GHG emission		30
Option 2	**Non - GHG Intensive**		
	≥ 15% of total GHG emission		5
	≥ 25% of total GHG emission		10
	≥ 40% of total GHG emission		15
	≥ 60% of total GHG emission		20
	≥ 80% of total GHG emission		25
	≥ 100% of total GHG emission		30
GHG Credit 6	**Scope 3 Emission Inventorization and reduction**	**20**	
GHG Credit 6.1	Scope 3 Inventorization		5
GHG Credit 6.2	>5 % Reduction in scope 3 emission intensity		5
	>10 % Reduction in scope 3 emission intensity		10
	>15 % Reduction in scope 3 emission intensity		15
	Sub total		**100**

Waste Management (Max:100 Points)			
Mandatory Requirement	**Waste Management Policy**		
WM Credit 1	**Leadership & Strategy**	**10**	
WM Credit 1.1	**Shor term & long term targets** : Short term targets should be complied within 3 years period, while long term targets can go beyond 3 years. The targets for reduction should be in terms of specific waste generation (waste / unit weight or volume of product) for all kind of wastes		5
WM Credit 1.2	**Action Plan and Resource Allocation:** Top management will ensure that appropriate resources (financial, infrastructural, technological, manpower, etc) are provided for effective implementation of waste management system.		5
WM Credit 2	**Employee Involvement & Capacity Building**	**10**	
WM Credit 2.1	**Strategies adopted for awareness creation and employee involvement** –Programs and initiatives taken by the plant team for awareness creation and employee involvement like poster competition, displaying slogans, earth day, world environment day celebrations, incentives based on suggestion schemes, recognition awards, etc. These programs should be aimed at involving all the employees.		5
WM Credit 2.2	**Training programs and capacity building**– Training program to build capacity of employees so that they are able to contribute to waste management activities. The plant should identify the training needs of employees with regard to waste management and organize programs accordingly.		5

WM Credit 3	**Waste Management System :** Encourage continuous monitoring and accounting of different types of wastes generated to understand, quantify and manage various waste streams efficiently	**10**	
WM Credit 3.1	Having proper collection, segregation and dispoal system of different types of waste		5
WM Credit 3.2	Inventorisation for hazardous and non hazardous waste : All types of hazardous (im-lcusive of E-waste)and non-hazardous wastes should be quantified at each stage of waste management- generated, recycled / reused, recovered, treated, landfill / disposed off along with quantity, the inventorization should also include the source of each waste generated.		5
WM Credit 4	**Solid Waste Management :** Reduce the amount of solid waste that are hauled to and disposed off in landfill to minimise the negative impacts on the environment.	**25**	
WM Credit 4.1		**15**	
Option-1	Hazardous waste Management		
	Reduction in specific waste generation		
	≥ 5 % Reduction in specific waste generation		5
	≥ 10% Reduction in specific waste generation		10
	Reduction in specific waste disposal		
	≥ 10 % Reduction in specific waste disposal		5
Option -2	**Use of waste as Alternate fuel/ raw materials**		
	Atleast one project implemeneted (usage of waste as alternate fuel/ raw material)		5
	Use of ≥10% of waste disposed as Alternate fuel/ raw materials		10
	Use of ≥20% of waste disposed as Alternate fuel/ raw materials		15
WM Credit 4.2	Non Hazardous Waste Management	10	
	Reduction in specific waste generation		
	≥ 10 % Reduction in specific waste generation		5
	Reduction in specific waste disposal		
	≥ 10 % reduction in specific waste disposal		5
WM Credit 5	**Liquid Waste Management :** Prevent / reduce the amount of liquid pollutants dis-charged to the storm drain system or to water bodies and minimize negative environ-mental impacts.	**25**	
WM Credit 5.1	Percentage reduction in process effluent discharge		15
	Reduction of Process Effluent Generation		
	≥ 10% reduction		5
	≥ 20% reduction / zero effluent discharge		10
	Recycling of Process Effluent		
	≥ 20% recycling in process applications		5
WM Credit 5.2	Percentage reduction in domestic/sewage effluent discharge		10
	Reduction of sewage Effluent Generation		
	≥ 20% reduction		5
	Recycling of Sewage Effluent for domestic application (other than gardening)		
	≥ 20% recycling in process/domestic applications		5

WM Credit 6	**Gaseous Waste Management :** Prevent release of VOCs, SPM, TPM, SOx, NOx and other gaseous pollutants to environment and maintain ambient air quality within the plant.	**20**	
WM Credit 6.1	Gaseous Waste Management (other than GHG emissions)		
	Reduction in Ambient Air quality pollutants		
	>=15% reduction over and above the norms		5
WM Credit 6.2	Reduction in Gaseous Pollutants Emission with respect to latest norms released legal authorities		15
	(Nox/NO2) Reduction		
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production		5
	SPM Reduction		
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production		5
	SO2/SoX Reduction		
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production		5
Note: Incase the plant is not applicable for all the parameters or the parameters included above are not covered plant scope, points shall equally distributed for the applicable parameters like process emissions			
	Sub total	**100**	

Material Conservation, Recycling & Recyclability (Max:100 Points)			
MCR Credit1	**Leadership & Strategy**	**10**	
MCR Credit 1.1	Material Conservation & Recycling Policy		5
MCR Credit 1.2	Short & long term targets and allocation of resources		5
MCR Credit 2	**Employee Involvement & Capacity Building**	**10**	
MCR Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
MCR Credit 2.2	Training programs and capacity building		5
MCR Credit 3	**Systems**	**10**	
MCR Credit 3.1	Framework for Material Conservation		5
MCR Credit 3.2	Systematic Monitoring Plans		5
MCR Credit 4	**Raw Material Conservation**	**30**	
Option 1	**Replacement of raw materials by recycled material / waste or equivalent**		
	≥ 5% usage of recycled / waste material or equivalent		5
	≥ 10% usage of recycled / waste material or equivalent		10
	≥ 15% usage of recycled / waste material or equivalent		15
	≥20% usage of recycled / waste material or equivalent		20
	≥ 25% usage of recycled / waste material or equivalent		25
	≥ 30% usage of recycled / waste material or equivalent		30
Option 2	**Percentage reduction in specific raw material consumption**		
	≥ 3% reduction in waste generation		5
	≥ 5% reduction in waste generation		10
	≥ 8% reduction in waste generation		15
	≥ 10% reduction in waste generation		20
	≥ 12% reduction in waste generation		25
	≥ 15% reduction in waste generation		30

MCR Credit 5	**Management of Packaging Material**	**25**	
MCR Credit 5.1	**Reduction in Packaging Material**	**15**	
	≥ 5% reduction in packaging material		5
	≥ 10% reduction in packaging material		10
	≥ 15% reduction in packaging material		15
MCR Credit 5.2	**Recycled content in Packaging Material**	**10**	
	≥ 5% recycled content in packaging material		5
	≥ 10% recycled content in packaging material		10
MCR Credit 6	**Recyclability and / Biodegradability of the product**	**15**	
	≥ 75% content of the product is recyclable/bio-degradable		5
	≥ 80% content of the product is recyclable/bio-degradable		10
	≥ 85% content of the product is recyclable/bio-degradable		15
	Sub total		**100**
Green Supply Chain (Max: 100 Points)			
GSC Credit 1	**Leadership and Strategy**	**10**	
GSC Credit 1.1	Strategy and Targets (Short and Long term)		5
GSC Credit 1.2	Approved budget allocation for current year & ensuing year		5
GSC Credit 2	**Education and Awareness creation**	**10**	
	≥ 50 % Suppliers		5
	≥80 % Suppliers		10
GSC Credit 3	**Resource Conservation through Supply Chain Management Systems (SCM)**	**10**	
GSC Credit 3.1	Management System for resource conservation through supply chain management		5
GSC Credit 3.2	Monitoring System for resource intensity in supply chain		5
GSC Credit 4	**Green Procurement Guidelines**	**10**	
GSC Credit 4.1	Green Procurement Guidelines		5
GSC Credit 4.2	Implementation of Green Procurement Guidelines		5
GSC Credit 5	**Efficiency Improvement programs for Suppliers (carbon, material, water & toxicity)**	**15**	
GSC Credit 5.1	Supplier Audits		
	≥5 % of category 'A' suppliers		5
	≥ 10 % of category 'A' suppliers		10
GSC Credit 5.2	Recognition programs for suppliers		5
GSC Credit 6	**Resource intensity reduction in Supply Chain (carbon, material, water & toxicity)**	**45**	
GSC Credit 6.1	Baselines and targets		5
GSC Credit 6.2	% Reduction in Supplier resources (Carbon/Material/Water/Toxicity)		
	At least one project		5
	≥0.75% reduction		10
	≥1.5 % reduction		15
	≥.25% reduction		20
	≥3.0% reduction		25
	≥3.75% reduction		30
	≥4.25% reduction		35
	≥5.0% reduction		40
	Sub-Total	**100**	

Product Stewardship(Max: 75 Points)			
PS Credit 1	**Leadership and Strategy**	**10**	
PS Credit 1.1	Strategy & Targets (Short and Long term)		5
PS Credit 1.2	Action plan		5
PS Credit 2	**Education, Awareness creation & Communication programs**	**10**	
PS Credit 2.1	Defining Stakeholders (Type & No's)		5
PS Credit 2.2	No. of Training Programs for Stakeholders		5
PS Credit 3	**Product Responsibility Management**	**10**	
PS Credit 3.1	Quality Management System for reducing waste in Supply Chain		5
PS Credit 3.2	Environment Risk Assessment for new and existing products		5
PS Credit 4	**Reduction in Toxic or Hazardous substances in products & process**	**15**	
	≥ 10% reduction		5
	≥ 20 % reduction		10
	≥ 30 % reduction		15
PS Credit 5	**Extended Producer Responsibility**	**10**	
PS Credit 5.1	Product take back and Recycling		5
PS Credit 5.2	Safe Disposal		5
PS Credit 6	**Sustainable Design (-ve impacts of the products/service)**	**15**	
PS Credit 7	**Engagements to Voluntary codes and standards and also directives for reducing environmental impacts**	**5**	
	Sub-Total	**75**	
Life Cycle Assessment (Max: 75 Points)			
LCA Credit 1	**Leadership and Strategy**	**10**	
LCA Credit 1.1	Strategy & Targets (Short term & long term)		5
LCA Credit 1.2	Action plan for conducting Life Cycle Analysis or Management		5
LCA Credit 2	**Life cycle Management for Products/service**	**10**	
LCA Credit 2.1	≥ 25% of the products covered		5
LCA Credit 2.2	≥ 50% of the products covered		10
LCA Credit 3	**Life Cycle Assessment for any of the products/process**	**10**	
LCA Credit 3.1	Internal LCA Study		5
LCA Credit 3.2	LCA Study with Peer Review		10
LCA Credit 4	**Environmental Impact Reduction based on LCA (Carbon/ Material/Water/Toxicity)**	**25**	
	Atleast one project		5
	≥ 5% impact		10
	≥ 10% impact		15
	≥ 15% impact		20
	≥ 20% impact		25

LCA Credit 5	**Detailed Environmental Product Declaration for Products/ service**	**10**	
	Atleast one product		5
	≥ 25% of the products or Products contributing to 25% of TO		10
LCA Credit 6	**External Partnerships contrubuting to LCI Database at National Level**	**10**	
	Sub-Total	**75**	
Others (Max: 100 Points)			
Green Factory Building	**To achieve IGBC Green Factory Building Rating, the unit/ facility has to either follow Credit 1 Or Credit 2, 3 and 4**		
OS Credit 1	**Achieve Green Buidling as per IGBC Green Factory Rating**	**50**	
OS Credit 2	**Indoor Environment Quality**	**20**	
OS Credit 2.1	Fresh Air Ventilation 20%, 30%		10
OS Credit 2.2	Low VOC Paints		5
OS Credit 2.3	Eco friendly house keeping chemicals		5
OS Credit 3	**Site Location**	**10**	
OS Credit 3.1	Housing facility for 40% of Employees within 5 kM radius		5
OS Credit 3.2	Access to Public Transport / Shuttle Services		5
OS Credit 4	**Landscaping**	**20**	
OS Credit 5	**Innovation (exemplary performances in any of 9 parameters or other innovations)**	**40**	
	8 Innovations @ 5 Points / Innovation		40
OS Credit 6	**Accredited Green Professionals**	**10**	
	Sub total	**100**	
Total		**1000**	

ENERGY EFFICIENCY (EE)

Background

The industrial sector is vital for economic growth but at the same time consumes the most energy to manufacture products we use every day. According to a report by International Energy Agency (IEA), in 2009, industry consumed a share of 40% of the electricity and 77% of coal worldwide.

Governments are increasingly faced with the challenge of providing energy to various sectors- households, manufacturing industries, transport, service, etc. In many countries, energy demand has outstripped supply leading to generation deficit and peak load deficit. This deficit leads to huge loss in GDP. Governments are thus increasingly aware of the urgent need to make better use of the world's energy resources. In addition, in countries like India, large population have no access to electricity and limited access to other clean or modern fuels.

In order to encourage and motivate consumers to conserve energy, Amory Lovins coined the term "Negawatt" in 1989. Negawatt power is a theoretical unit of power representing amount of energy saved (measured in Watts). Throughout the manufacturing process, energy is lost due to equipment inefficiency and mechanical and thermal limitations. Optimizing the efficiency of these systems can result in significant energy and cost savings. Understanding how energy is used and wasted can help plants pinpoint areas of energy intensity and ways to improve efficiency. According to a report by International Energy Agency (IEA), a significant potential for further energy savings remains. The application of proven technologies and best practices on a global scale could save between $25X10^9$ GJ and $37X10^9$ GJ of energy per year (1.9 Gt CO_2 to 3.2 Gt CO_2 emissions per year), which represents 18% to 26% of current primary energy use in industry.

Bureau of Energy Efficiency (BEE), nodal agency spear heading energy efficiency programs in India has launched Perform Achieve Trade (PAT) program to enhance energy efficiency in the country. Under the scheme, almost 478 units under 8 sectors are given targets for reducing energy consumption.

The companies that better their targets will be allowed to sell energy-saving credits ESCERTs to those failing to achieve the required cuts.

In short, energy will define the 21st century. In order to stay ahead of the competition, companies will need to invest in energy efficiency activities. India being one of the fastest growing economies in the world, the demand for energy is on the rise. Implementing energy conservation initiatives will reduce the demand, thus helping the nation achieve energy security. Huge investments are made each year to set up power plants to meet the supply demand gap. Investing in energy efficiency will help reduce these investments and also reduce the supply and demand gap.

Improved energy efficiency is thus the most economic and readily available means of improving energy security. The benefits of more efficient use of energy are well known and include reduced investments in energy infrastructure, lower fossil fuel dependency, decrease in greenhouse gas emissions, increased competitiveness and improved consumer welfare.

Energy Policy

EE Mandatory Requirement 1

Goal

To demonstrate the commitment of the company towards energy efficiency. An energy policy provides framework and direction for energy efficiency activities in the company.

Compliance Options

An energy policy with a clearly defined objective and commitment to systematically reduce energy consumption and improve energy efficiency. The policy should also highlight targets for annual percentage reduction in energy consumption.

Documentation Required

1. Copy of the energy policy signed by the head of the unit or head of the organisation.

Energy Management Cell & Energy Manager

EE Mandatory Requirement 2

Goal

To establish energy management cell with an energy manager and cross functional team to facilitate

energy efficiency improvements in the plant in a focused manner.

Compliance Options

The energy management team should be cross functional with representatives from various departments such as operation, mechanical maintenance, electrical, instrumentations, projects, engineering, utility, etc having clear responsibilities for improving energy efficiency in the plant. The energy management cell should be headed by full/ part time energy manager directly reporting to the head of the plant.

Documentation Required

1. Organizational structure of the energy management cell
2. Roles and responsibilities of the energy management cell

Leadership & Strategy

EE Credit 1 Points: 20

Goal

To demonstrate the commitment of top management towards improving energy efficiency.

Compliance Options

Target setting towards national & world class performance – Set specific targets for reduction in energy consumption. The targets should be in terms of specific energy consumption. This can be based on internal or national or international benchmarking.

financial resource allocation – The plant should commit upfront financial resources to minimize the gestation period between the identification of energy efficiency improvement projects and implementation. The upfront allocation of financial resource facilitates speedy implementation of the projects. The plant team can then be empowered to make use of the allocated resources with specific guidelines on investment / ROI / payback period.

Conduct monthly reviews – Conduct monthly reviews involving top management pertaining to energy

efficiency activities.

The break-up for allocation of points for EE credit 1 is as shown below:

Credit	Description	Points
EE Credit 1.1	Target setting - Internal benchmarking - National/International benchmarking	 5 10
EE Credit 1.2	Financial resource allocation at the beginning of the year	5
EE Credit 1.3	Monthly reviews pertaining to energy efficiency	5

Documentation Required

1. A brief write up along with supporting documents showing specific targets for reduction of energy consumption signed by the head of the unit.

2. Documents regarding allocation of resources for energy efficiency projects and financial empowerment of department heads / energy manager / others for taking up energy efficiency projects.

3. Sample minutes of the monthly review meetings.

Approach

Prevention is better than cure and so is the case with energy conservation (Encon). In the roadmap towards achieving energy efficiency, the top management should take the following initiatives:

- **Implement energy policy** - The policy should demonstrate the company's commitment towards energy efficiency. Energy policy can be part of environmental or sustainability policy. This requirement is mandatory for GreenCo certification.

- **Create energy management cell** - Companies need to have a team assigned for identifying all the energy conservation opportunities within the unit. The energy management team should be a cross functional team with representatives from various departments such as operation, mechanical maintenance, electrical, instrumentations, projects, engineering, utility, etc. The team should be led by key personnel from the senior management with clearly assigned roles and responsibilities for each individual. The team can be either full time or part time depending on the energy intensity of the company. Energy intensive companies like cement, fertilizer, refinery, iron and steel should have full time energy managers. While non energy intensive companies like automobile, building, engineering can have part time energy managers.

- **Set short term and long term targets** - The reduction targets can be either internal benchmarks based on the plant's specific energy performance or benchmarks on the basis of companies operating with the lowest specific energy performance on the national or international level. Both short term (3 years) and long term (beyond 3 years) targets should be set for reduction in energy consumption. EE credit 1.1 awards 5 points for setting targets based on internal benchmarking and 10 points for setting targets based on national/international level benchmarking.

- **Allocate resources** - Once a policy is framed, targets have been established, a dedicated energy management cell has been created, the next step is to allocate financial resources at the beginning of the year for implementation of various energy efficiency projects. EE credit 1.2 awards 5 points for allocating financial resources for energy efficiency activities.

- **Regular Monitoring** - A review mechanism needs to be maintained to monitor the energy performance and initiatives implemented in the plant on a regular basis (daily /monthly). Companies also need to ensure that monthly meetings are held to continuously monitor the progress madetowardsachievingthe set targets. These meetings should focus on discussing the challenges faced and opportunities for improvement in energy efficiency. EE credit 1.3 awards 5 points for monthly reviews of energy efficiency activities.

Resources

1. CII-Godrej Green Business Centre Energy Efficiency Services: http://www.greenbusinesscentre.com
2. Publications on Energy Efficiency by CII Godrej Green Business Centre:
   a. Manual on Improving Steam System Performance
   b. Manual on Compressors and Compressed Air Systems
   c. Energy Efficiency Guidebook for Electrical Engineers
   d. Low Carbon Roadmap for Indian Cement Industry
   e. Cement Formulae Handbook
   f. Manual on Best Practices in Cement Industry
   g. Manual on Best Practices in Indian Thermal Power Generating Units
   h. Investors Manual for Energy Efficiency in Small & Medium Scale Enterprises
   i. Energy Efficiency Guidelines and Best Practices in Indian Datacentres
   j. Best Practice Manual on Pulp & Paper Industry http://www.greenbusinesscentre.com/CII Publication/energy_manag.html
3. National Award for Excellence in Energy Management by CII- Godrej Green Business Centre http://www.greenbusinesscentre.com
4. International Energy Agency http://www.iea.org
5. U.S. Department of Energy http://www.eere.energy.gov
6. Bureau of Energy Efficiency, India http://www.beeindia.in

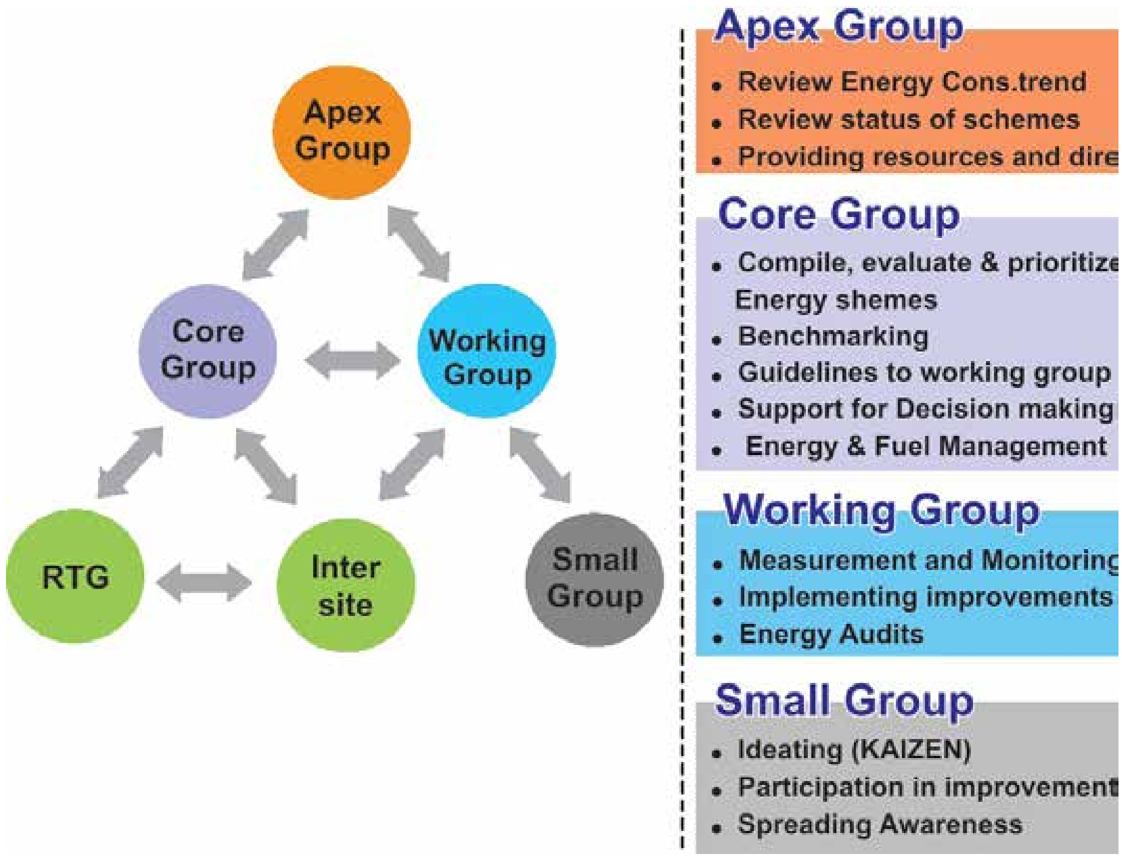
Case Study 1- Energy Policy

A leading automobile company in the business of designing and manufacturing vehicles framed the following energy policy:

- Strive to become the lowest specific energy consumer in the automobile domain.
- Maximize energy efficiency to minimize the carbon footprint.
- Use renewable energy in the manufacturing business.
- Develop a robust measurement and monitoring program for tracking real time energy consumption.
- Establish a strong Energy Monitoring & Management System by leveraging in-house as well as external resources.
- Continue with capacity building of manufacturing locations to propagate energy management in routine manufacturing functions.
- Conduct periodic energy audits.
- Propagate energy conservation culture both in letter and in spirit.
- Adopt best energy management practices with stake holders.
- Ensure energy efficiency equipment purchase for all new projects.

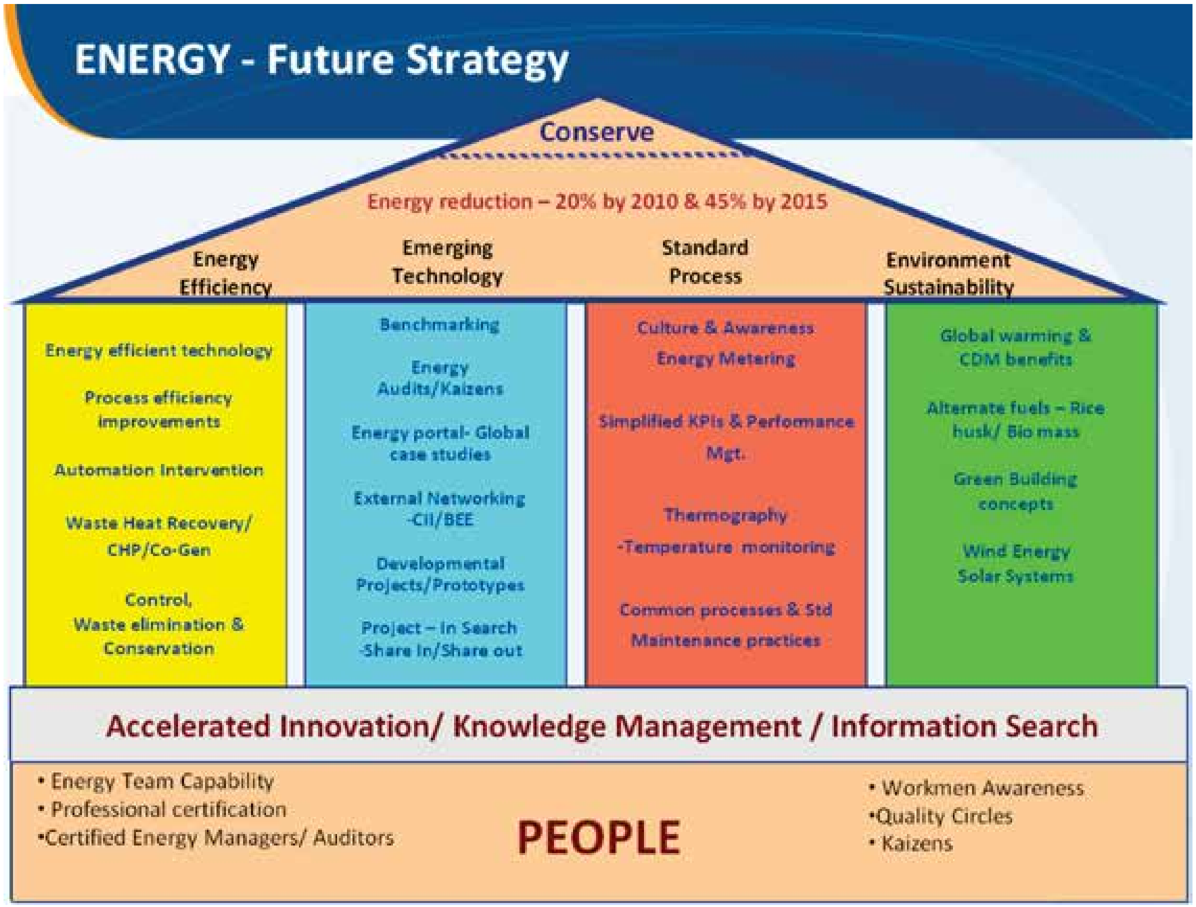
Case Study 2- Energy Management Structure

A leading petrochemical company has adopted a four tier structure for energy conservation in the plant. The company follows a top driven approach where-in the accountability for energy conservation initiatives are equally distributed amongst all employees who fall under the various groups. Each group is assigned an activity which gets reviewed on a regular basis.



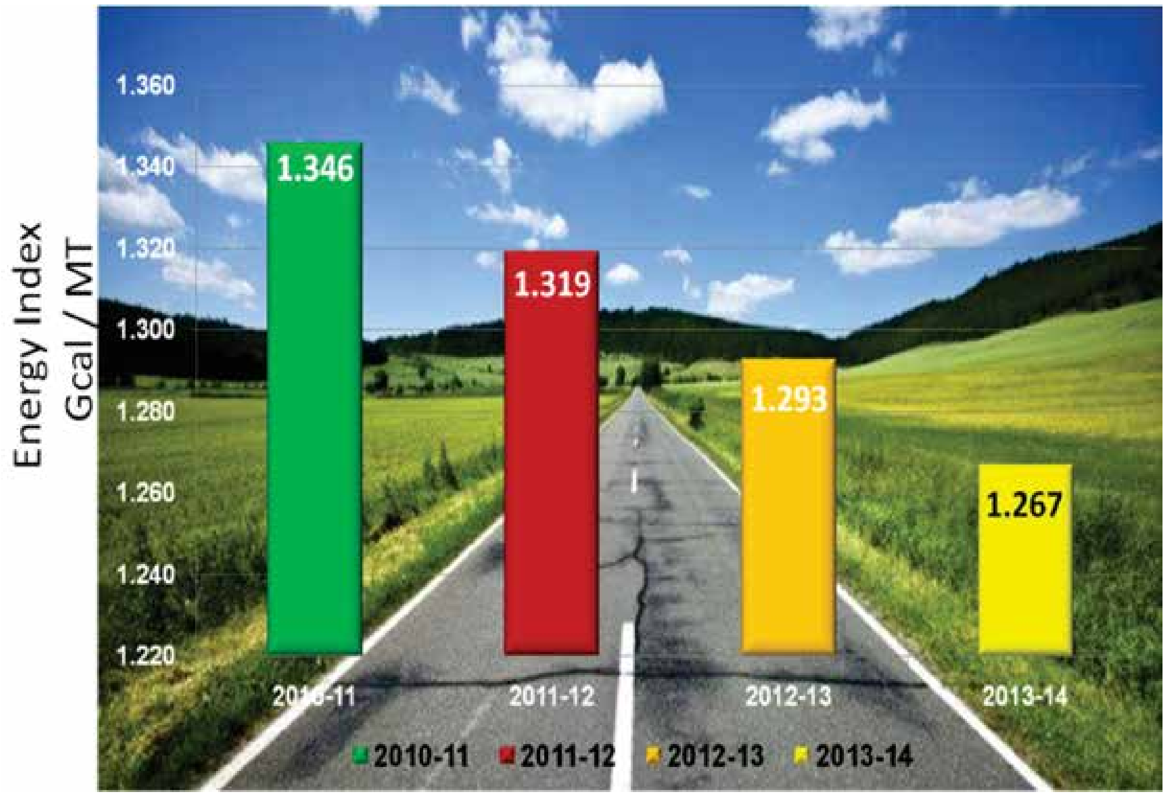
Case Study 3- Energy Conservation Roadmap

A leading FMCG company has developed a roadmap for energy conservation. The roadmap illustrates the clear vision and commitment of the management in pursuing energy conservation. The company has a clear goal of reducing its energy consumption by 20% (short term) and 45% (long term) over the coming years. The company has also specified the various approaches or strategies being adopted for meeting the set targets.



Case Study 4- Targets for Reduction in Specific Energy Consumption

A leading petrochemical plant has a clear vision and commitment taken by the organisational head towards energy efficiency. All targets are devised based on meeting this objective. The company has clearly demarked the activities required for fulfilling the long term and short term goals. The long term goals have been assigned based on the benchmarking exercise and new capacity addition of the facility. The midterm and annual plans are derived from the various energy conservation implementation and accounting systems.



Employee Involvement & Capacity Building

EE Credit 2 **Points: 15**

Goal

Encourage companies to create awareness about energy efficiency among all employees and build the capacity of specific team members to take up energy efficiency improvement projects on a continuous basis.

Compliance Options

Strategies adopted for awareness creation and employee involvement – Programs and initiatives taken by the plant team for employee involvement like poster competition, displaying slogans, energy conservation week, incentives based on suggestion schemes, etc. These programs should be aimed at involving all the employees.

Training programs and capacity building – Training program to build capacity of employees so that they are able to contribute to energy efficiency activities. The plant should identify the training needs of employees with regard to energy efficiency and organise programs accordingly.

Implementation of energy score card – Energy score card is a process of considering energy performance of the plant section as one of the criteria while appraising the performance of the plant personnel. This is applicable for plant personnel like energy managers, operation and maintenance engineers and operators where high manual intervention is required and who have a direct role on energy efficiency of the plant. Contribution to energy efficiency activities should also be a key performance indicator (KPI) for other employees like utility team, projects team, etc.

The break-up for allocation of points for EE credit 2 is as shown below:

Credit	Description	Points
Credit 2.1	Strategies adopted for awareness creation and employee involvement	5
Credit 2.2	Training programs and capacity building	5
Credit 2.3	Energy score card	5

Documentation Required

1. A brief write up explaining the different awareness programs conducted during the year and strategies adopted for employee involvement. The write up should clearly explain the following- date of program, agenda of the program, participants, contents of the presentations, photographs, results, feedback, etc.

2. Documentation on the training needs of employees on energy efficiency and the training programs conducted in the last one year.

3. Documentation on performance appraisal of employees based on the energy performance of the plant.

Approach

Energy conservation in not a one time activity and is often a continuous process. Most people are unaware of how their everyday actions and activities affect energy use and impact the environment. An important aspect of energy-conservation which is often overlooked is employee involvement. Without the cooperation and involvement of employees, even the best-designed energy-conservation programme can fail or, at best, achieve very little success. Energy costs can be reduced by changes in the behaviour of employees.

To obtain employee commitment to energy conservation, the benefits related to employees, the organization and the community should be communicated as a whole. Engaging employees requires a clear set of goals and objectives, performance measurement and regular communication. Conserving energy should be more than just a policy statement - it must become a part of the daily work routine through a mixture of incentives, training, and assigned responsibilities. A truly successful energy program requires the active participation of everyone in the organization. By increasing employee awareness about the steps that they can take to help reduce unnecessary energy consumption, companies can realize significant cost and energy savings. EE credit 2.1 awards 5 points for awareness creation among all employees.

Apart from general awareness sessions, it is also essential for companies to conduct capacity building and training programs on specific skills required for energy conservation. These training programs are conducted for a smaller group of staff that are directly involved in the energy efficiency activities. EE credit 2.2 awards 5 points for training and capacity building programs.

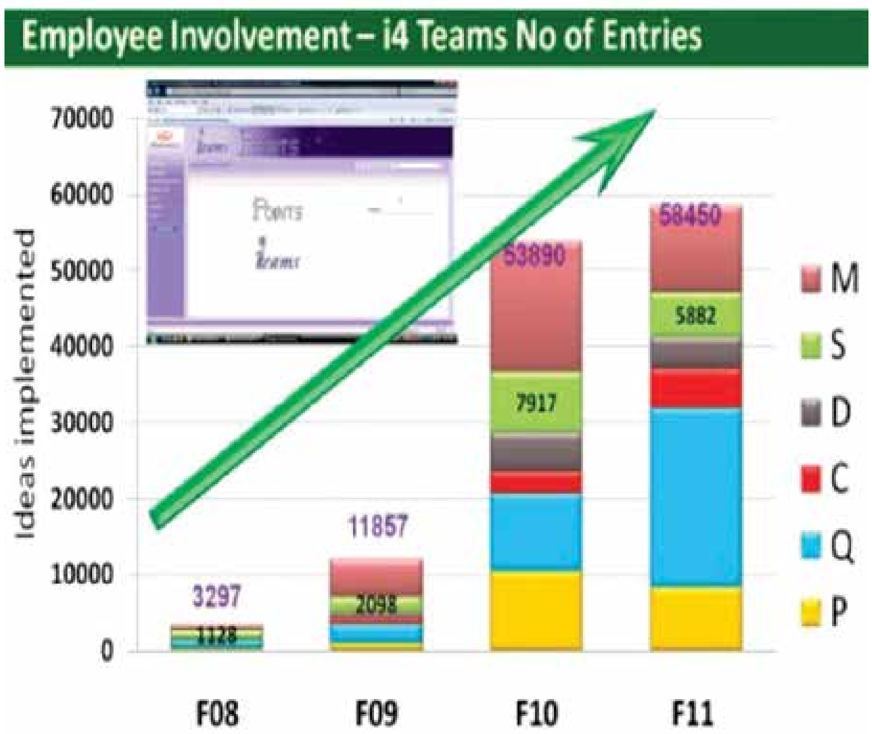
Energy scorecard: World class units compile energy metering and monitoring data in a presentable format (energy scorecard) which is used as a tool to evaluate the performance of the department as well as individual. Using the energy scorecard, individuals from various departments such as operation, maintenance,

electrical, instrumentations, projects, engineering, utility, etc. should be evaluated based on energy savings achieved. EE credit 2.3 awards 5 points for maintaining energy scorecard.

Case Study 1- Awareness Creation

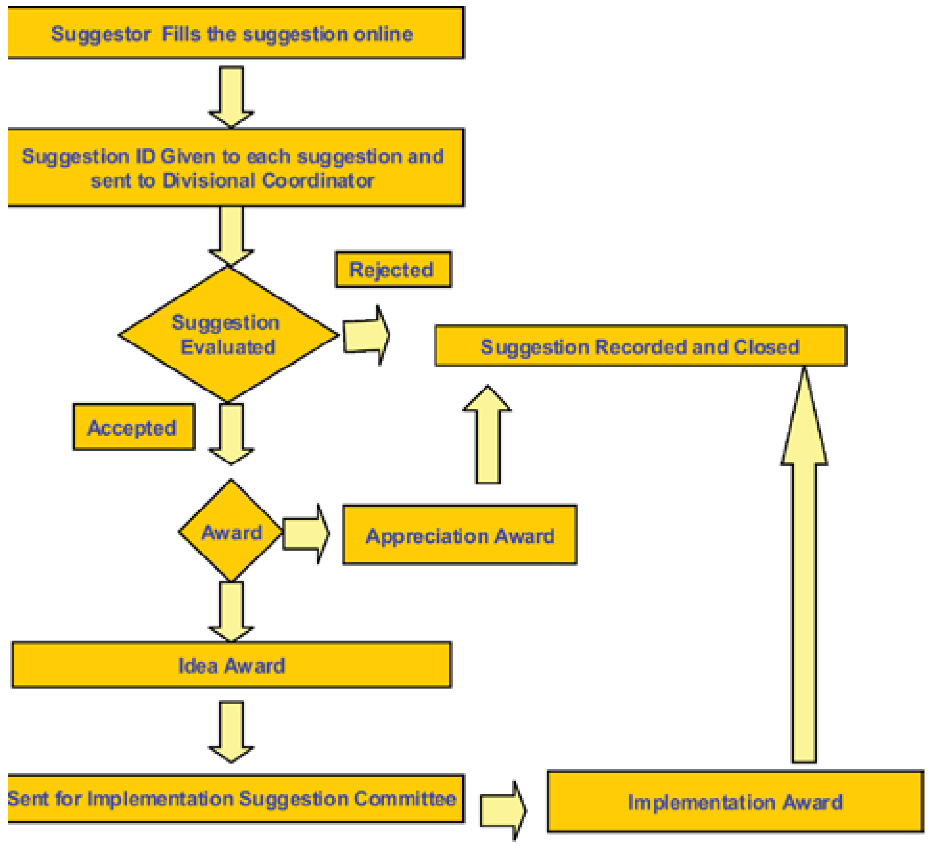
A leading automobile company displays posters at different locations in the unit to spread awareness on different environmental issues like energy conservation.

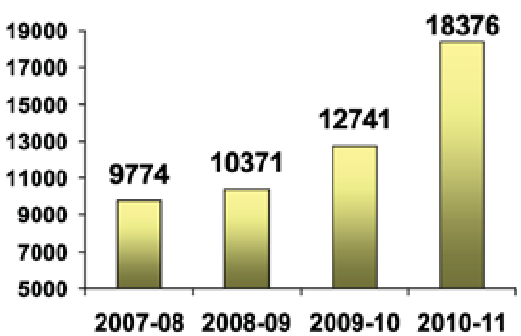
The company also encourages suggestion schemes & conducts recognition programs for employees that suggest schemes leading to improvement in energy efficiency.

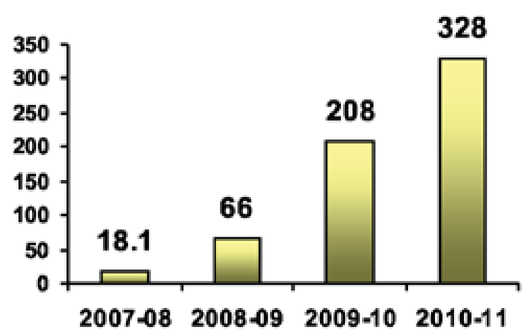


Case Study 2- ENCON Suggestion Schemes

A leading automobile company believes that “there is always a better way of doing a thing and only the employees can suggest it”. Around 18,376 suggestions were received for energy savings in 2010-2011 which resulted in savings worth Rs. 328 lakhs as shown in the graph below:







No: of suggestions received

Savings (in Lakhs)

Energy Monitoring & Management System

EE Credit 3 **Points: 15**

Goal

Encourage implementation of a comprehensive Energy Monitoring & Management System for monitoring energy consumption across the plant on a continuous basis, carryout variance analysis and take corrective actions on a daily basis to minimize energy consumption.

Compliance Options

Implement a comprehensive Energy Monitoring & Management System in the plant. The Energy Monitoring & Management System should consist of the following:

Energy monitoring and accounting - Install energy monitoring system and monitor both electrical & thermal energy consumption at the supply and user ends. Balance the energy supply with the consumption at individual user ends and generate a daily report for analysis.

Daily variance analysis and correction - Analyze the daily report and take corrective actions immediately if there is an increase in energy consumption. Document the reasons for increase in energy consumption, analysis carried out and the corrective measures taken.

Credit	Energy Monitoring & Accounting	Points
Credit 3.1	Energy monitoring for equipment (electrical & thermal) having > 10% of total energy consumption – 5 points Energy monitoring for equipment (electrical & thermal) having > 5% of total energy consumption – 10 points	10
Credit 3.2	Daily variance analysis and correction	5

Documentation Required

1. Schematic diagram of the energy monitoring system for electrical and thermal energy.
2. Details of the percentage of energy consumers covered as part of the energy monitoring system.
3. Sample monitoring reports generated on a daily basis for both electrical and thermal energy consumers.
4. Sample documentation of daily variance analysis and corrective action taken.

Approach

The problem of saving energy is a large issue for many corporations. Conserving energy saves resources, money and the environment. According to the popular axiom, “you can’t manage what you can’t measure”, it is highly impossible to properly conserve energy without knowing how and where it is being consumed. This is where energy monitoring plays a crucial role.

A sound Energy Monitoring & Management System is a prerequisite for identifying and implementing energy conservation measures, sustaining the momentum for different conservation activities and for effective improvements on a continuous basis. It is a management technique that uses information on energy consumption as a basis to eliminate waste, reduce and control current level of energy usage and improve the existing operating procedures. When energy consumption becomes available for viewing and analysis, it alerts them to situations where they may be acting in an unintentionally wasteful manner.

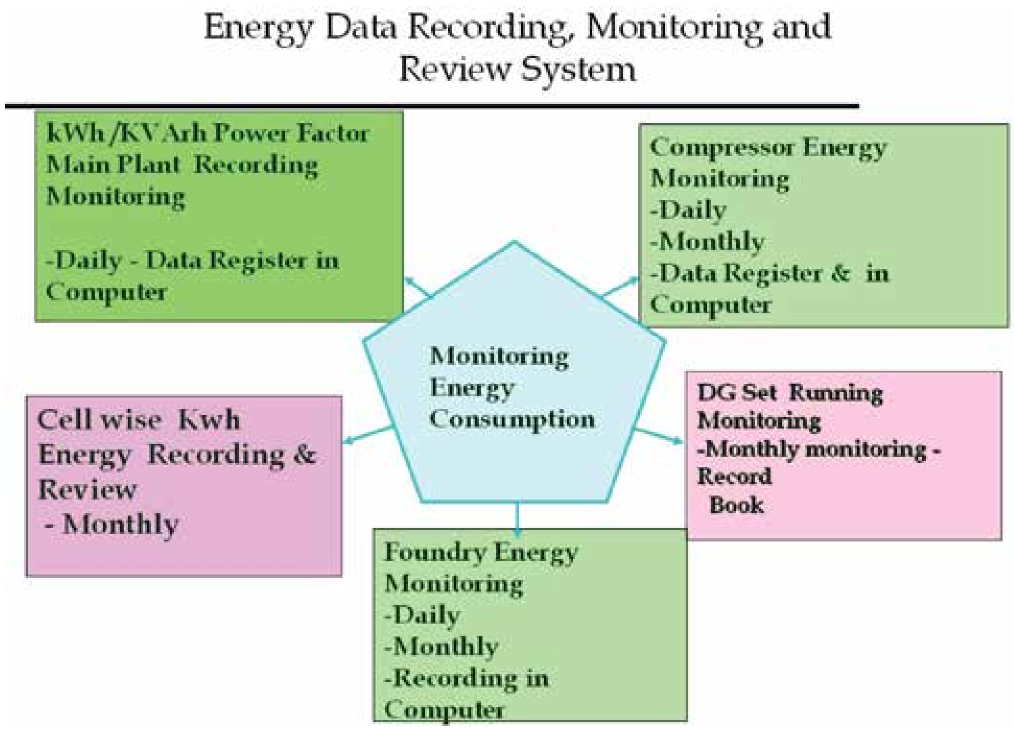
Select digital energy meters having same accuracy level for metering at the supply as well as at the user end. It is preferable to select digital meters of class 0.2. Install a centralized monitoring system and monitor the energy consumption in all the metered equipment. The centralized monitoring system should have provision for monitoring the instantaneous and cumulative energy consumption of the equipment measured. There should also be a provision for maintaining history of energy consumption and generating reports on daily basis.

EE credit 3.1 awards 5 or 10 points for monitoring of equipment (electrical and thermal) that consumes more than 10% or 5% respectively of total energy consumption. If multiple smaller equipment in the plant collectively consume significant amount of energy, monitoring of individual sections consisting of these equipment is required. In case single equipment consumes more than 80% of the total energy used, this credit requires monitoring of other major equipment, over and above the equipment that is consuming 80% of the total energy used.

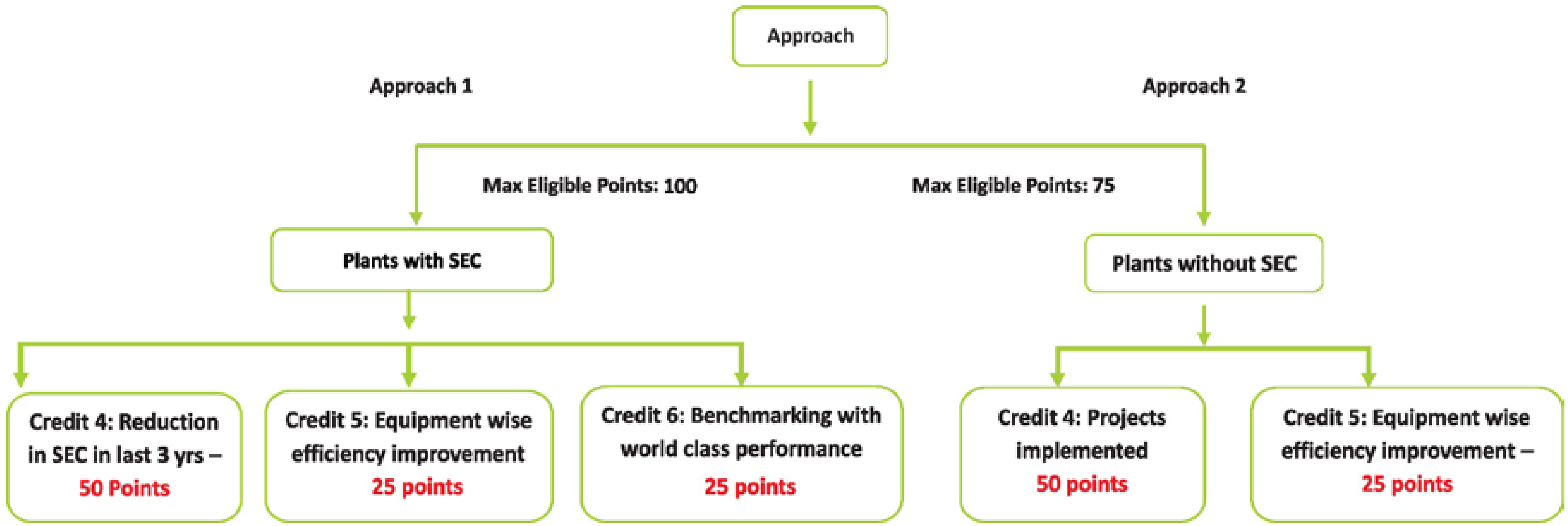
EE credit 3.2 awards 5 points for daily variance analysis and for steps taken to check on the reasons behind the variance and corrective action taken to fix the variance.

Case Study 1- Energy Monitoring System in a Foundry

A leading foundry in India implements a detailed metering and monitoring system as displayed in the diagram below. In order to sustain savings achieved the company has adopted systems to monitor the savings of implemented projects. For every ENCON project, check sheet is prepared & periodic review or internal audit is conducted. Periodic calibration of meters & gauges is done as a part of energy monitoring & quantification.



Assessment of the measures taken and the actual benefits achieved



Approach -1 Plant with SEC Reduction in SEC in the last 3 years

EE Credit 4 **Points: 50**

Goal

To achieve consistent reduction in specific energy consumption and set clear targets for further reduction.

Compliance Options

Monitor the specific energy consumption on a daily basis. Document the specific energy consumption variations on a daily, monthly and yearly basis.

Establish the percentage reduction in specific energy consumption after implementing energy conservation measures year wise for each financial year. Points will be awarded based on the percentage reduction in energy consumption achieved in the plant in the past 3 years.

The various categories of sectors and the details of the threshold for allocation of points for reduction

in specific energy consumption are given below:

Categorization of sectors			
Category -1	Category -2	Category -3	Category -4
Automobile	Chemical	Cement	Fertilizer
Building	Pulp & Paper	Iron & steel	Refinery
Engineering	Petrochemical	Chlor Alkali	Aluminium Smelting
Service	Pharmaceutical		
FMCG	Metals – Non ferrous		
Textile	Glass		
Foundry	Tyres		

Category -1	Category -2	Category -3	Category -4
>2.5% - 5 Points	>1.% - 5 Points	> 0.50% - 5 Points	> 0.25% - 5 Points
>5% - 10 Points	> 2% - 10 Points	> 1% - 10 Points	> 0.5%- 10 Points
>7.5 % - 15 Points	> 3 % - 15 Points	> 1.5 % - 15 Points	> 0.75 %- 15 Points
>10% - 20 Points	> 4% - 20 Points	> 2% - 20 Points	> 1.0% - 20 Points
>12.5% - 25 Points	> 5% - 25 Points	> 2.5% - 25 Points	> 1.25% - 25 Points
>15% - 30 Points	> 6% - 30 Points	> 3% - 30 Points	> 1.5% - 30 Points
>17.5% - 35 Points	> 7% - 35 Points	> 3.5% - 35 Points	> 1.75% - 35 Points
>20% - 40 Points	> 8% - 40 Points	> 4% - 40 Points	> 2.0% - 40 Points
>22.5% - 45 Points	> 9% - 45 Points	> 4.5% - 45 Points	> 2.25% - 45 Points
>25% - 50 Points	> 10% - 50 Points	> 5% - 50 Points	> 2.5% - 50 Points

Documentation Required

1. Documents indicating the SEC of the company for the last 3 years.
2. Details of the projects implemented to reduce specific energy consumption.

Approach -2 Plants without SEC

This approach will be adopted only if the plant has not established specific energy consumption figures or benchmarked their consumption at national or international level.

Projects implemented in the last 3 years

EE Credit 4 **Points: 50**

Goal

To encourage implementation of the maximum number of energy saving projects and reduce the overall energy consumption.

Compliance Options

List of energy saving projects implemented in the last three years with the following details

a. Project title

b. Annual savings achieved in Energy units (kWh / Kcal) and in Rs. million

c. Investment made in Rs. million

d. Simple payback period

The projects will be evaluated based on the following aspects.

Description	Total Points
Percentage of savings achieved with respect to the annual energy consumption > 2.5% - 5 Points > 5% - 10 Points > 7.5 % - 15 Points > 10% - 20 Points > 12.5% - 25 Points > 15% - 30 Points > 17.5% - 35 Points > 20% - 40 Points > 22.5% - 45 Points > 25% - 50 Points	50

Documentations Required

1. Details of the projects implemented with savings achieved.

2. Trend indicating the variation in energy consumption in the last 3 years

Approach

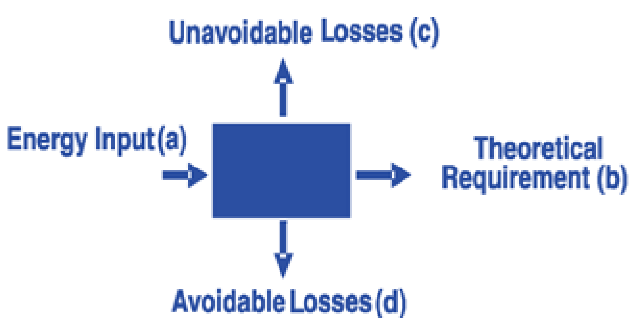
Increasing cost and lack of availability of energy sources has resulted in companies looking at optimising energy consumption and improving efficiency for reducing operating costs thereby enhancing profitability in the highly competitive market. Energy efficiency is considered as one of the key initiatives for organisations pursuing long term sustainable growth. Energy efficient companies can gain a competitive advantage over less efficient companies, allowing them to increase their profits at current product prices, or lower their prices to gain market share, or a combination of the two.

The first step at the design stage is to begin with specific energy consumption targets for the

- Overall process
- Individual equipment/section

Any unit/process operation consists of energy input (a), theoretical requirement (b), unavoidable losses (c) and avoidable losses (d) where a = b+ c+ d. The focus should be to:

- concentrate on avoidable losses
- quantify the losses
- identify ways and means for reduction
- implementation



World class units have a holistic approach to energy conservation. The following three pronged approach is advocated for achieving energy conservation. This approach comprises of:

- **Energy efficient technologies**

For achieving quantum jumps in energy efficiency, the application of an efficient technology is vital. A detailed verification of both the process and equipment from the energy point of view is necessary. The life cycle cost should be taken as the basis for choice of alternatives. Some of the latest technologies which have been introduced in the Indian industry include, variable speed drives (VSDs), heat exchanger network, micro steam turbines, roller press for cement grinding, etc. Operating with Best Available Technologies (BAT) is carried out through retrofits, renovation, modernisation and capacity enhancement processes. Usually this approach is capital intensive but the benefits incurred are phenomenal.

- **Operational fine tuning**

Normally equipment or machines are provided with an additional margin as part of a safety precautionary measure. In order to achieve maximum efficiency, the equipment needs to operate at the design level. Hence it is required to identify the potential efficiency at various operating loads to determine the best efficiency levels to operate and reap maximum benefits.

- **Capacity utilisation**

Operating the equipments at maximum capacity utilization usually leads to higher energy efficiency levels. This helps to optimise the energy consumption and improve the performance of the equipment by utilising its maximum potential thereby enhancing productivity.

For EE credit 4, plants with reduction in specific energy consumption are awarded maximum of 50 points for reducing SEC by 2.5% to 25% or more (depending on the category) in the last three years.

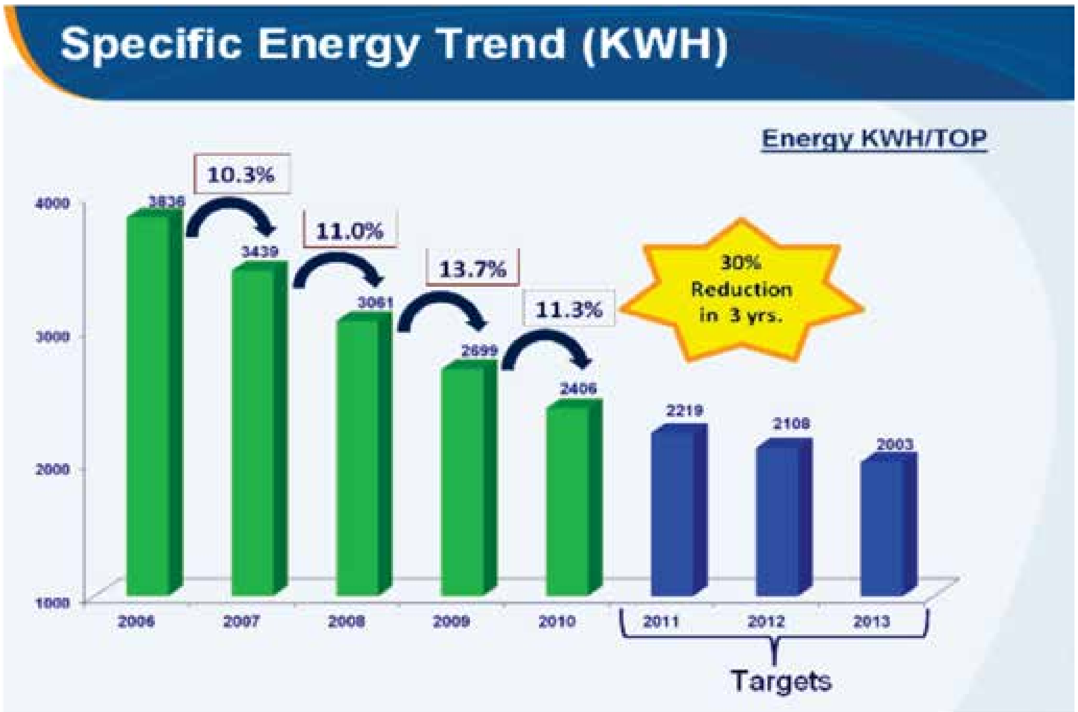
Plants with reduction in total energy consumption are awarded maximum of 50 points for reducing total energy consumption by 25% in the last three years.

Case Study 1- Reduction in Specific Energy Consumption by FMCG Company

A leading FMCG company regularly monitors the specific energy consumption of both its thermal and electrical consumption for a ton of product. The plant has specified targets for reduction over the coming years:

- 10% reduction by 2015
- 25% reduction by 2020

Through rigorous implementation of projects to meet the set targets, the company has successfully reduced specific energy consumption by 30% in the last 3 years.



The following initiatives were taken to achieve 30% reduction in SEC:

- 4 conventional evaporators replaced with one multiple effect evaporator which resulted in savings of 2550 tonnes of coal
- Automatic barometric condensers which resulted in 2.4 lakh kWh savings
- JET Cooling tower which resulted in 90,000 kWh savings
- Solar ACs which resulted in 30,000 kWh savings

Case Study 2- Reduction in Total Energy Consumption by Automobile Company

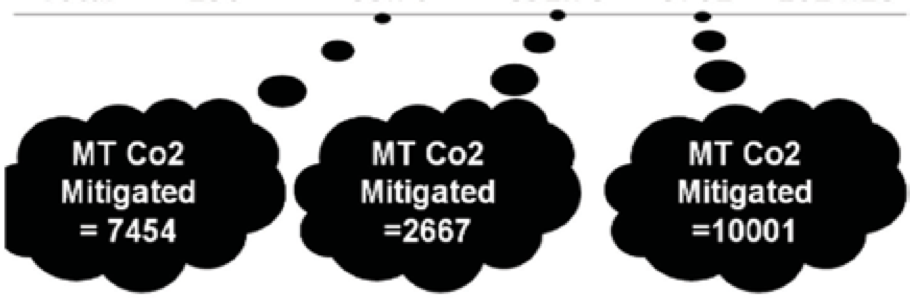
One of the leading automobile manufacturers has been continuously implementing energy efficiency initiatives within the company to reduce the resource consumption and to conserve energy. The unit made investments worth Rs 39.6 million which has resulted in annual recurring savings of Rs 162.4 million over the last 3 years.

Measures	No. of Projects
No/low investment < 1 Lac	225
Medium investment < 5 Lac	19
High Investment > 5 Lac	6
Total	250

Measures	No. of Projects
VFD/Energy Efficient Pumps/ Motors	43
Lighting System	146
Compressed Air Mgt	14
Thermal Efficiency	16
Others- Logistics	31

Year	Investment Rs. Lacs
2008-2009	82
2009-2010	163
2010-2011	151
Total	396

Year	No.of Projects	Electrical saving Lakh kWh	LPG saving MT	HSD saving kL	Total saving Rs.Lakhs
2008-09	126	41.0	172.38	1895.7	906.8
2009-10	86	36.7	496	642.9	606.4
2010-11	38	6.06	224.35	1163	111.08
Total	250	83.76	892.73	3702	1624.28



Equipment Wise Efficiency Improvement

EE Credit 5 **Points: 25**

Goal

To facilitate energy efficiency improvement through installation of energy efficient equipment and operating the equipment at the highest level of efficiency.

Compliance Options

Performance evaluation of energy intensive equipment should be carried out and recorded. The equipment accounting for major consumption i.e. 80% of the total energy consumption of the plant should be considered for performance evaluation.

The points will be allocated based on the deviation of the present efficiency of the equipment from the design efficiency or the best efficiency of the equipment available in the market. The maximum points that can be earned for this credit are 25. If the efficiency of the equipment available in the market is more than the design efficiency of the existing equipment, the efficiency of the equipment available in the market will be considered as reference.

CII – Godrej GBC has published various manuals as listed under EE credit 1 resources. The different manuals list the efficiencies of all the major energy intensive equipment. Sample evaluation procedures for some equipment are given in Annexure-D.

Documentation Required

1. Details of the energy intensive equipment i.e. equipment consuming 80% of the total energy consumption in the plant.

2. Performance evaluation sheets of the individual equipment.

3. Steps taken to ensure the efficiency of energy intensive equipments is at its best.

Approach

Energy efficiency is recognised to be the fastest and most cost-effective response in the battle against climate change. Investing in energy efficient equipment makes sound business and environmental sense as equipments and machinery are the workhorses of any industry. But several barriers can hinder the market penetration of energy efficient products. In some cases, these products aren't available to consumers; in others, consumers don't understand the benefits or can't afford the higher up-front costs. Businesses must sometimes be convinced that investments in new efficient equipment and processes will benefit their bottom line.

Purchasing equipments of higher efficiency and ensuring that the existing equipment is being operated at optimum efficiency can help the company in reducing energy consumption and reducing operating costs.

All energy intensive equipments should be analysed periodically for operating deviation from the design level based on the present energy performance.

Table: To monitor equipment wise energy efficiency

Sl. No.	Name of the equipment	Design efficiency (%) or energy performance of the equipment (ex- kw/ cfm of compressed air @ operating pressure kw/ton of refrigeration)	Operation efficiency (%) or operating energy performance of the equipment (ex- kw/ cfm of compressed air @ operating pressure kw / ton of refrigeration)	Deviation	Action taken to maintain or improve the efficiency

For example, for each compressor the table below should be filled:

Sl. No.	Compressor No	FAD	Actual quantity of air delivered	Actual power consumption kw	Specific power consumption kw/cfm
Total					
		Average specific power consumption		Σ A/nA	

This exercise will help determine the actual performance of the compressor with respect to its design efficiency. Similar exercise should be conducted for all major energy intensive equipment in the facility. Annexure D contains list of sample evaluation sheets for different equipment.

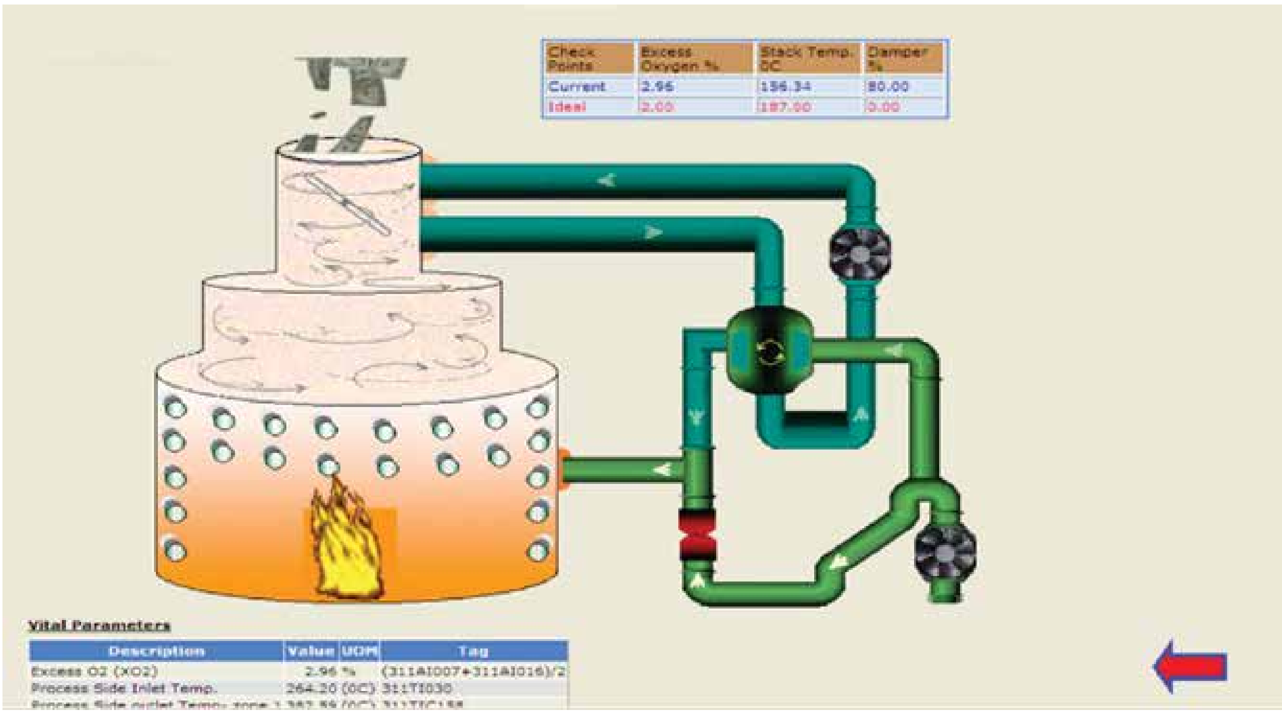
Monitoring equipment wise efficiency will enable companies to look at various options for improvement such as:

- continuous accounting of each equipment's energy performance
- fine-tuning equipments to operate at the best efficiency levels
- procuring lowest energy consuming equipment and machinery
- implementing best available technologies (BAT)

Equipment wise efficiency should be monitored on a monthly/quarterly basis depending on the intensity of the equipment. Relevant action steps should be taken when the actual efficiency of the equipment is found to be less than the reference efficiency. EE credit 5 awards 25 points for regular monitoring and evaluation of equipment efficiency and the necessary action taken to ensure maximum energy efficiency.

Case Study 1- Monitoring Efficiency of Energy Intensive Equipment in a Refinery

A leading refinery has employed a real time monitoring mechanism for all energy intensive equipment in the plant. Here all the major industrial furnaces are continuously monitored for the fuel and thermal efficiency in addition to the regular parameters. The deviations are also analysed on a continuous basis and corrective actions taken to operate the equipments at the maximum efficiency levels. The diagram below shows furnace monitoring web page:



Approach -1 Plant with SEC

Benchmarking With World Class Performance

EE Credit 6 **Points: 25**

Goal

To help plants realise their present status with respect to energy efficiency and also guide them to progress towards world class performance in energy efficiency.

Compliance Options

Demonstrate the performance in terms of Specific Energy Consumption in line with National and International SEC benchmarks.

1. Category 1 - National Benchmarking

2. Category 2 - International Benchmarking

Credit	National/International SEC benchmark in the sector	Points
EE Credit 1.1	**National SEC benchmark**	
	Among top 10 Units / Top 10% of the units at national level	5
	Among top 5 units / Top 5% of the units at national level	10
EE Credit 1.2	**International SEC benchmark**	
	Among top 20 Units / Top 20% of the units at international level	15
	Among top 10 units / Top 10% of the units at international level	20
	Among top 5 units / Top 5% of the units at international level	25

Documentation Required

1. Documents specifying the SEC of the company for the last 3 years.

2. Sector specific national and international benchmarks and source for each benchmark.

3. List of top 10 national / international companies from an authentic source.

Approach

Energy conservation practices have acquired top priority in the present context of increasing energy prices, acute energy shortage and the ever- widening demand supply gap. Many industrial units have adopted several measures to optimize energy costs. Significant reduction in power consumption and substantial reduction in cost has been achieved by these units. A world class energy efficient unit is:

- A trend setter in specific energy consumption norms – the lowest in the world
- A leader in implementing the latest technologies
- Has practically "nil" energy wastage
- Has adopted energy scorecard
- Has made energy conservation (ENCON) an "on-going activity" and incorporated as a part of the management system.

Essentially, a world class energy efficient unit operates with the world's lowest specific energy consumption (electrical & thermal).

The various characteristics of world class units are elaborated below:

♦ **Benchmarking and trend setting**

With the 'benchmarking' approach, units try to identify the best unit in its class, and plan to match themselves their performance in line with the best unit identified. With the benchmarking approach, the units reach a performance level closer to the best units.

Worldclassunitsadoptanapproachof'trendsetting'; that is beyond benchmarking. They start with a 'zero' base, look for innovative opportunities in each area of operation and implement them. This approach facilitates the plant to look for the most efficient design / technology / operating practices without being bounded by the 'Benchmark'. World class plants thus are trendsetters and emerge as leaders in the field.

♦ **Information sharing**

World class companies believe in information dissemination as quick as possible. The fact that the time lost due to delay in information transfer could result in a significant monetary (energy) loss is well understood by the company.

♦ **Implementation of latest technology**

World class units are willing and have the capacity to take the risk of implementing latest technologies. Several rewards accompany this risk. They become the technology developer's first preference, and get the technology at a very low price. The technology developer also works hand-in-hand with the plant team in making the new technology successful.

♦ **Energy wastage**

In a world class unit, energy wastage is very minimal.

♦ **EnCon culture**

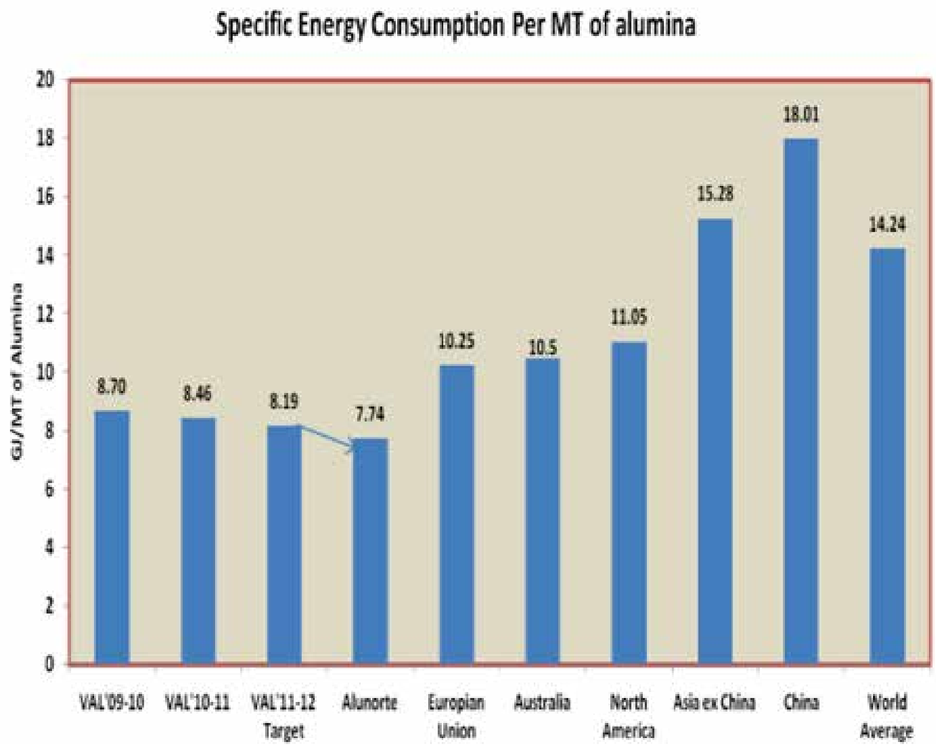
In a world class unit, energy efficiency activities are not driven by just external factors like costs, cheaper imports, etc. Energy efficiency instead becomes routine activity. Top management allocates resources to each department. This mode of operation has 2 benefits- it ensures faster implementation of energy saving projects once technically proven and drives people to identify newer avenues for utilizing the resources allocated.

EE credit 6 emphasizes on the importance of benchmarking to drive world class performance. EE credit 6 awards companies 5 to 25 points for achieving SEC that is among top 5% to 10% of the units nationally or top 5% to 20% of the units internationally.

Companies can obtain national and international benchmarks from various publications, sustain ability reports of leading companies, presentations from energy awards, sectoral associations, etc. Any variation in the process compared to the major competitor can be highlighted. In case the process is unique and no national and international benchmarks are available, the company can provide internal benchmarks and initiatives taken to reduce specific energy consumption in the last 5 to 10 years.

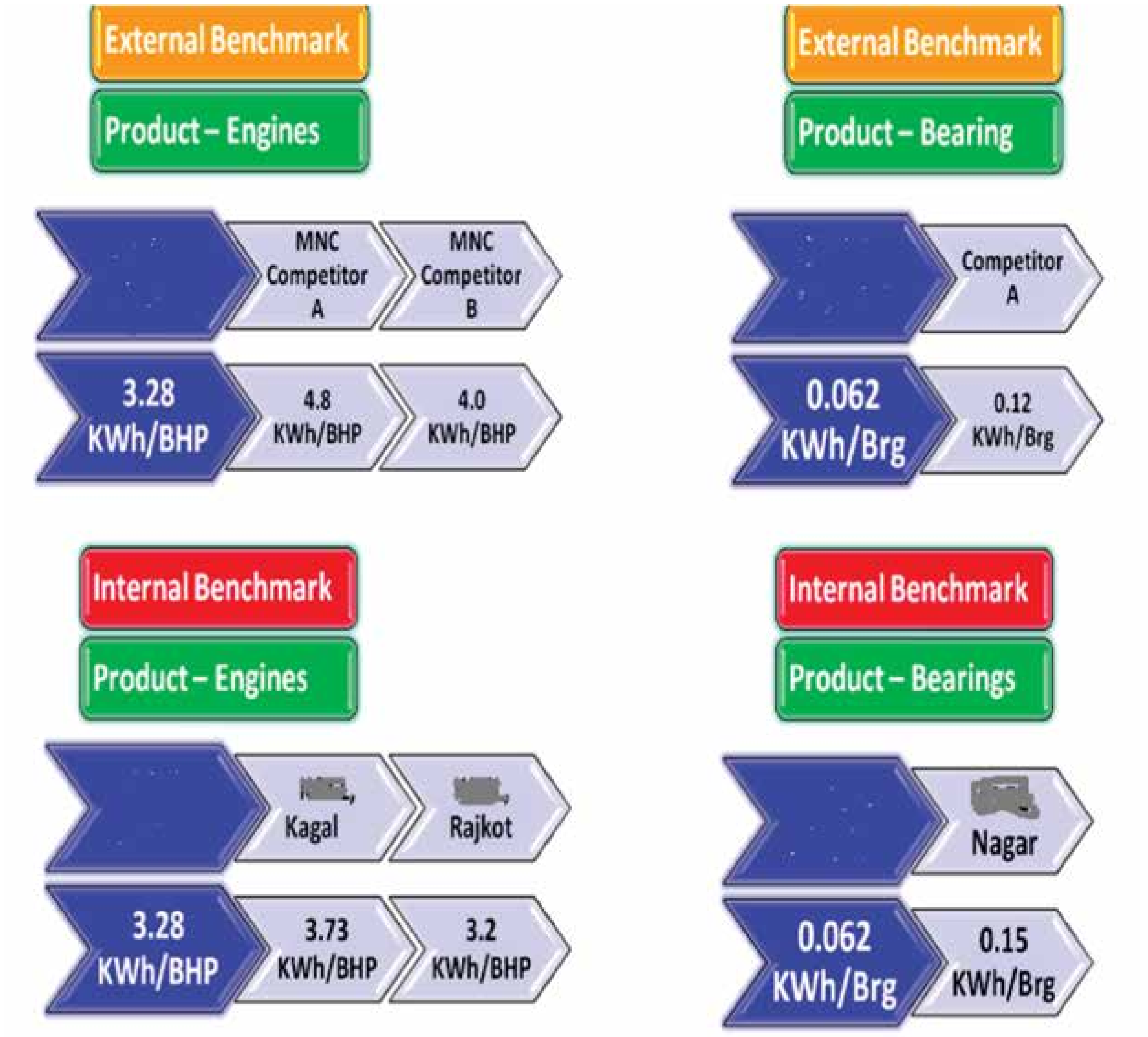
Case Study 1- Benchmarking by an Alumina Plant

One of the leading aluminium manufacturers in India is regularly benchmarking itself with its major competitors in the world. It is constantly looking at being the lowest energy consumer within the sector and has been operating far higher than the world averages in terms of specific energy consumption. The company has also specified the timeline for achieving the best benchmark.



Case Study 2- Benchmarking by an Auto Ancillary Company

A leading diesel engine manufacturing company regularly benchmarks itself both at the national and international level. The diagram below illustrates how the company computes the benchmarks on the basis of the various products its manufactures. The plant compares itself with the performance of its competitors at the international level while it follows a comparison methodology between sister facilities of the same organisation on the national level.



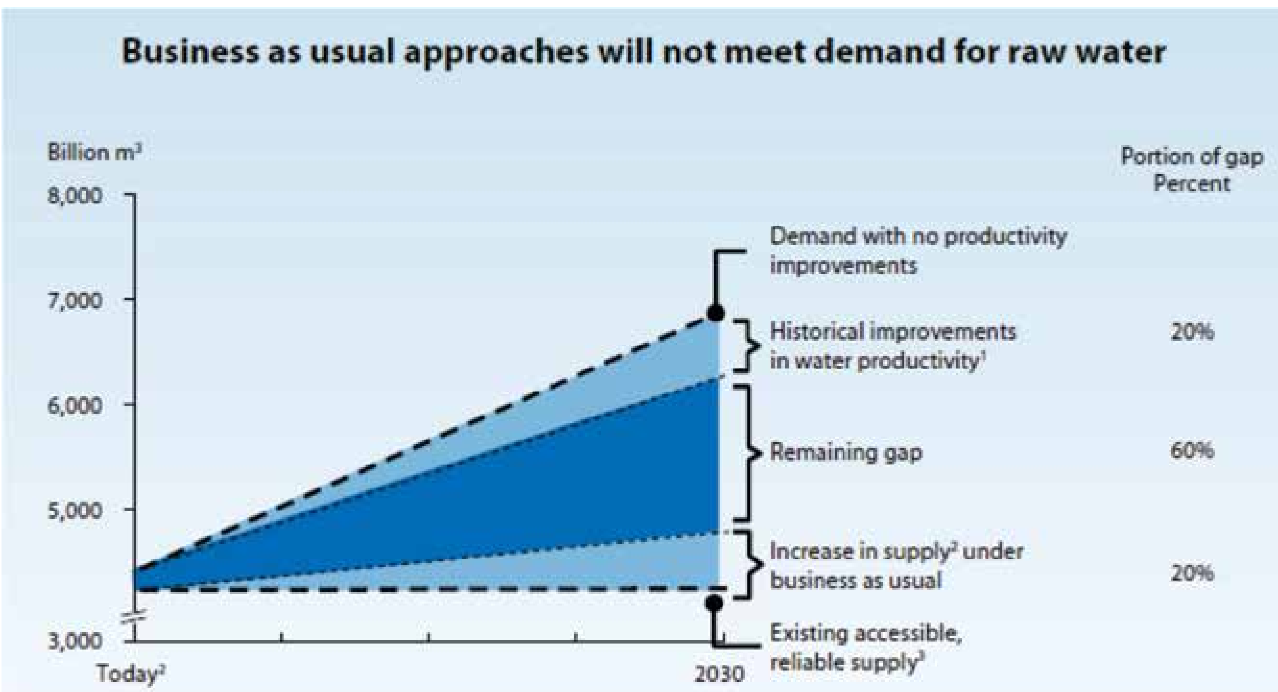
WATER CONSERVATION (WC)

Background

Fresh water represents less than 2.5% of the total water on Earth. Of the balance 97.5%, 69.5% is blocked in glaciers and 30.1% is in the form of groundwater. Only 0.4% of the surface water is fit for human consumption. This virtually means that if water available globally is a glassful, the potable water available would be a spoonful. Industrial water consumption in India is 42 BCM and is expected to increase to 161 BCM by 2050. Using large volumes of water increases maintenance and life cycle costs for operations as well as treatment costs. Industries that use water efficiently can reduce costs through lower water use fees, lower sewage volumes to treat; resulting in energy and chemical use reductions. Many water conservation strategies involve either no additional cost or rapid payback.

According to World Water Vision report, there is a huge water crisis today. But the crisis is not about having too little water to satisfy everyone's needs. It is a crisis of managing water so badly that billions of people - and the environment - suffer badly. The competition for scarce amounts of water will become more and more prominent for industries in years to come and they will need to develop and rely on aggressive water-saving technologies to remain competitive. Freshwater resources are limited and need to be managed wisely in order to avoid the current crisis from worsening. Industries need to prioritize water management as part of business management and at the same time work towards the community as their water interests are interlinked.

The diagram below shows that the global demand for water will not be met by business as usual approach (source: UNEP report, 2011)



Water Policy

WC Mandatory Requirement 1

Goal

To demonstrate the commitment of the company towards water conservation.

Compliance Options

The company should have a water policy. The policy statement should have a commitment from the top management on water conservation or reduction in water consumption over a period of time. The policy should include strategies for sustainable water management both within the fence as well as beyond the fence. The water policy could be part of the Sustainability or Environment policy.

Documentation Required

1. Water policy (Sustainability or Environment policy) signed by the chief executive or plant head.

Water Manager & Accountability

WC Mandatory Requirement 2

Goal

To have a water manager who is accountable for all water conservation activities in the plant. This is to facilitate continuous and focused action towards water management.

Compliance Options

The unit should have a dedicated water manager (part/full time) along with a cross functional team (part/ full time) responsible for water management in the organization.

Documentation Required

1. Documentation regarding the roles and responsibilities of water manager and the cross functional team.

2. The list of water management activities handled and projects implemented by the water manager and cross functional team.

Leadership and Strategy

WC Credit 1 **Points: 10**

Goal

To demonstrate the commitment of the top management towards water conservation.

Compliance Options

Conduct monthly reviews- Conduct monthly reviews related to water conservation & management involving top management / water manager.

Target setting towards improvement- Set specific targets for reduction in water consumption. The targets could be based on specific water consumption or internal/national/international benchmarking.

Credit	Description	Points
WC Credit 1.1	Target setting and action plan	5
WC Credit 1.2	Monthly reviews on water conservation and management	5

Documentation Required

1. Sample meeting minutes of the monthly review meetings.
2. Document regarding specific targets of reduction in water consumption.

Employee Involvement & Capacity Building

WC Credit 2 **Points: 10**

Goal

Encourage companies to create awareness about water conservation among all employees and build the capacity of specific team members to take up water conservation projects on a continuous basis.

Compliance Options

Strategies adopted for awareness creation and employee involvement – Programs and initiatives taken by the plant team for employee involvement like poster competition, displaying slogans, energy conservation week, incentives based on suggestion schemes, etc. These programs should be aimed at involving all the employees.

Training programs and capacity building – Training program to build capacity of employees so that they are able to contribute to water conservation activities. The plant should identify the training needs of employees with regard to water conservation and organize programs accordingly.

Credit	Description	Points
Credit 2.1	Strategies adopted for awareness creation and employee involvement	5
Credit 2.2	Training programs and capacity building	5

Documentation Required

1. A brief write up explaining the different awareness programs conducted during the year and strategies adopted for employee involvement. The write up should clearly explain the following- date of program, agenda of the program, participants, contents of the presentations, photographs, results, feedback, etc.

2. Documentation on the training needs of employees on water efficiency and the training programs conducted in the last one year.

Approach

Water is essential to our health and to the health of our economy. As a major user of this precious resource, industry has an important responsibility to practice water conservation. Companies need to have a water policy (or sustainability or environmental policy that incorporates water) that demonstrates the commitment of top management towards water management activities. It is also essential to have a water manager to facilitate continuous and focused action towards water management. These two requirements are mandatory under GreenCo- Water Conservation.

Water conservation program should transform a commitment to save water into a workable plan designed to systematically achieve an organization's water reduction goals. Companies should set the goals of the program as well as the details for implementing specific measures. Water conservation credit 1.1 awards 5 points for target setting and action plan. Once the goals are set, establish a budget and secure the necessary funding.

It is equally important to establish a process for documenting and evaluating the plan. Companies should carry daily, weekly or monthly reviews on water conservation activities. Water conservation credit 1.2 awards 5 points for monthly reviews related to water conservation and management. Water use is monitored to track the progress of conservation programs. Fine tune the plan to make additional water use reductions.

A critical component of water conservation is involving everyone. It involves changing behaviors and expectations about water usage and the way things should be done. Establish and coordinate employee communication program. To ensure maximum success, all employees should be informed and involved in the action plan. WC credit 2.1 awards 5 points for awareness creation and employee involvement. Employees should participate in relevant training and capacity building programs on water conservation. WC credit 2.2

awards 5 points for training program and capacity building.

Resources

1. CII Triveni Water Institute http://www.greenbusinesscentre.com
2. CII Publications: The following website lists documents published by CII - http://www.greenbusinesscentre.com/CII-Publication/water_manag.html
   a. CII Northern Region Core Group "Water Manual"- The manual focuses on efficient use of water, adoption of water minimization techniques, effective water management and recycling in the areas of the process.
   b. CII publication "Our Cup of Joy"- is a compilation of 51 best practices in water management.
   c. CII publication - Directory on Water Management-Thisdirectoryisacompendium of manufacturers and suppliers of water and water related products, water treatment & supply, waste water treatment technologies, water testing equipment suppliers, water chemicals, service providers, consultants, government associations, etc.
   d. CIIpublication- Water Qualityand Standards- Essentials- contains information relating to issues of industrial water management.
   e. CII publication - A Pocket Guide on Water Management
   f. CII Water Awards: The website lists the presentations made by nominees and winners. It lists various initiatives taken by industries across the country. http://www.greenbusinesscentre.com/site/ciigbc/viewevent.jsp?eventid=264016&presentation=dd
3. India Water Portal: http://wwwindiawaterportal.org/

Case Study 1- Water Policy

A leading automobile company adopted the following water policy. A water policy should reflect commitment from top management on water conservation over a period of time and strategies for sustainable water management.

22nd March, 2009

WATER POLICY

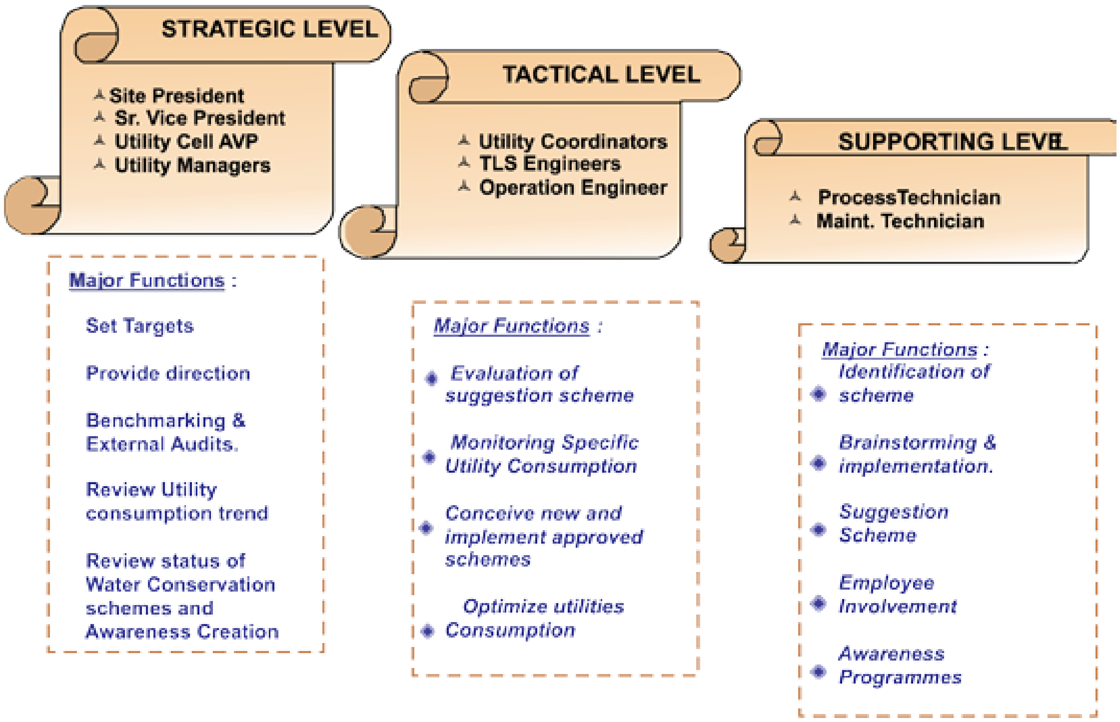
We, at Automotive Sector, Plant-1 in the business of design, development and manufacturing of automotive products and associated services in line with our commitments towards Sustainable Development, considering importance of water as a precious resource, we are committed to :

1. Provide clean and hygienic drinking water to all people working in all our Plants.
2. Reduce the consumption of water for every vehicle produced, by the engineering control and ingenious ideas.
3. Ensure minimum generation of effluents & pollution by implementing eco-friendly technologies.
4. Recycle and reuse the waste water through world class Waste Water Management System.
5. Explore ways and means of rain-water harvesting.
6. Create awareness among the society for conservation of water and its natural resources.
7. Protect the water resources by our ESOPs activities.
8. Share and contribute our knowledge through community development projects.

Sr. General Manager - Operations

Case Study 2- Water Management Structure

A petrochemical industry in Gujarat established a dedicated water management structure along with cross functional team responsible for water management in the organization. It is critical to have a water manager with accountability so as to facilitate continuous and focused action towards water management. The diagram below shows how employees from strategic level, tactical level and supporting level are involved in water conservation activities. Major functions of each team member are outlined. It is also important to document the water management activities handled by the water manager and cross functional team.



Metering and overall Monitoring

WC Credit 3 **Points: 5**

Goal

To implement systems to measure and monitor the overall fresh water consumption and the total wastewater discharge in the plant.

Compliance Options

The unit should have a system for measuring and monitoring water usage and disposal.

1. Water metering at critical locations accounting for more than 80% of fresh water consumption and wastewater discharge
   - ♦ Intake from sources – all sources to be covered
   - ♦ Fresh water users – all individual users of consumption accounting for more than 10% of the total water consumption
   - ♦ Monitoring of wastewater generated, wastewater recycled or reused and wastewater discharged as effluent
2. Monitoring and variance analysis of water consumption on a monthly basis

Credit	Description	Points
WC Credit 3.1	Water metering at critical locations accounting for more than 80% of total water consumption	5

Documentation Required

1. Detailed water balance of the plant
2. Detailed description of the monitoring system implemented for accounting water consumption

Approach

Credit 1 and 2 discussed setting targets, developing action plan, employee involvement and capacity building. The above can be achieved only when baseline consumption is calculated. Monitoring and measurement are two most important things in effective industrial water management. Proper recording and monitoring helps develop a clear water balance of any facility which is the primary key to reducing water consumption. At least 2% of water saving can be easily achieved by just measuring and monitoring. Credit 3 awards 5 points for metering at critical locations accounting for 80% of total water consumption.

Metering refers to measuring water flow rates and quantities at various points of use. In industries, water is generally used for the following applications and needs monitoring at each point:

1. Cooling of steam in condenser, use in heat exchangers for the cooling of liquid,gas and solids, in humidifiers and chilling units
2. Scrubbing of gases and for dust suppression
3. Steam generation in boilers
4. As an ingredient of the product
5. For the washing of product and raw material in different stages of the process
6. Transportation and segregation of solids
7. Washing of process lines, process equipment etc.
8. Fire fighting application
9. Indoor domestic use
10. Landscape irrigation ‘

The basis of good flowmeter selection is a clear understanding of the requirements of the particular application. Therefore, time should be invested in fully evaluating the nature of the process fluid and of the overall installation. Here are some key questions which need to be answered before selecting a flowmeter:

- What is the fluid being measured by the flowmeter?
- Do you require rate measurement and/or totalization from the flow meter?
- If the liquid is not water, what viscosity is the liquid?
- Is the fluid clean?
- Do you require a local display on the flow meter or do you need an electronic signal output?
- What is the minimum and maximum flowrate for the flow meter?
- What is the minimum and maximum process pressure?
- What is the minimum and maximum process temperature?
- Is the fluid chemically compatible with the flowmeter wetted parts?
- If this is a process application, what is the size of the pipe?

Flowmeter types:

Rotameter (Variable Area Flowmeter) is a tapered tube and a float. It is the most widely used variable- area flow meter because of its low cost, simplicity, low pressure drop, relatively wide rangeability, and linear output.

Piston-type flowmeters use an annular orifice formed by a piston and a tapered cone. Their simplicity of design and the ease with which they can be equipped to transmit electrical signals has made them an economical alternative to rotameters for flowrate indication and control.

Thermal-type mass flow meters operate with minor dependence on density, pressure, and fluid viscosity. Many of these mass flowmeters have integral displays and analog outputs for data logging. Popular applications include leak testing and low flow measurements in milliliters per minute.

The ultrasonic doppler flow meters are commonly used in dirty applications such as wastewater and other dirty fluids and slurries which ordinarily cause damage to conventional sensors.

The turbine meter can have an accuracy of 0.5% of the reading. It is a very accurate meter and can be used for clean liquids and viscous liquids up to 100 centistokes. A minimum of 10 pipe diameters of straight pipe on the inlet is required.

Paddlewheel sensors are one of the most popular cost effective flowmeters for water or water like fluids. These meters like the turbine meter require a minimum of 10 pipe diameters of straight pipe on the inlet and 5 on the outlet.

Positive displacement flowmeters are used for water applications when no straight pipe is available and turbine meters and paddlewheel sensor would see too much turbulence. They are also used for viscous liquids.

Vortex Meters have low sensitivity to variations in process conditions and low wear relative to orifices or turbine meters. Also, initial and maintenance costs are low. For these reasons, they have been gaining wider acceptance among users. Vortex meters do require sizing.

Pitot Tubes (Differential Pressure Sensor) offer the following advantages- easy, low-cost installation, much lower permanent pressure loss, low maintenance and good resistance to wear.

Sub-metering is an excellent way to accurately account for large water uses in specific processing equipment for departments within the facility. Temporary strap on meters can be used to determine the approximate flow in order to obtain the appropriate size for a sub-meter. Sub-metering will help determine the water balance of a facility.

Water balance is a numerical account used to show where water enters and leaves the facility and where it is used within the facility. It serves as a framework for assessing water loss situation. It reveals reliability and availability of data, creates awareness of problems and gives direction for improvements. Use the metering results to prepare a diagram that depicts all water uses

from source through on site processes and finally, to evaporation and discharge as wastewater. It is presented as a block diagram which makes it easier to understand and use as a management tool. Each block represents an activity or location with water inputs and outputs.

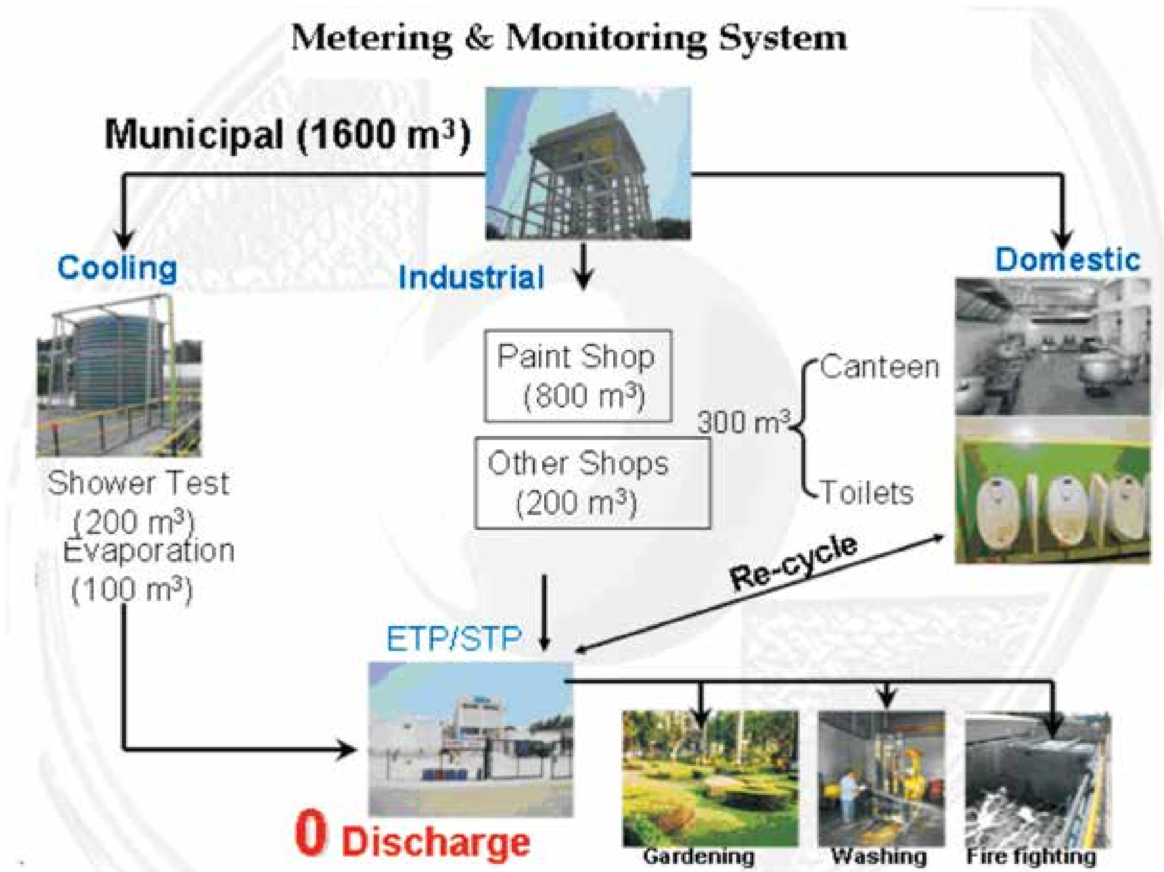
Apart from creating a water balance and implementing water conservation measures, it is of paramount importance to monitor the actual water consumption at regular intervals. Large water users should continue to read meters daily. This will ensure detection of losses, sudden spikes in usage and success of the water conservation measures implemented.

The table below shows a sample water balance.

WATER BALANCE – Company Name, Date		
S No	**Location of Measurement**	**m^3/day**
1	Raw water received at plant	628
	Raw water intake from Municipality	628
2	Distribution from treated water tank	669
	Unfiltered to garden	16
	Unfiltered line to change rooms/CT/ETP	162
	Main Line for plant	491
3	Total freshwater consumption	624
A	Filtered freshwater consumption	462
	BD - I and finishing	12
	BD - II	14
	BD - III	8
	BD - IV	10
	BD - V	56
	Pharma - I & Guest House	259
	CT - 03 A/B/C/D VAS	27
	CT - 19	14
	CT - 30	20
	Pharma - II	36
	Admin	6
B	Unfiltered freshwater consumption (change rooms/CT/ETP)	162
	Line to change rooms	15
	Line to finishing Utilities	79
	Cooling tower one make up line	28
	Line to ETP/ Utilities area	40
Unaccounted losses (difference between distribution and consumption)45		

Case Study 1– Metering and Monitoring System

You can't manage what you don't measure. Automobile company in Nashik implemented a thorough metering and monitoring system to achieve their goal of annual water savings. The water balance diagram below shows how municipal supply of 1600 m^3 is used for cooling (300 m^3), paint shops (1000 m^3) and domestic (300 m^3). The diagram also shows how the company is a zero discharge company and the treated water is used for gardening, washing and fire fighting. It is important to measure and monitor different usage points to calculate baseline consumption.



Case Study 2 – Metering and Monitoring System

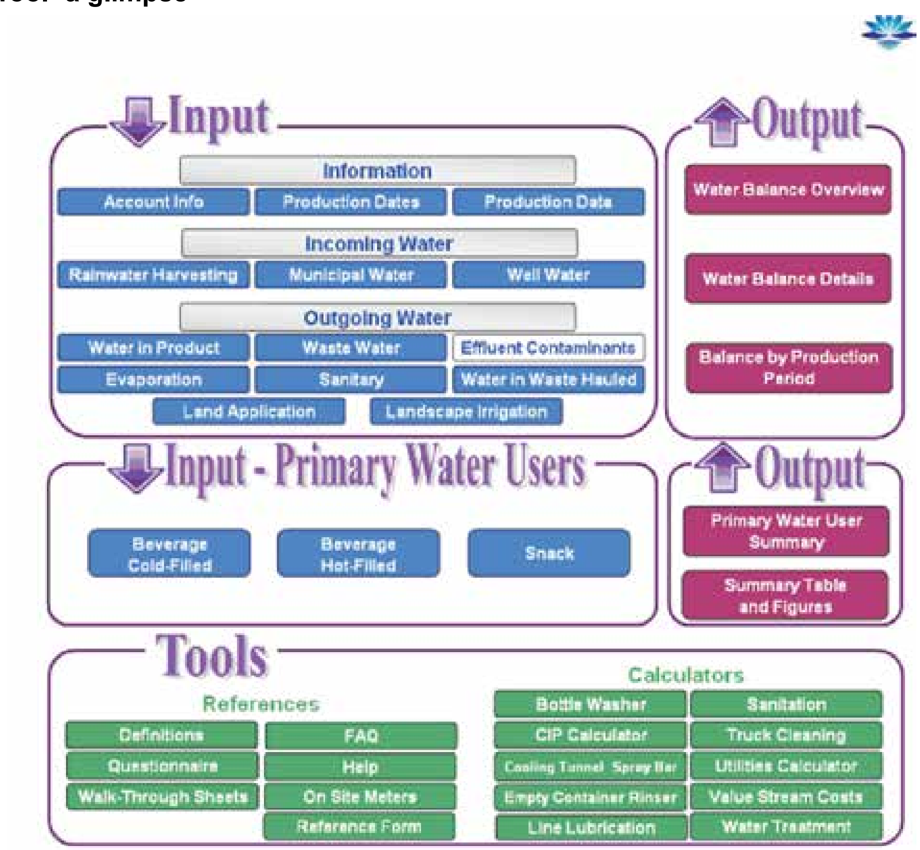
One of the strategies adopted by a beverage company to achieve water conservation is to deploy tools to identify untapped opportunities for water savings. The company carried water balancing at each process step to identify the saving potential, quantified the unaccounted losses against main consumption and deployed a strong system to account every liter of water in the processes.

Water profiler tool:

- estimates plant water use
  - uses existing data to generate overall water balance
  - drills down to identify and quantify primary water users
  - identifies potential projects for improvement in water use
- provides calculators to estimate unmetered water use
- provides data in an excel format

Water profiler helped quantify identified opportunities. First 6 months of consumption was analyzed through water profiler and also identified potential for further savings of 60 m3 per day.

Water Profiler Tool- a glimpse



Reduction in Specific Fresh Water Consumption in Last 3 years

WC Credit 4 **Points: 30**

Goal

Reduce the demand for fresh water consumption by maximizing water use efficiency and minimizing the specific wastewater generated in the plant.

Compliance Options

The plant should have employed strategies and concepts for achieving reduction in specific fresh water consumption. Three compliance options are available for achieving points for this credit.

Option 1: Reduction in specific fresh water consumption

Reduction in specific fresh water consumption	Points
≥5% reduction	5
≥10% reduction	10
≥15% reduction	15
≥20% reduction	20
≥25% reduction	25
≥30% reduction	30

OR

Option 2: Reduction in total fresh water consumption

Reduction in total fresh water consumption based on the water projects implemented in the past 3 years	Points
≥5% reduction	5
≥10% reduction	10
≥15% reduction	15
≥20% reduction	20

Note: This approach will be adopted only if the plant has not established specific water consumption figures

OR

Option 3: International Benchmarking

International Benchmarking	Points
Among top 10 units / top 10% of the units at International level	25
Among top 5 units / top 5% of the units at International level	30

Note: If the unit's specific water consumption is one among the top 5 or 10 at the international level, then the unit is eligible for maximum points under this credit

Documentation Required

1. Provide details of the annual specific fresh water consumption over the last 3 years
2. List of water saving projects implemented and percentage of water savings achieved in last 3 years.

Approach

Water conservation credit 1 & 2 described the strategy to be adopted and capacity building required to implement water conservation. Credit 3 explained how a water balance is essential to understand the baseline consumption of water. Credit 4 talks about how once a water balance is completed, the inventory is used to identify water demands and determine methods to minimize or eliminate these demands.

A water conservation plan depends on accurate data. Before water saving measures are implemented, a thorough audit should be done. Schedule a water audit and oversee the process. When conducting a water audit, ask the question, "Can this process be done as well or better using less water?" Popular 3R approach- Reduce, Reuse and Recycle is to be adopted to reduce specific or total water consumption.

Reduce:

- **Leak detection** is one of the easiest ways to reduce demand. Common locations for leaks are in piping joints, restroom fixtures, pump seals, loose nozzles/shut off valves, drinking fountains, processing equipment, etc. Water fixtures and process equipment should be observed both during use and down time. Underground or under the floor leaks can be detected through a leak detection survey using the facility's water meter.

- Many **low tech conservative initiatives** pay for themselves in a very short period of time. For example, turn off water that is not being used, install flow restrictors or flow control valves to process tanks, install timers and pedals to use water only when needed, use conductivity meters to activate flow only when needed, install multiple rinse tanks with counter current water flow, agitate rinse bath water mechanically or with air to increase rinse bath life and rinse efficiency. Other examples include use of drain boards, extended dwell time, slower withdrawal rates, air knives and fog nozzles to reduce drag- out and use of high pressure washing systems to reduce waste water generation. Handle waste materials in a dry mode if possible.

- Variety of **water efficient fixtures** are currently available in the marketplace and can be installed in the same manner as conventional fixtures. Consider ultra-high efficiency fixture and control technologies, including toilets, faucets, showers, dishwashers, clothes washers and cooling towers. Electronic taps with sensors, foam taps, dual flush toilets, low flush showerheads, waterless urinals are some examples of the latest technology that is readily available. Consider dry fixtures such as waterless urinals and composting toilets. These technologies use no water volumes to cope with human waste. Waterless urinals use advanced hydraulic design and a buoyant fluid instead of water to maintain sanitary conditions. Composting toilets mix human waste with organic material to produce a nearly odorless end product that can be used as a soil amendment.

- **Water efficient landscaping** is another area of focus where huge savings could be achieved. The following water conservation techniques should be adopted while designing landscape:

  - Indigenousplantswithlowwaterrequirements should be selected. Native landscapes that have lower irrigation requirements tend to attract native wildlife. Native plants require less fertilizer and fewer pesticides and thus reduce water quality impacts.
  - Watering only early morning or late evening instead of during the day can save 25% of water.
  - Perform a soil and climate analysis to determine which plants will adapt best to the site's soil and climate.
  - Change the surface profile of garden beds to prevent water run off and provide at least 4 cm of mulch for garden beds to prevent evaporation. Honeycomb structures can be used to prevent soil erosion.
  - Use of weather based controller in place of a time based controller can save 50% of the water for the same quality of irrigation. It monitors 5 weather factors on a daily basis and actually adjusts each zone every day.
  - Inaddition, use techniquessuchasintegrated pest management, mulching, alternative mowing and composting to maintain plant health.

- **Monitoring and control** is a useful technique in reducing water usage. As discussed in WC credit 3, it is important for companies to monitor the water consumption on daily basis. While monitoring water usage, companies should examine and control the amount of water being used by each application or process and reduce it whenever possible. If the same process can be done with less water without compromising on quality, the amount of water being used should be readily reduced.

Reuse:

Reuse of pre-treated water, before it is discharged, in applications that do not require fresh water can lead to huge water and cost savings. Determine whether discharges from any one operation can be substituted for fresh water supplied to another operation. Vacuum evaporators can be used to capture high purity, condensed process water for reuse. The quantity and quality of discharge from each operation is examined to see if it would be possible to reuse that water in another process with or without additional treatment (refer table below).

Recycle:

Wastewater is increasingly being considered as a resource. Consider segregating wastewater streams according to the level of contamination. Grey wastewater is separated from black wastewater so that they can both be recycled and reused appropriately. This can reduce the use of treatment chemicals, facilitate material recovery and allow greater reuse of water. In many industries, potable water used for make up to cooling towers is replaced with treated wastewater. Treated wastewater is also commonly used for gardening or irrigation. The high nutrient content of wastewater reduces or eliminates the need for expensive chemical fertilizers. Other industrial applications that can use treated wastewater include paper mills and carpet dyers, dust control, construction activities, concrete mixing and artificial lakes. Treated wastewater can also be used for domestic purposes such as flushing.

Matching Water Quality to Quantity to Determine Water Reuse Potential				
Process	**Process Need**		**Process Discharge**	
	volume	**Quality**	**volume**	**Quality**
Cooling				
Process				
Boiler				
Sanitation				
Landscape				
Other??				

Case Study 1- 4R Approach of Recover, Reuse, Reduce and Recycle

A printing and packaging company in Chennai adopted 4R (recover, reuse, reduce and recycle) strategy to implement water savings. The company has been water positive for more than 8 years in a row.

Project Title	**Annual Savings (m^3)**
Increased usage of recycled water for gardening	6,600
Use of cooling towers instead of spray ponds for DGs	13,000
Use of AHU condensate for gardening	5,800
Installation of automatic taps and urinal flushes	12,000
Use of STP discharge for cooling tower make up and boiler feed water supply	10,200
Reuse of ‘New Plant’ filter backwash water	8,000
Reuse of WTP Back wash water	9,450

Hydrogeology of the site was studied and appropriate recharge structures were designed. Annual recharge to groundwater through rainwater harvesting (1,12,793 m^3) is more than annual withdrawal of groundwater (app. 72,000 m^3 per annum).

A water balance is created with a source to sink approach. Everyday report (water well consumption, water well TDS, STP water TDS, Softener water TDS, water level in well) is sent through SMS to the Manager. Water conservation campaigns (essay, quiz competitions) and training programs are conducted throughout the year.

They also have a goal of meeting international printing benchmarks of specific water consumption of 0.62 m^3 to 2.09 m^3 per tonne of paperboard. Their specific water consumption for the following year is projected to be 1.6 m^3 per tonne of paperboard.

Case Study 2- Reduction in Specific Water Consumption

Engineering company in Jaipur implemented various projects to achieve water savings. One of the projects implemented is replacing underground pipes with above ground pipes which has the following advantages:

- easy identification of leakages
- easy maintenance
- water saving of 60 m^3 per day
- cost savings of Rs. 286, 890 per annum

Nearly 70 meters are installed throughout the site to monitor the water usage on a daily basis. By implementing various conservation initiatives listed below the company was able to reduce specific water consumption from 0.227 m^3 per pump to 0.113 m^3 per pump.

Sl No	Title of Water Saving project implemented	Year of Implementation	Annual Water Savings		Invest. Made	Payback Period (Months)
			m^3	Rs. Lakhs	Rs. Lakhs	
1	PLC based sprinkler and drip irrigation system	2007 -2008	22000	2.66	11	49
2.	Utilization of RO and Softening plant reject water for Horticulture purpose	2008-2009	4780	0.58	2.28	47
3.	Replacement of Urinals Manual taps to Sensor based urinals with flow control technique	2008-2009	4105	0.53	1.5	33
4	Installation of water flow meter at every place to monitor the water consumption	2009- 2010	932	0.12	1.5	150
5	Replacement of underground pipe line with above ground pipe line	2010-2011	21900	2.87	1.1	4.5
6	Replacement of Manual Utensils cleaning to Automatic dish washing m/c in canteen.	2010-2011	3650	4.78	10.0	25

Rainwater Harvesting in Roof and Non-roof Areas

WC Credit 5 **20 points**

Goal

To substitute fresh water usage or increase the groundwater table through effective and appropriate rainwater harvesting structures.

Compliance Options

Company should have implemented rainwater harvesting system to capture run-off water from roof and non roof (paved and unpaved) areas. The captured rainwater should be utilized in the plant to preferably substitute freshwater or recharge groundwater.

Points are allocated based on the percentage of potential captured:

Credit	Rain Water Harvesting in Roof and Non-Roof Areas	Points	
WC Credit 5	Rain water Harvesting in roof and non-roof areas	20	
WC Credit 5.1	Implementation of RWH Structures		
	≥ 10% potential captured		2.5
	≥ 25% potential captured		5
	≥ 50% potential captured		7.5
	≥ 75% and above potential captured		10
WC Credit 5.2	Substituting with fresh water		10

Documentation Required

1. Provide details of the rainwater harvesting system installed- area of the facility (roof, paved, unpaved), rainfall received, details of storage or recharge structures, percentage of potential captured, percentage of freshwater substituted using rainwater, applications where rainwater has substituted fresh water, quantity of rainwater recharged, etc.

2. Details of the quantity of rainwater harvested in last 3 years.

3. Details of monitoring and maintenance system.

Approach

Increase in economic growth is also accompanied with an increase in water demand. Industries are usually located in the outskirts of the city and are not connected to the piped network of the city. They thus depend on groundwater for their needs. As a result, groundwater table is falling at an alarming rate. Even if government supply is available, industries pay one of the highest tariffs for water. It therefore makes eminent sense for industries to harvest rainwater.

Rainwater harvesting has the following benefits:

- Helps meet ever increasing demand of water
- Improves quality and quantity of groundwater
- Decreases the choking of storm water drains and flooding
- Reduces soil erosion as the surface runoff is reduced
- Reduces the rate of power consumption for pumping of groundwater. For every 1 m rise in water level, there is a saving of 0.4 kWh of electricity.

Rain water harvesting is collection and storage of rain water that runs off from roof tops, parks, roads, open grounds, etc. This water run off can be used in the following ways:

Storage: The goal for harvesting rainwater should be to capture and store the maximum potential.

1. The stored rainwater should first be considered for use for potable purposes like drinking, cooking, steam generation in boilers,an ingredient of the product, washing of product, etc.

2. If the stored rainwater cannot be used for potable purposes then it should be considered for non potable uses like irrigation, washing of process equipment, fire fighting application, toilets, etc.

Recharge: If the rainwater harvested cannot be stored due to lack of space or quality issues, water is recharged into the groundwater.

A rainwater harvesting system consists of various components as described below.

1.Catchment Area

Roofs are excellent catchments. Paved areas which are clean can also be treated as catchments. Unpaved areas are usually best reserved to ensure increase in soil moisture or to recharge groundwater. Irrespective of the kind of roof (flat/ sloped), each of them is an excellent catchment as long as it is kept clean.

Runoff coefficients for different types of catchment are shown in Table 1.

Rainfall for a particular region can be obtained from Indian Meteorological Department or measured on site using rain gauge.

Type of Catchment	**Runoff coefficient**
Roof Catchments	
Tiles	0.8 – 0.9
Corrugated Metal Sheets	0.7 – 0.9
Ground Surface Coverings	
Concrete	0.6 – 0.8
Brick Pavement	0.5 – 0.6
Untreated Ground Catchments	
Soil on slopes less than 10%	0 – 0.3
Rocky Natural Catchments	0.2 – 0.5
Green Area	0.05 – 0.1

Table 1: Runoff Coefficient (Source: Pacey, Arnold and Cullis, Adrian 1989, Rainwater Harvesting: The collection of rainfall and runoff in rural areas, Intermediate Technology Publications, London)

2. Conveyance

Conveyance systems include rainwater gutters and down pipes which move the rainwater from the catchment area to the filtration system. PVC is the material generally used for both gutters and down pipes though other materials can also be used.

3. First Flushing

A first flush device is a valve that ensures that runoff from the first spell of rain is flushed out and does not enter the system. This needs to be done since the first spell of rain carries a relatively larger amount of pollutants from the air and catchment surface.

4. Filtration

A filter unit is a chamber filled with filtering media such as fibre, coarse sand and gravel layers to remove debris and dirt from water before it enters the storage tank or recharge structure. Charcoal can be added for additional filtration. Selection of a filter depends on type of catchment, amount of silt load, quality of runoff, purpose of storage and type of recharge structure.

5. Storage and/or recharge structures

There are many ways to store rainwater. Rain barrels are one method where HDPE tanks are used to collect and store rainwater. The size of the storage tank depends on consumption, rainfall, type and size of catchment and free space available for construction of tanks. Capacity of the tank can match the quantity of water required by its users or size that is appropriate in terms of costs, resources and construction methods.

Study the site plan to find out the space available for water harvesting structures. This will determine the size and location of the structures. Note the number and location of existing rain water pipes, outlets/spouts. Determine the natural drainage, slope and location of storm water drains. This will help to lay out the conveyance pipes along the natural drainage patterns. Mark the location of plumbing (water and sewage) and electrical lines in the site. Find out if there are any existing storage tanks or swimming pools that can be used for storing the harvested water.

Example

Catchment Area = 100 sq m Rainfall = 1200 mm

Runoff Coefficient = 0.8

1. Calculate maximum amount of rainwater that can be harvested:

Annual water harvesting potential = catchment area (A) x runoff coefficient (C) x rainfall (R)

= A x R x C

= 100 x 1.2 x 0.8

= 96 m^3

2. Tank Capacity: If the facility is interested in capturing 100% of the rainwater and there is enough space available for constructing a storage structure, size of the rectangular tank constructed will be about 10.0 m x 10.0 m x 1.0 m.

Recharge pits or recharge wells take the rainwater and allow it to go into shallow aquifers or deeper aquifers. Some industries with large areas have even used recharge ponds. Storm drains can be led to recharge ponds of 2 to 10 lakh litres capacity to store and recharge the groundwater. For the landscaped areas, swales and berms capture water and soak it into the soil, increasing soil moisture and enabling plants to thrive. Find out if there are any defunct borewells that can be used for recharging the harvested water. A recharge well is preceded by a settlement tank. Settlement tanks are used to remove silt and any floating impurities that might be present in the run off.

For designing the optimum capacity of the recharge structure, size of the catchment, intensity of rainfall and rate of recharge, which depends on the geology of the site need to be considered. The capacity of the tank should be enough to retain the runoff occurring from conditions of peak rainfall intensity. Since accurate recharge rates are not available without detailed geo-hydrological studies, the rates have to be assumed. The capacity of recharge tank is designed to retain runoff from at least 15 minutes rainfall of peak intensity. (For Delhi, peak hourly rainfall is 90 mm (based on 25 year frequency) and 15 minutes peak rainfall is 22.5 mm/hr, say, 25 mm, according to CGWB norms). The void ratio of the filler material varies with the kind of material used, but for commonly used materials like brickbats, pebbles and gravel, a void ratio of 0.5 may be assumed.

Monitoring:

Implementing a monitoring system will help determine the amount of rainwater harvested, amount of rainwater used and amount of rainwater recharged. In order to understand and measure the impact of rainwater harvesting implemented through recharge of groundwater, monitoring groundwater level is very critical. Groundwater recharge rate can be calculated using water level monitoring or infiltration test. It is recommended that the monitoring be done monthly especially pre and post-monsoon.

A facility has the potential to capture and harvest x liters of rainwater per annum. If a facility captures 10% of this potential, WC credit 5 awards 5 points. WC credit 5 awards maximum of 20 points for capturing 100% of the potential. Data submittals should include submission of the table below:

S No	Type of Catchment	Area (m^2) Ap	Runoff Coefficient C	Annual Rainfall (m) R	Harvesting Potential (m^3/yr) Hp = Ap*C*R	Actual area for which rain water harvesting system is designed (m^2) Aa	Actual Rain Water Harvested (m^3/yr) Ha = Aa*C*R	% Potential Captured Ha/(Hp*100)
1	Roof top	2000	0.8	0.6	960	1000	480	50%
2	Lawn	500	0.1	0.6	30	200	12	40%

Assuming a void ratio of 0.5, the required capacity of a recharge tank is calculated as follows:

Rainfall intensity = 25 mm Catchment Area = 100 sq meters Rainfall Coefficient = 0.85

Capacity of recharge tank = (100 x 0.025 x 0.85)/0.5 = 4.25 cu. m.

Resources

1. IndiaWaterPortal http: www.indiawaterportal.org
2. Rainwater Harvesting Club http:www.rainwaterclub.org
3. Central Groundwater Board (CGWB) http:cgwb.gov.in
4. American Rainwater Catchment Systems Association www.arcsa-usa.org
5. Bangalore Water Supply and Sewerage Board http:www.bwssb.org/rainwater_harvesting.html
6. Tamil Nadu Water Supply and Drainage Board http:www.aboutrainwaterharvesting.com
7. Centre for Science and Environment www.cseindia.org

Case Study 1- Rainwater Harvesting Storage and Use in High End Applications

A FMCG manufacturing facility in Bangalore is capturing 83% of rainwater harvesting potential. Rainwater is harvested and stored in two ponds within the premises with total capacity of 8,700KL, through which 34% of the water requirement was met in 2010-11. The rainwater stored is used for the following applications after treatment:

1. machine cleaning
2. boiler feed water
3. process water
4. scrubbers
5. toilet flushing
6. utensil cleansing
7. humidification in air handling units for HVAC

In addition, weather station supplied by Karnataka State Natural Disaster Monitoring Centre is installed onsite. The station is solar powered and data is recorded every 5 min. The unit is making a CAPEX investment of 109 lakhs in the year 2011-12 for an additional rainwater harvesting pond to cover the remaining 17 % of the land area and become 100% rainwater harvesting.

Various benefits are obtained as a result of rainwater harvesting:

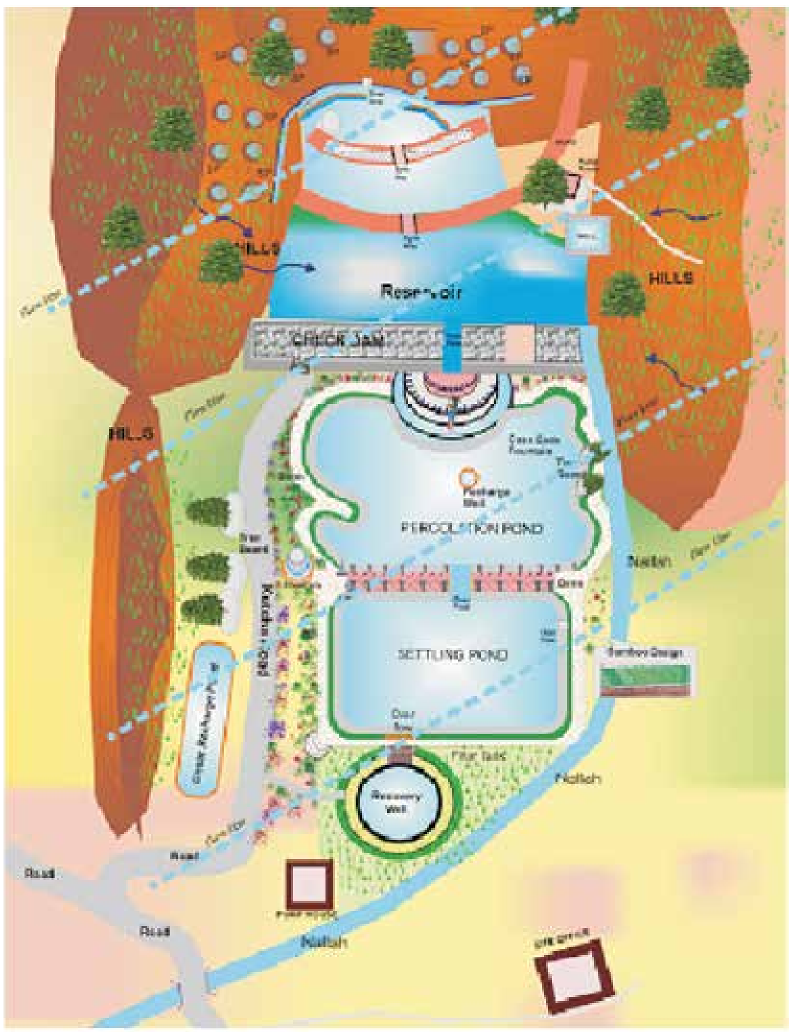
1. The static level of borewells is monitored once in two months. The percolation and also the forced injection in the borewell near one of the ponds has helped the unit to sustain the usage of borewells.
2. Total of 1497 m^3 is recharged through 10 recharge wells and 2374 m^3 through borewell.
3. No requirement of buying water from outside.
4. The two ponds attract a lot of birds during the rainy season which helps to maintain the biodiversity in the area.
5. The rainwater harvesting also prevents the flooding of the area and also nearby lands.

Case Study 2- Rainwater Harvesting Substituting Freshwater Consumption

A steel company substitutes 22.7% of its freshwater consumption with harvested rainwater. Water harvested is used for washing iron ore, dust suppression, gardening, car washing and drinking after due treatment. Rainfall in the region varied from 1,064 mm to 1,278 mm. The site has a potential to harvest

5.8 million m^3 per annum. Around 22.65% of this potential is harvested. A detailed hydrogeological study was done before the rainwater harvesting structures were designed. 75% of the rainwater is recharged while 25% of the rainwater is stored. Benefits from implementing rainwater harvesting are:

- Withdrawal of water from source reduced by 22.27%.
- Yield of wells has increased.
- Total dissolved solvents in the water drawn from the recovery wells has come down.
- Proportional saving of power has been achieved due to less pumping of water from the river source.



Augmentation of Groundwater Beyond the fence

WC Credit 6 **Points: 25**

Goal

To avoid competition with the society for shared resources and achieve water positive status such that the quantity of groundwater replenished is higher than the freshwater consumed.

Compliance Options

Companies should implement projects related to augmenting groundwater table by providing recharging structures within the same aquifer or beyond the industry premises.

The break-up for allocation of points for WC credit 6 is as below:

Description (Augmentation beyond the fence/premises)	Points
At least one project implemented on augmentation of groundwater	5
1:1 recharging	10
1:2 recharging	15
1:3 recharging	20
1:4 recharging	25

Note: If a unit withdraws groundwater from a particular aquifer and recharges rainwater in the same aquifer, the following would be applicable.

- 1:1 recharging 20 points
- 1:2 recharging 25 points

Documentation Required

1. A brief write up explaining beyond the fence initiatives adopted by the company in the last 3 years to implement sustainable groundwater management practices.
2. Hydrogeology report or results of the hydrogeological survey done in a particular region to understand aquifers, groundwater usage, change in depth of the groundwater table, etc.

Approach

Recent data on the status of groundwater resources across the world has revealed several alarming trends. It is to be noted that across many States in India, the net draft of groundwater is either in excess of or close to the net available resource implying that these states are facing a situation of dangerous overexploitation of their available groundwater resources. The rate of withdrawal of groundwater has reached “unsafe” levels in 31% of the districts, covering 33% of the land area and 35% of the population. The situation has dramatically worsened within a short span of nine years, between the assessments done in 1995 and 2004. There is enough evidence of increased pressure on aquifers and the resulting hydrological imbalance.

The amount of water available matters but so does its quality. Out of 593 surveyed districts of India, more than 35% districts have problems like high F, As, Ni, Fe etc. Water is a scarce input and there are conflicts over its allocation between different users (domestic, agriculture, industry). Integration of demand side management and supply side management is required for sustainable groundwater management. This situation needs immediate attention by industries that heavily depend on the availability of good quality groundwater. Industries need to look beyond the fence while implementing groundwater management measures.

Calculate the amount of water consumed within the facility (say x liters). Points worth 10, 15, 20, 25 are awarded for recharging x, 2x, 3x, 4x liters of groundwater respectively. In order to attain water balance, water should be recharged in the same aquifer that it is withdrawn from. In this case, points worth 20, 25 are awarded for recharging x and 2x liters of groundwater respectively.

Science of hydrogeology plays a crucial role in sustainable groundwater management. The first step in sustainable management of groundwater within and outside the facility is to carefully construct a disaggregated picture by mapping aquifers and delineating aquifer typologies. Disaggregated

aquifer maps and database management system will make it possible to determine sustainable yield for each aquifer. This gives the amount of groundwater available that is to be divided and allocated between competing uses and users. There is a need to bring this information to the communities residing outside the facility to enable them to take informed decisions about their water resources.

Thus, sustainable management of groundwater involves:

- enhancing recharge through protection of the recharge area,
- controlling the depth and spacing of wells,
- regulating capacity and efficiency of pumps used,
- water-saving irrigation methods and
- overall regulation and prioritization of water use.

A wide spectrum of techniques are used to recharge groundwater reservoirs.

1. Surface Spreading Techniques: are aimed at increasing the contact area and resident time of surface water over the soil to enhance the infiltration and augment groundwater storage in aquifers.

a) Runoff Conservation Structure:

   i. Bench Terracing

   ii. Contour Bunds

   iii. Gully Plugs, Nala Bunds, Check Dams

   iv. Percolation Ponds

   b) Flooding

   c) Recharge Basins

   d) Stream Modification/Augmentation

2. Sub surface Techniques:

   a) Injection wells (recharge wells)

   b) Dug well/Bore well/Tube well recharge

   c) Recharge pits and shafts

Sub surface dykes (Bandharas) and fracture sealing cementation techniques are also used to arrest sub surface flows.

3. Combinationtechniquesinvolvingacombination of surface and subsurface techniques can also be implemented.

Contour Bunds aimed at building up soil moisture storage involve construction of small embankments or bunds across the slope of the land. The bunds are constructed along contours of equal land elevation

Contour Trenches are rainwater harvesting structures, which can be excavated on hill slopes as well as on degraded and barren waste lands in both high and low rainfall areas. They break the slope at intervals and reduce the velocity of surface runoff.

Check dams, Gully Plugs and Nala Bunds are constructed across gullies, nalas or streams for impeding the flow of surface water in the stream channel and water is retained for a longer duration in the pervious soil or rock surface. As compared to gully plugs, which are normally constructed across first order streams, nalla bunds and check dams are constructed across bigger streams, in areas with gentler slopes.

Percolation ponds are artificially created surface water bodies submerging highly permeable land areas so that the surface run-off is made to percolate and recharge the groundwater. Percolation tanks should be located on the downstream side of run-off zone with land slope between 3 to 5%.The capacity of a percolation tank should be governed by the percolation capacity of the strata in the tank rather than the yield of the catchment. These structures are suitable for both alluvial and hard rock areas. In case of hard rock areas submergence area should have high permeability with the degree and extent of weathering of rocks should be uniform and not just localized. Percolation tanks with wells and shafts can also be constructed in areas where shallow or superficial formations are highly impermeable or clayey.

Recharge trench is a continuous trench excavated

in the ground and refilled with porous media like pebbles, boulders or broken bricks. A recharge trench can be 0.5 m to 1 m wide and 1 m to 1.5 m deep. The length of the recharge trench is decided as per the amount of runoff expected. The recharge trench should be periodically cleaned of accumulated debris to maintain the intake capacity. In terms of recharge rates, recharge trenches are relatively less effective since the soil strata at depth of about 1.5 metres is generally less permeable. For recharging through recharge trenches, fewer precautions have to be taken to maintain the quality of the rainfall runoff. Runoff from both paved and unpaved catchments can be tapped.

Recharge troughs collect the runoff from paved or unpaved areas draining out of a compound. They are commonly placed at the entrance of a residential/ institutional complex. These structures are similar to recharge trenches except for the fact that the excavated portion is not filled with filter materials. In order to facilitate speedy recharge, boreholes are drilled at regular intervals in this trench. In design part, there is no need of incorporating the influence of filter materials. This structure is capable of harvesting only a limited amount of runoff because of the limitation with regard to size.

Resources

1. Advanced Centre for Water Resource Development and Management (ACWADAM) www.acwadam.org

2. Central Groundwater Board http://cgwb.gov.in/

3. Artificial Recharge to Groundwater- Guidelines Indian Standard IS 15792:2008- These guidelines provide details of methods aimed at augmentation of groundwater resources by modifying the natural movement of surface water.

A sugar and ethanol manufacturing company in Maharashtra adopted innovative participatory water harvesting and management approach through the following initiatives-

- Revival of 8 rivers spread across 12.9 km harvesting 11.77 million cubic feet of water
- Construction of 12 check dams and 35 bori bundh structures harvesting 16.32 million cubic feet of water
- Construction of 7 percolation tanks & 193 farm ponds covering many villages and benefiting hundreds of farmers
- Inter-linking water bodies
- Recharging of 221 wells & 4 bore wells

In addition to water conservation, 18 gabion structures and 130 loose boulder structures were constructed for soil conservation. Other sustainable water management strategies were also implemented like promotion of micro irrigation covering an area of 192 acres, group lift irrigation, less water intensive and horticulture crops.

The above initiatives resulted in reduced soil erosion, increased in situ moisture, overcoming water logging problems, increase in water table by 8 feet, increased water flow in rivers/streams, increased tree density, ensured efficient use of water in 192 acres. In order to assure sustainability of the project, user groups were trained in operations and maintenance. Ownership was created among the users as they were involved in the planning stage. The community was empowered through awareness programs, street plays, exposure visits, promotional material in local language, etc. A total of Rs. 4,52,60,975 was spent on the various initiatives.

Case Study 2- Sustainable Groundwater Management Beyond the Fence

A beverage company in Rajasthan revived 400 year old Bawari benefiting nearly 10,000 residents in the neighbourhood. In addition, farmers were trained on water efficient agricultural practices. 337 drip irrigation projects covering 165 hectares of land lead to annual groundwater savings of 1,98,600 kiloliters. Apart from water saved, huge cost savings was also achieved due to reduced labour, reduction in fertilizers and electricity savings initially spent on bore wells. Increase in yield was observed due to optimum use of fertilizers. This was done in public private partnership with Government of Rajasthan.

RENEWABLE ENERGY (RE)

Background

Increasing energy supply from renewable sources reduces the risks from rising and volatile prices for fossil fuels in addition to delivering mitigation benefits. The current fossil fuel-based energy system is at the root of climate change. Use of fossil fuels leads to destruction of natural resources, air and water pollution. Energy sector accounts for 58% of the greenhouse gas emissions.

Some African countries, including Kenya and Senegal, devote more than half of their export earnings to energy imports, while India spends 45%. India being one of the fastest growing economies in the world, the demand for energy is on the rise. Demand has exceeded supply leading to a deficit of 10.1% and peak load deficit of 12.7%. Vast growing population and industrial growth also pose a serious challenge in terms of providing electricity. In addition, access to electricity in rural areas has been a challenge for several years.

The twin challenge of energy security and climate change brings an opportunity to reduce dependency on fossil fuels and increase the share of renewables in overall energy mix. Many countries have set targets to generate a certain percentage of their final energy from renewable sources. For example, Europe has a target of 20 percent, Brazil has a target of 75 percent by 2030, China has a target of 15 percent by 2020, Kenya has a target of 4 GW of geothermal by 2030 and India has a target of 15 percent of energy mix by 2020. By early 2011, at least 119 countries had some type of policy target or renewable support policy at the national level, up from 55 countries in early 2005. Investing in renewable sources that are available locally – in many cases abundantly – could significantly enhance energy security – and by extension, economic and financial security.

Renewable Energy Policy

Mandatory Requirement 1

Goal

Commitment to maximise the share of renewable energy generation and utilization thereby reducing dependence on fossil fuels.

Compliance Options

The company should have a Renewable Energy Policy statement or it can be part of other implemented energy / environment policy approved by the Chief Executive of the company. The policy statement must include a declaration of commitment from senior management to maximize the use of renewable energy generation or utilization with clearly specified annual targets. This policy information is to be transparent and has to be shared with the employees.

Documentation Required

A copy of the Renewable Energy Policy statement or any other relevant energy policy which includes renewable energy component approved by the Chief Executive or the Plant Head of the company. This document must essentially include long term and short term targets for installation of renewable energy, monthly progress review mechanism and clear budget approval for the current year and ensuing year.

Leadership and Strategy

RE Credit 1 **Points: 10**

Goal

To develop a concrete action plan for increasing the share of renewable energy generation or utilization by the company.

Compliance Options

The company should have:

- Specific short term and long term targets for increasing the share of renewable energy generation or utilization in the company
- Clear short term & long term action plans to achieve the set targets
- Approved budget allocation from the top management to carry out the activities
- Monitoring mechanism

Credit	Description	Points
RE Credit 1.1	Short term & long term targets and action plan	5
RE Credit 1.2	Approved budget allocation for current & ensuing year and monitoring mechanism	5

Documentation Required

1. Provide a document containing the short term & long term targets and action plan to achieve the set targets.
2. Provide an approved budget allocation statement showing the financial allocation from the Chief Executive or the finance department of the company for the current and ensuing year.
3. Review mechanism to monitor the progress of implementation.

Approach

Renewable energy has a mandatory requirement that requires companies to have a renewable energy policy with a goal to maximize the share of renewable energy generation and utilization thereby reducing dependence on fossil fuels. The following strategy should be followed:

- Set short term and long term targets/goals- The company should set specific targets for implementing and increasing the share of renewable energy generation and utilization. Both short term targets for 3 years and long term targets for more than 3 years should be set.

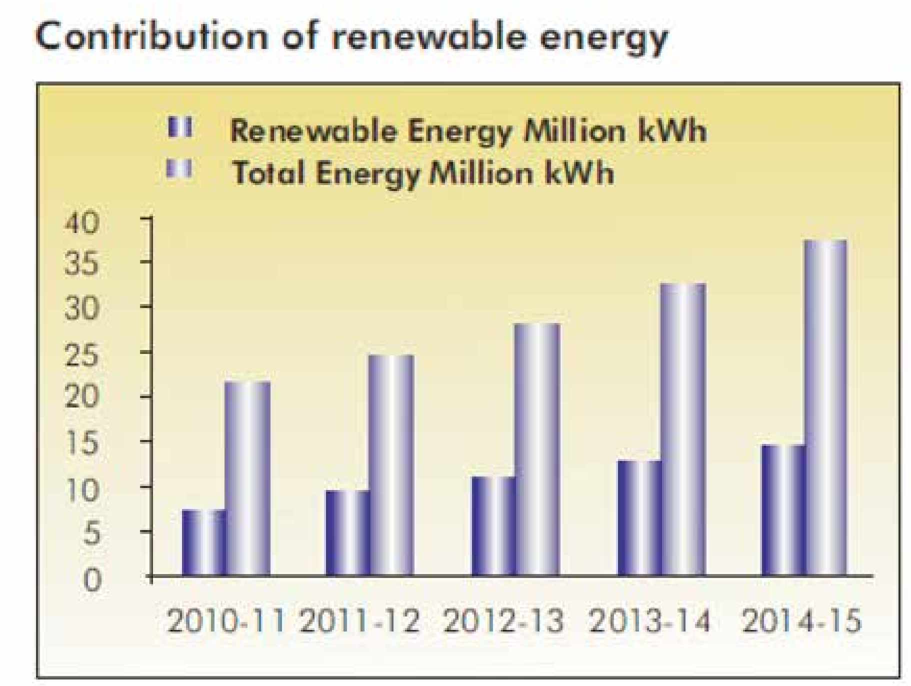
- Frame clear short term and long term action plan- Once the targets have been set, a clear action plan with details of specific measures has to be established. This will transform the commitment of the company into a workable plan designed to systematically achieve the targets. RE credit 1.1 awards 5 points for short term and long term targets and action plan.

- Approved budget- Once the targets are set, establish a budget and secure the necessary funding. Research the available financial incentives provided by the government that will help fund the project.

- Monitoring mechanism- It is equally important to establish a process for documenting and evaluating the plan. RE credit 1.2 awards 5 points for approved budget allocation from top management and for monitoring mechanism.

Case Study 1- Setting Targets on Utilization of Renewable Energy

A leading manufacturer of engineering goods has taken several initiatives in generation and utilization of renewable energy. As shown below, targets are set to meet 30% of their energy usage through renewable energy.



The following projects have been implemented:

1. 4 MW wind farm
2. Solar Pumping system for Cupola water
3. Solar water heater for housing colony
4. Bio gas plant for Bachelor hostel
5. Biomass gasifier for generation of electricity from waste wood
6. Small solar-wind turbine for street lights

On-site Renewable Energy Generation (Both Electrical & Thermal Energy)

RE Credit 2 **Points:25**

Goal

To maximize the share of on-site renewable energy and reduce dependence on conventional sources of energy.

Compliance Options

Install on-site renewable energy systems to generate electrical energy through solar, wind, biomass, biogas, bio-diesel, or any other forms of renewable energy accepted by the appropriate authority and/ or generation of thermal energy (expressed as an equivalent of electrical energy) to cater to the total energy requirement of the company. All energy values shall be expressed in kWh or equivalent kWh.

Onsite Energy (Both Electrical & Thermal Energy) Substitution with Renewable Energy	Points
≥1%	5
≥2%	10
≥3%	15
≥4%	20
≥5%	25

* Thermal energy substitution is converted into equivalent electrical energy

Documentation Required

1. On-site renewable energy systems installed.

2. Annual generation of renewable energy (electrical & thermal) in equivalent kWh.

3. The total electrical energy & fuel consumption for last three years.

Approach

In order to reduce dependence on conventional sources of energy, the share of on-site renewable energy should be maximized. Apart from being environment friendly, onsite renewable energy is superior to conventional energy sources as it has negligible transmission costs and impacts. This credit requires you to design and specify the percentage of renewable energy generated onsite to the total energy consumed.

Various forms of renewable energy technologies are available:

Solar Photovoltaic:

Solar photovoltaic are arrays of cells containing a material that converts solar radiation into direct current (DC) electricity. Some of the commonly used materials include amorphous silicon, polycrystalline silicon, mono-crystalline silicon, cadmium telluride, and copper indium selenide. The total solar irradiation of the sun to the earth surface is about $1.8 \cdot 10^{14}$ kW which is $5.6 \cdot 10^{12}$ TJ per year. The estimated potential of power generation through solar photovoltaic system is about 20 MW / sq.km in India. This huge potential needs to be harnessed to overcome current energy crisis.

Photovoltaic is flexible in terms of possible uses. The applications range from single kW to MW, e.g. in clocks, to large plants with several megawatts. There is no other system of electricity generation that allows applications in such many orders of magnitude.

1. Solar PV for Outdoor Lighting - Solar street lighting systems consist of a PV panel, inverter and storage battery connected to a light source. It can replace conventional outdoor lighting system and operate for more than 8 hours a day. These systems have been installed in many industrial complexes. The cost of solar street light would vary from Rs. 18,000 to Rs. 21,000 per system. These systems can be fitted with automatic sensors, which would switch on/off the solar street lighting depending on the light intensity.

2. Solar Water Pumping Systems - These systems consist of solar panels, DC – AC converter in case of AC motors, flow optimizer and a submersible pump. These systems can be installed in open wells and bore wells to the depth vary from 30 to 80 feet. Depending on the depth and solar radiation, water output would vary.

3. Solar Photovoltaic Power Generation - PV can also be used for direct power generation in which case the system consists of solar array, charge controller, battery bank, inverter and AC distribution system. Investment required is approximately Rs 2.2 lakhs/kW. Life cycle cost is around Rs 14/kWh. Average units generated by a 100 kW power plant is 1,50,000 per year.

4. Building Integrated Photovoltaic (BIPV) module - Photovoltaic power systems integrated with building design allow the possibilities of combining energy production with other functions of the building envelope, including structural support, weatherproofing, shading etc. Cost savings through these combined functions can be substantial.

Solar Thermal:

Solar water heating and solar air heating are two most common applications of solar thermal.

1. Solar water heating (SWH) – Heating around 100 litres of water by 40°C requires about 2.6 m^2 of collector area. The cost of a 100 litres capacity solar water heater would be about Rs 15,000 – 20,000. The simple pay back period of such systems would normally be 3 – 4 years, when compared with electrical heating.

2. Solar air heating – It is used for various process heating requirements. One such example is that of tea drying. For tea drying, conventional drier is normally used with fuels such as firewood, coal, furnace oil and briquette etc. This can be replaced with solar air heating system.

3. Solar concentrating cooking - A typical parabolic type community cooking system of 7 m diameter would cost around Rs. 40,000 – 50,000 depending upon the type of reflectors. It would save up to 35 – 45 LPG cylinders per year and the investments would get paid back in 4 – 5 years period.

Biomass:

Biomass energy is normally produced from firewood, agricultural residues such as bagasse, crop stalks, animal dung and wastes generated from agro-based industries. Cost to generate electricity from biomass varies depending on the type of technology used, size of power plant and cost of the biomass fuel supply. Various applications that are widely in use are:

1. Power generation- 1 MW grid connected biomass based power plant operating for 5000 hrs in a year would require about 6000T of dry wood (Approximately 1.3 kg of dry wood per kWh).

2. Biomass gasification for thermal heating and power generation- Biomass gasification can be used for both thermal and electrical applications. Generally, firewood, agricultural residues such as rice husk, cashew shell etc., are used in biomass gasifiers. Thermal gasifiers find applications in industries like steel re-rolling, engineering industries, tiles manufacturing, brick kilns, chemical industries, etc. Typical 1 MW biomass gasifier requires about Rs. 2.5 to 3.0 crores investment and has a simple payback period of 3 – 4 years depending on the type of fuel and capacity utilization.

3. Biogas generation for cooking and distributed power generation- Biogas produced from organic materials such as animal dung, canteen wastes, industrial wastes and selective plants could be used in biogas plants. The gas essentially comprises of methane and CO in

Small Wind Power:

Small wind turbines are wind turbines which have lower energy output (<100 kW) than large commercial wind turbines. These small units often have direct drive generators, direct current output, aero-elastic blades and use a vane to point into the wind. Such a system can meet the electricity needs of a household, farm, or small business. The system would cost around Rs. 2.50 – 3.00 lakhs / kW.

Geothermal:

Geothermal energy is thermal energy generated and stored in the Earth. Earth's geothermal energy originates from the original formation of the planet (20%) and from radioactive decay of minerals (80%).Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma. The most common current way of capturing the energy from geothermal sources is to tap into naturally occurring "hydrothermal convection" systems where cooler water seeps into Earth's crust, is heated up, and then rises to the surface as steam. This steam is captured and used to drive turbines and in turn electric generators to produce electricity. Worldwide, about 10,715 MW of geothermal power is online in 24 countries. An additional 28 GW of direct geothermal heating capacity is installed for district heating, space heating, spas, industrial processes, desalination and agricultural applications.

Resources

1. Ministry of New and Renewable Energy http://www.mnre.gov.in/

2. American Wind Energy Association the ratio 55:45. It is the methane which has the fuel value. It is estimated that about 100 metric tones of cattle dung would be required to generate 300 kW of power. www.awea.org

3. Green Power Network www.eere.energy.gov/greenpower

4. Union of Concerned Scientists www.ucsusa.org/clean_energy

5. CII Publication - Case Study Booklet on Renewable Energy http://www.greenbusinesscentre.com/CII-Publication/renewable_ener.html

6. CII Website: This link lists the best practices in renewable energy http://www.greenbusinesscentre.com/msg/ renewable-e.html

7. Central Electricity Regulatory Commission http://www.cercind.gov.in/

8. National Renewable Energy Laboratory www.nrel.gov

9. Renewable Energy Policy Network for the 21st Century www.ren21.net

Case Study 1- Solar Water Heating System for Pre-heating Boiler Feed Water

Solar water heating system of capacity 50,000 LPD was installed to preheat boiler feed water at a

leather processing plant. The capacity of boiler is 5T/hr at working pressure of 7 to 8 kg. The steam is utilized for indirect drying of leather. The estimated energy generation from solar water heating system is 3,000,000 kcal/day. There are 711 solar collectors installed in four rows, which are connected in series. They are connected to 2 storage tanks of 50,000 liters capacity each. The system has been generating hot water at 80^{o}C almost through out the year. Further, during summer the temperature is set low in order to get maximum quantity of water.

Total investment- Rs.5,000,000

Depreciation benefits & subsidies- Rs.2,000,000

Annual savings- Rs.600,000 Payback < 5 years

The hot water generated by solar water heating system has replaced about 12 to 15 tons of coal per day depending upon the quality and type of coal. The system has resulted in substantial reduction in CO_2 and SO_2 emissions.

Case Study 2- Solar Air Conditioning System

A leading manufacturer of turbochargers in India installed a solar air conditioning system of 125 TR which is used for air conditioning the building. It caters to 25% of overall energy consumption. It saves Rs. 30 lakhs per year on energy costs. Payback period is 10.8 years.

The system uses 60 nos. of 6 sq. m area solar parabolic concentrator dishes to trap the solar rays. The trapped rays are concentrated at one point to generate pressurized hot water at a temperature of 140 deg. C. This is sent into a pressurized hot water fired vapor absorption chiller which generates chilled water used for air conditioning the building. The solar parabolic concentrator produces 90 TR. The total cost of the installed system is 2.5crores.

Two axis tracking Fresnel parabolic concentrator of 35 TR capacity was installed. The aperture area of the dish is 169 sq. m which always faces the sun with cavity absorber at point focus. The total cost of the installed Fresnel parabolic concentrator is 75 lakhs.

The company also installed solar-wind hybrid system for electricity generation, solar street lights around the building, water pumping windmill and solar water pumping systems for horticultural use.

Case Study 3- Use of Producer Gas instead of Diesel

Appliance manufacturing company produces powder coating for doors & side panels of refrigerator. In this process diesel is used to generate heat for water drying & curing (average of 500-600 liters daily). They decided to switch from fossil fuel to renewable fuel to use biomass to generate heat. Producer gas is generated from biomass using a gasifier. Payback period for this project is 35 months.

This process is made possible in a device called gasifier in a limited supply of air. A gasifier system basically comprises of a reactor, where the gas is generated and is followed by a cooling and cleaning system, which cools and cleans the gas. The clean combustible gas is thus available as fuel.

As a result, the following benefits are obtained:

- Reduced usage of fossil fuel (diesel) by 197.5 KL per year
- 790 MT reuse of agricultural waste per year for production of producer gas
- End product is charcoal and can be reused as a manure or as a fuel
- The gases coming out by burning of producer gas does not contain SO_2
- Annual savings of Rs. 19.75 lakhs.

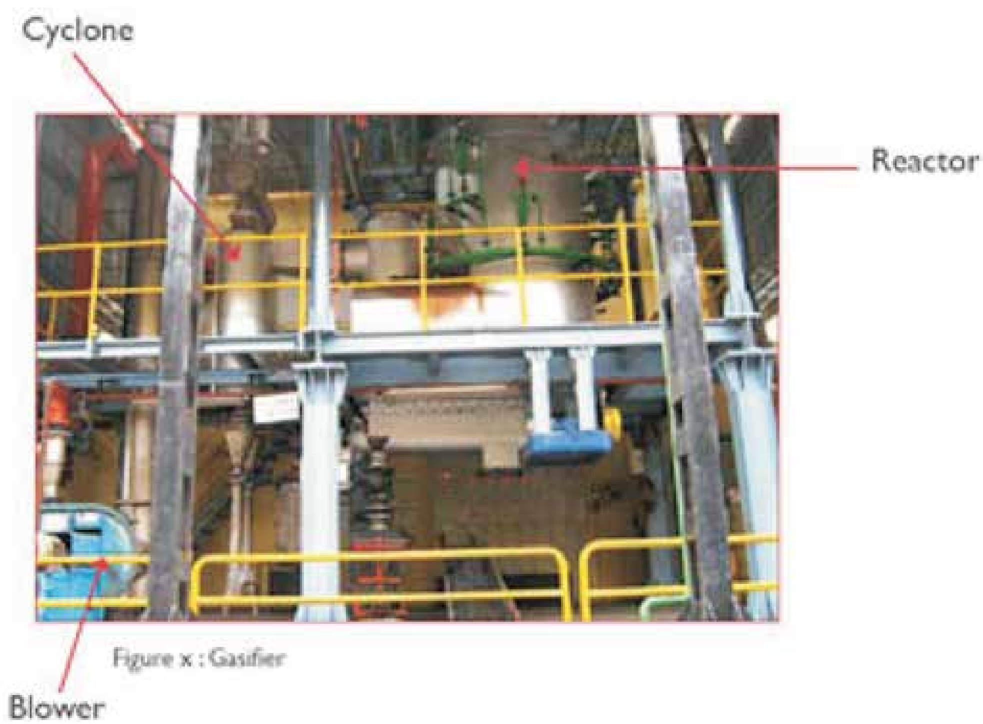


Figure x : Gasifier

Offsetting both Electrical and Thermal Energy through Renewable Energy Sources

RE Credit 3 **Points: 65 to 80**

Goal

To maximize the share of renewable energy through off-site generation or purchase of green power and thereby reduce dependence on conventional sources of energy.

Compliance Options

Demonstrate that the company has invested in off-site green power anywhere in the country.

The credit points are earned based on the percentage of annual green power generation with respect to total energy consumption of the plant including electrical & thermal energy and varies for different categories. The three broad categories is as follows –

Category - 1 80% substitution	Category - 2 50% substitution	Category – 3 20% substitution
Automobile	Chemical	Fertilizer
Building	Pulp & Paper	Refinery
Engineering, Tyre	Cement	Metals – Non ferrous
IT & Financial	Glass	Petrochemical
FMCG	Foundry	Chlor Alkali
Textile		Iron & steel
Pharmaceutical		

* Thermal energy substitution is converted into equivalent electrical energy

Points for the three categories are awarded as follows:

CATEGORY 1 –

% SUBSTITUTION	POINTS	% SUBSTITUTION	POINTS
≥5	10	≥50	50
≥10	20	≥60	55
≥20	30	≥70	60
≥30	40	≥80	65
≥40	45		

CATEGORY 2 –

% SUBSTITUTION	POINTS	% SUBSTITUTION	POINTS
≥2.5	5	≥30	45
≥5	10	≥35	50
≥10	20	≥40	55
≥15	30	≥45	60
≥20	35	≥50	65
≥25	40		

CATEGORY 3 –

% SUBSTITUTION	POINTS	% SUBSTITUTION	POINTS
≥1	15	≥15	55
≥2	25	≥20	65
≥5	35		
≥10	45		

Documentation Required

1. Provide documents indicating the green power provider with contract details. Total annual energy consumption for the last three years and total annual green power purchase need to be provided. All energy consumption values should be expressed in kWh.

Note:

1. The maximum number of points that can be earned in renewable energy criteria is 100.
2. In case the organization earns maximum allowable points in RE Credit 1 & 2, then the maximum number of points that can be achieved under RE credit 3 is only 65.
3. **In case the company is unable to implement any on-site generation, it may choose to go up to 100% offset of conventional energy through off-site RE generation, in which case the maximum points that can be awarded will be 80 under RE Credit 3.**
4. If the company / facility meets > 90% of its energy requirement through Renewable Energy, additional 5 points will be considered under innovation category.

Approach

Each site has access to limited resources while implementing on site renewable energy. These resources are space, location, altitude, solar radiation, wind, etc. It is not possible for companies to source 100% of their energy through renewable energy onsite. In addition, design and implementation of renewable energy is a specialized field and requires necessary technical expertise. Hence, this credit encourages companies to implement off site renewable energy. This also in turn encourages green entrepreneurship.

The company may adopt one or more of the following approaches for meeting the set targets:

Off-site power generation & wheeling

Some sites are more suitable for implementing renewable energy depending on space availability, altitude, budget, etc. Apart from generating renewable energy onsite as discussed in RE credit 2, companies can also meet their targets through off site renewable energy generation.

Small Hydro

A typical small hydro power plant consists of a turbine connected to the water source through penstocks. The generator which is coupled with turbine would generate power when water flows through it. Depending on the head availability and quantity of water flow, there are various types of turbines used for power generation. Normally for low head and large projects, horizontal Kaplan type turbines are used while for high head and low water flow projects, pelton wheel types are used. Investment required for a typical 1 MW plant is 5.0 to 6.0 crore. Average power generation is 30 lakhs units/ yr. Gestation period is 2 years and simple payback is 4 to 5 years at Rs.2.80/unit.

Wind Energy

Wind turbines convert kinetic energy of the wind into electricity. Generally, a gearbox turns the slow-turning turbine rotor into faster-rotating gears, which convert mechanical energy to electricity in a generator. Some latest technology turbines are gearless. The efficiency of wind power generation increases with the turbine height since wind speeds generally increase with increasing height. Larger turbines capture faster winds. Large turbines are generally installed in flat open areas of land, within mountain passes, on ridges, or offshore. According to a report, several countries met higher shares of their electricity demand with wind power in 2010, including Denmark (22%), Portugal (21%), Spain (15.4%), and Ireland (10.1%).

Minimum wind velocity required for power generation is about 2.5 m/s and the maximum could be 30 m/s. Energy generation for 1 MW turbine could be about 28 to 30 lakhs units per year, with a plant load factor of 17 to 18%. Rate of power generation depends on air density, direction of wind, wind speed and no of blades etc. A typical 1 MW wind turbine would generate about 28 to 30 lakhs units of electricity which costs Rs 4.5 to 5.0 crores. With the present power cost, the payback period would be about 3 – 4 years.

Purchase & wheeling of renewable energy from independent power developers

Companies also have the option of purchasing and wheeling renewable energy from independent power developers across the country.

Purchase of renewable energy credits

The renewable energy generators have two options - either to sell the renewable energy at preferential tariff fixed by the concerned Electricity Regulatory Commission or to sell the electricity generation and environmental attributes associated with renewable energy generation separately. Renewable energy credits (REC) is the environmental attribute. The value of REC will be equivalent to 1 MWh of electricity injected into the grid from renewable energy sources. The shelf life of REC is 1 year. In Indian context, the objective of REC mechanism is to overcome the hurdles in harnessing the RE sources spread non-uniformly across the states. REC is a market based instrument to promote renewable energy and facilitate compliance of Renewable Purchase Obligation (RPO) amongst various stakeholders. It is also widely acknowledged as a potential tool to achieve inter-state renewable energy transactions. REC mechanism co-exists with all other incentive schemes currently in vogue. There will not be any impact of REC mechanism on any of the existing schemes / benefits, including carbon credits. For issuing RECs, only grid interactive RE generators whose capacity is above 250 kW are eligible.

Investing in renewable power generation companies

There are several companies that are involved in the construction, development and generation of renewable energy through wind, solar, biomass, etc. For example, Vestas Wind Systems, Nordex, Suzlon Energy Ltd, Siemens AG, GE Energy, Mitsubishi Power Systems, Composite Technology Corp., Americas Wind Energy Corp., Clipper Windpower, etc.

Under this credit, companies can get from 5 to 80 points for investing in renewable power generating companies (in case of maximum points under Credit 1 and 2, a maximum of 65 points can be obtained under this credit).

Case Study 1- Wind Farm

A textile group has installed wind turbines offsite in Tamil Nadu for power generation. This project was commissioned under the ‘Technology Upgradation Fund Scheme’ (TUFS) of the Ministry of Textiles, Government of India, which provides re-imbursement of 5% on the interest charged by the lending agency. Wind turbines of capacity 750 kW generate 100% power at 15.0 m/s wind speed and have got a cut-off point at this speed.

Total investment - Rs. 55.0 crores Payback period – 4 to 5 years **Benefits:**

1. Enabled the textile unit to meet about 18 to 20% of their total power

2. Low maintenance costs

3. Substantial reduction in the pollution levels

Case Study 2- Mini Hydro

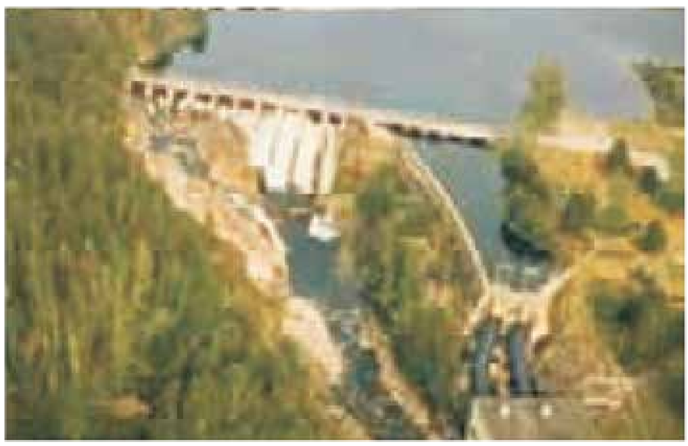
Carbon carbide manufacturing facility invested in a mini hydel power project in the hilly state of Himachal Pradesh. The company has entered into "Wheeling and Banking" agreement with the State Electricity Board and 2% wheeling and banking is being charged for the total units generated. The total power requirement of carbon carbide units is about 3.0 MW. The balance amount of electricity required is being met by other mini Hydel plants of this group located in several locations.

Installed capacity - 1 MW

Total investment - Rs.7.2 crores Pay back period - 5-6 years

(after considering depreciation benefits and subsidies)

This project has also benefited the local community in many ways. It has improved the line voltage and has provided free street lighting to the village to the tune of 60 kW. Total power generation on an average by this plant is about 60.0 lakh units per year.



GREENHOUSE GAS EMISSIONS (GHG)

Background

According to Intergovernmental Panel on Climate Change (IPCC), the major greenhouse gases are:

1. Carbon dioxide (CO_2)
2. Methane (CH_4)
3. Nitrous oxide (N_2O)
4. Hydrofluorocarbons (HFCs)
5. Perfluorocarbons (PFCs) and
6. Sulphur hexafluoride (SF_6)

Each gas has a heat retaining potential, called Global Warming Potential (GWP) which is defined as the ratio between the increased infrared absorption it causes and the increased infrared absorption caused by 1 kg of CO_2. The table below shows the GWP of the major greenhouse gases:

S No	GHG	Unit	1750	2007	GWP
1	CO2	ppm	280	384	1
2	CH4	ppb	700	1857	25
3	N2O	ppb	270	321	298
4	CFC 12	ppt	0	541	10900
5	HFC 134a	ppt	0	49	1430
6	SF6	ppt	0	6.4	22800

According to IPCC, between 1970 and 2004, these gases globally weighted by their GWP have increased by 70% which resulted in an average rise in surface temperature around 1.5°C. The projections predict that if the emissions continue to rise at the same intensity, there would be a severe food crisis due to disrupted rainfall patterns affecting agriculture all over the globe, melting of glaciers resulting in increase in sea level and increased frequency of extreme events which could displace more than 20 million people.

Business organizations and industry as a whole has taken a lead role in several voluntary initiatives to reduce their emissions. Increasing GHG levels in the atmosphere and associated

impacts have instigated several government and non-governmental organizations, businesses, and individuals to take proactive measures to curtail the rate of growth of emissions. Several governments have undertaken legislative steps to minimize the rate of increase of GHG levels in the atmosphere through measures such as introduction of emission trading programs, voluntary programs, carbon or energy taxes, and regulations and standards on energy efficiency.

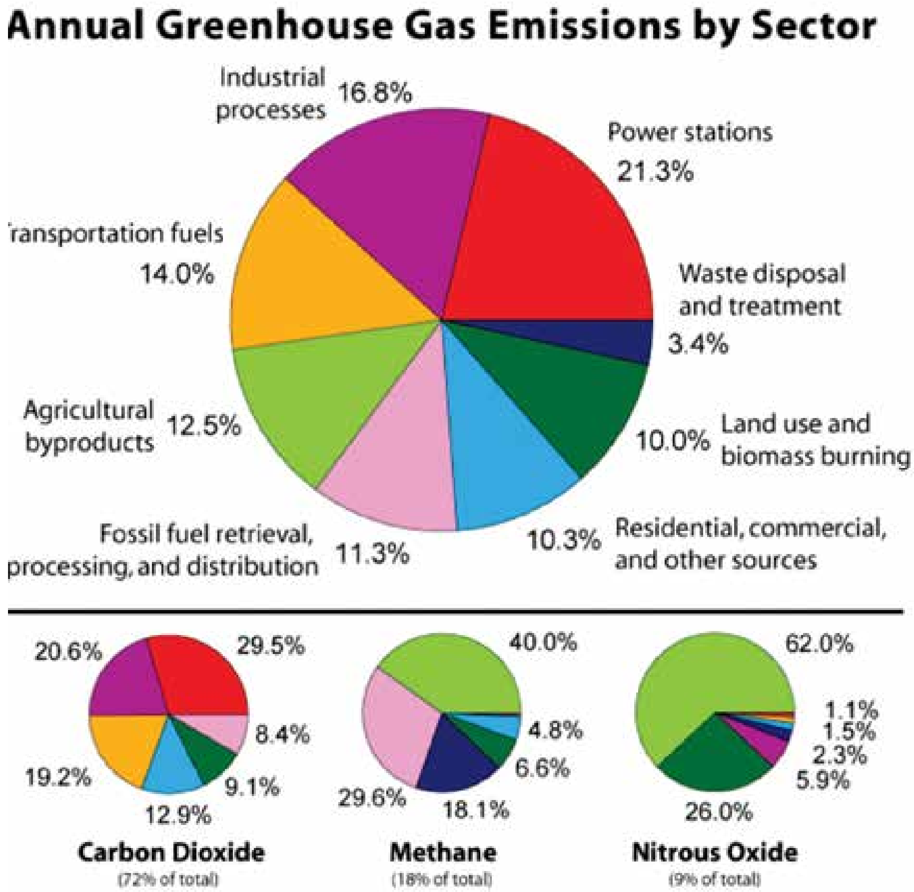
Different countries across the globe have also adopted voluntary targets to reduce GHG emission levels. For example,

- ♦ Canada – reducing GHG emissions by 20% below 2006 level by 2020
- ♦ US – reducing GHG emissions by 17% below 2005 level by 2020
- ♦ EU - reducing GHG emissions by 20-30 % below 2005 level by 2020
- ♦ Russia - reducing GHG emissions by 25% below 1990 level by 2020
- ♦ China - 40% reduction emissions per GDP compared to 2005 by 2020
- ♦ India- reducing GDP emission intensity by 20- 25% by 2020 compared to the base year of 2005

Global companies have also taken the lead and adopted GHG reduction targets. For example,

- ♦ GE - 1% yearly from 2004 to 2012
- ♦ California Portland Cement – 9% per production index from 2003 to 2012
- ♦ Holcim – US emissions reduction by 12% from 2000 to 2008
- ♦ Dupont – 15% reduction from 2004 to 2015
- ♦ General Motors – total North American emissions reduction by 40% from 2000 to 2010

These initiatives to reduce emissions are also being seen with a focus on cost-reduction and maximizing profits. Complying with the norms for the future and gaining market-based incentives of being a cleaner company builds trust and opinion in public as a sustainable company. This in turn helps in satisfying various stakeholders, attract investments and customers. Hence, effective GHG management leads to sound business sense.



GHG Emission Inventorization

Mandatory Requirement 1

Goal

To ensure accounting of GHG emissions to understand, quantify, and manage emissions arising out of operations in a unit or a facility.

Compliance Options Inventorization

Establish a system to monitor and account 6 greenhouse gas emissions from various sources of operations on an annual basis based on internationally accepted protocols like GHG protocol / ISO standards (ISO 14064).

Inventorization of scope-1 and scope-2 emissions is mandatory requirement and scope-3 is optional for the first year. It is mandatory to inventorize emissions under all three scopes from the second year. First year is the base year when scope 1 and 2 emissions are inventorized for the first time. From the year following the base year, scope 3 emissions should also be inventorized.

De-minimis criteria: Data may either be unavailable or not be within reasonable levels of accuracy for certain emissions. If these emissions are very small and account for less than 2% of total emissions, they can be ignored for GHG inventorization.

Documentation Required

Provide annual GHG inventory report containing the details of GHG emissions accounted and monitored under the three scopes defined.

Approach

For estimating the GHG emissions for a facility, the first step is to build an inventory. An inventory can be built by accounting the activities that lead to GHG emissions. According to GHG Protocol Corporate Standard, GHG accounting and reporting should be based on the following principles:

- Relevance:

  Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

- Completeness:

  Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusion.

- Consistency:

  Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

- Transparency:

  Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

- Accuracy:

  Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

  It is essential for companies adopting effective and innovative GHG emission management practices to set up an operation boundary to inventorize and account for the activities responsible for GHG emissions. This will help organizations tomanage the gamut of GHG risks and opportunities effectively. On these terms, the emissions are broadly classified into two categories:

- Direct Emissions

- Indirect Emissions

  Direct GHG emissions are emissions from sources that are owned or controlled by the company. Indirect GHG emissions are emissions that are a consequence of the activities of the company, but occur at sources owned or controlled by another company.

  To clearly demarcate direct and indirect emission sources and to improve transparency, the GHG Protocol Corporate Standard approach of three "scopes" (scope 1, scope 2, and scope 3) defined for GHG accounting and reporting purposes can be adopted. Scopes 1 and 2 are defined in a way that ensures that two or more companies will not account for same emissions in the same scope. This makes the scopes amenable for use in GHG programs where double counting matters. Companies should separately account for and report on scopes 1 and 2 at a minimum.

- **SCOPE 1:** Direct GHG emissions occur from sources that are owned or controlled by a company, for example-

  - Generation of electricity, heat or steam- emissions from combustion in owned/ controlled boilers, furnaces, turbines,
  - Physical or chemical processing- emissions from chemical production in owned/ controlled process equipment,
  - Transportation of materials, products, waste, employees- These emissions result from the combustion of fuels in company owned/ controlled mobile combustion sources (e.g., trucks, trains, ships, airplanes, buses, and cars); and
  - Fugitive emissions - These emissions result fromintentionalorunintentionalreleases,e.g., equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; HFC emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.

- ♦ **SCOPE 2:** It accounts for GHG emissions

from the generation of purchased electricity consumed by a company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

- ♦ **SCOPE 3:** It is optional for the first year but mandatory from the second year. Scope 3 emissions are a consequence of the activities of a company, but occur from sources not owned or controlled by the company. For example-
  - Extraction and production of purchased materials and fuels
  - Transport-related activities in vehicles not owned/controlled by reporting company:
  - Transportation of purchased materials or goods
  - Transportation of purchased fuels
  - Employee business travel
  - Employees commuting to and from work
  - Transportation of sold products
  - Transportation of waste
- ♦ Electricity-related activities not included in scope 2
  - Extraction, production, and transportation of fuelsconsumedinthegenerationofelectricity (either purchased or own-generated by the reporting company)
  - Purchase of electricity that is sold to an end user (reported by generating company)
  - Generation of electricity that is consumed in a T&D system (reported by end-user)
- ♦ Leased assets, franchises, and outsourced activities-emissions from such contractual arrangements are only classified as scope 3 if the selected consolidation approach does not apply to them
- ♦ Use of sold products and services
- ♦ Waste disposal
- ♦ Disposal of waste generated in operations
  - Disposal of waste generated in the production of purchased materials and fuels
  - Disposal of sold products at the end of their life

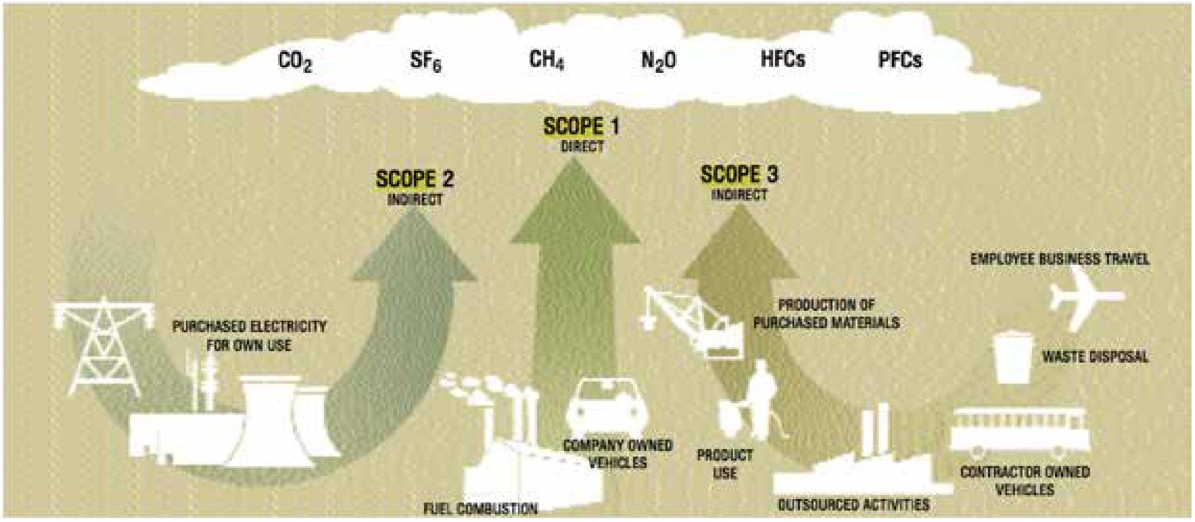
Once the inventory boundary has been established, companies can calculate their GHG emissions using the following steps:

1. Identify GHG emissions sources
2. Select GHG emissions calculation approach
3. Collect activity data and choose emission factors
4. Apply calculation tools

To create an accurate account of emissions, companies have found it useful to divide overall emissions into specific categories. This allows a company to use specifically developed methodologies to accurately calculate the emissions from each sector and source category. Identifying sources of GHG emissions can typically occur from sources of stationary combustion, mobile combustion, process emissions and fugitive emissions. These emissions have to be respectively categorized into SCOPE-1, 2 and 3.

Identification of sources is followed by selection of calculation approach as given by GHG protocols which are specific to the sector. Once the approach has been decided, collection of data and arriving at respective emission factors has to be done. Then using the calculation tools specific to the sector, an estimation of the footprint of GHG emissions can be calculated.

The diagram below gives overview of scopes and emissions-



Source: WRI/WBCSD 2004. The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard

Resources

1. Corporate GHG Inventory Program Guide (version 1) by CII – Sohrabji Godrej Green Business Centre

2. The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard by World Resource Institute

3. Estimation of Tamil Nadu's Carbon Footprint by CII-Godrej GBC

GHG Emission Intensity Reduction Targets

GHG Credit 1 **Points: 10**

Goal

To provide a direction and to encourage GHG emission reduction initiatives for a plant (or) a facility and contribute to the global climate change mitigation efforts.

Compliance Options

The rating system encourages companies to set short term & long term emission reduction targets and develop action plan for achieving the same. Target setting for emission reduction should be on the basis of emission intensity or absolute emission reduction from the baseline year. Short term targets will be for 1 – 3 years and long term targets will be for 4 years and above. Identification of emission mitigation opportunities for reducing the GHG emission levels must be carried out by performing feasibility study and strategize emission mitigation plan into short term and long term targets with a developed action plan.

Points for GHG emission reduction targets are:

Credit	Description	Points
GHG Credit 1.1	Setting short term & long term GHG emission targets	5
GHG Credit 1.2	Developing detailed action plan for achieving the targets	5

Documentation Required

1. Provide a document signed by the CEO or the Plant Head with the emission reduction target.
2. Provide documents on proposed action plan for GHG emission reduction

Approach

What is a target?

A target specifies a time bound desired levels of improvement to be achieved. It is usually a desired or promised levels of performance based on the indicators. It may specify a minimum level of performance or define aspirations for improvement. The targets must be set on realistic and achievable terms which should be measurable, challenging and time bound. GHG credit 1.1 awards 5 points for setting short term (3 years) and long term (more than 3 years) targets.

Why set a GHG target?

A GHG target is a planning tool which will help raise internal awareness about the risks and opportunities and ensures it stays in focus with the company's business agenda. Effective GHG management involves setting GHG reduction targets. Few drivers for developing strategies to reduce GHG emissions are:

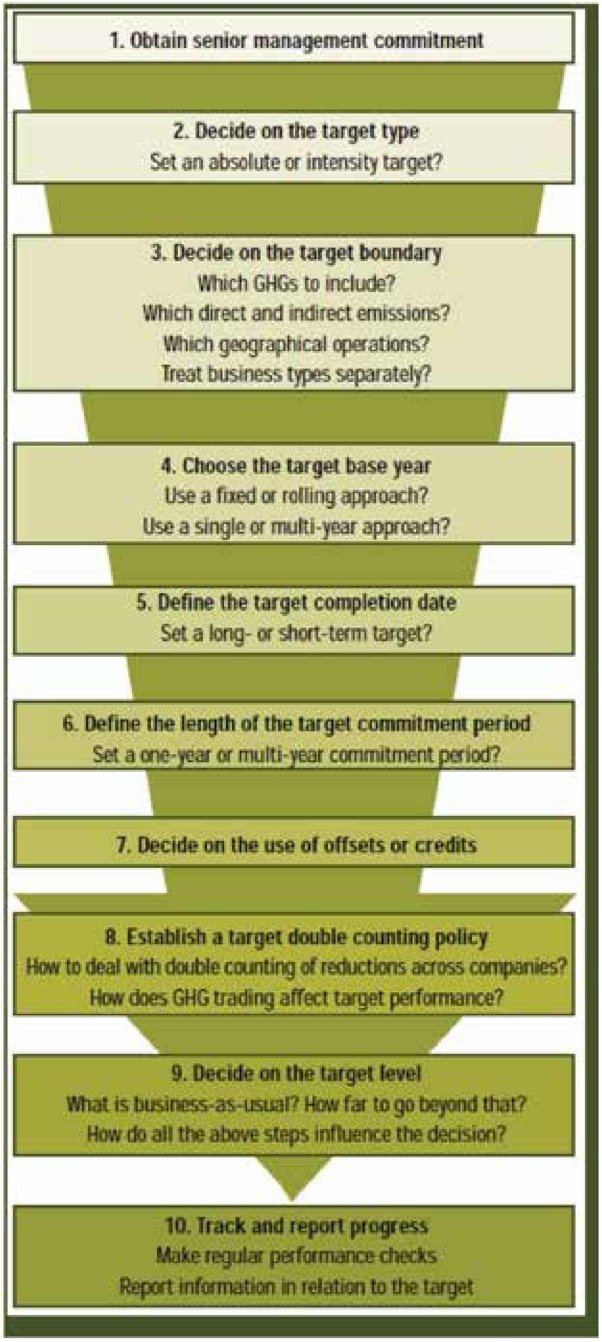
- Minimizing and managing GHG risks
- Achieving cost savings and stimulating innovation
- Preparation for future regulations
- Demonstrating leadership and corporate responsibility

Absolute targets track reductions in the total emissions of an organization. Intensity targets track reductions per unit of output of the organization, and may be applicable where growth of the organization may offset efficiency improvements or other reductions.

Steps in setting a GHG target

The prerequisite for implementing these steps is to have a developed GHG inventory. Setting a GHG target involves making choices among various strategies for defining and achieving reduction in GHG emissions. The following nine steps are suggested by GHG Protocol report (2004) to establish a GHG target:

1. Obtaining a commitment from the top management
2. Target type – absolute (or) intensity-based
3. Establishing target boundaries
4. Setting a target base year
5. Setting a target timeframe – short term (or) long term
6. Defining the length of the commitment period
7. Use of GHG offsets (or) credits
8. Decide on the level of target
9. Tracking and reporting progress



Source: GHG protocol report, WRI, 2004

The current emission intensity levels accounted can be compared to the national/international benchmarks for similar units/facilities to analyze where the unit stands. Feasibility studies can be done for pointing out the major sources/activities leading to GHG emissions and the concerned mitigation opportunities can be analyzed. The emission mitigation opportunities should be prioritized on the basis of 'minimum investment' and 'maximum reduction' and all the minimum investment options should be classified into short term targets and all higher investment options into long term targets. GHG credit 1.2 awards 5 points for having a detailed action plan to achieve the targets set in credit 1.1.

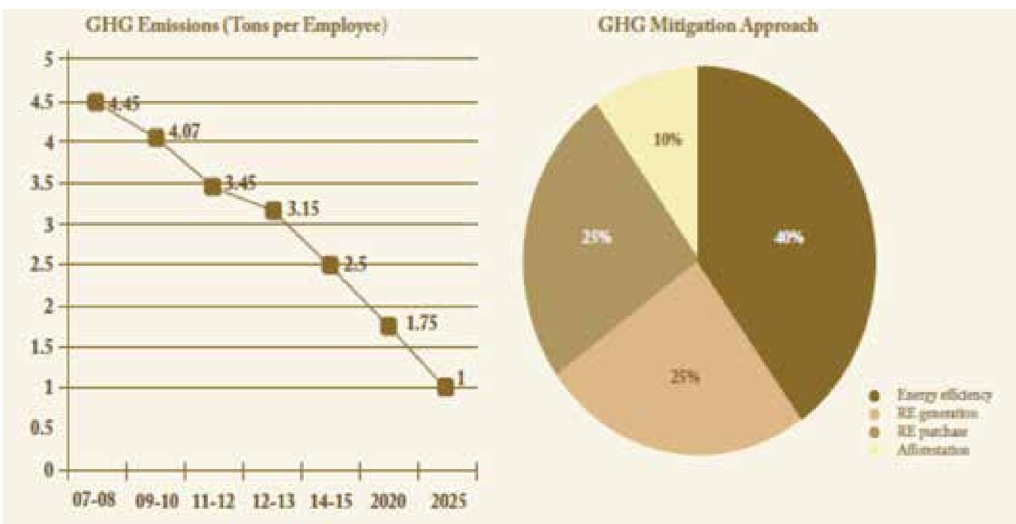
Case Study 1- GHG Reduction Targets by IT Hardware and Service Company

A leading IT company established the following vision and goals:

- To reduce GHG intensity to 2.5 tons per employee by 2015.
- To achieve a total reduction of 55,000 tons from the base figure of 455,000 tons (2008-09) by 2015.
- Focus on energy efficiency with equal emphasis on clean energy knowing the limitations of energy efficiency.
- To project energy efficiency: renewable energy mix of 40:60 to reach the goal of reduction of GHG intensity and absolute figures.

GHG mitigation approach included the following as shown in the diagram below:

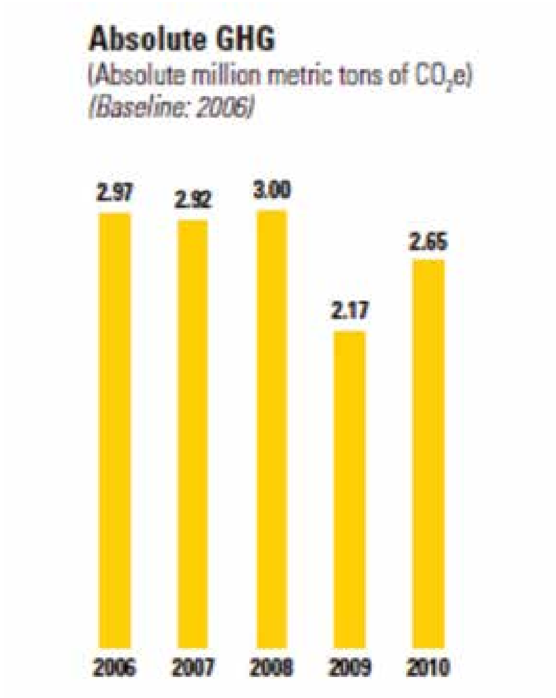
- 40% by energy efficiency
- 25% by RE generation
- 25% by RE purchase
- 10% by Afforestation



Case Study 2- GHG Reduction Target by a Global Automobile Manufacturer

A leading automobile company established long-term goals on GHG emissions reduction for year 2020:

- Reduce absolute GHG emissions from existing facilities by 25%
- Reduce customer GHG emissions by 20%
- Increase energy efficiency by 25%
- Use alternative or renewable sources of energy to cater 20% of energy needs



Employee Involvement & Capacity Building

GHG Credit 2 **Points: 10**

Goal

To involve employees at all levels for effective implementation of GHG emission mitigation efforts.

Compliance Options

A successful implementation of a GHG emission reduction program requires involvement from employees of all levels. The unit/facility has to ensure capacity building for relevant personnel involved in GHG emission Inventorization, target setting and mitigation opportunities.

Credit	Description	Points
GHG Credit 2.1	Strategies adopted for awareness creation and employee involvement	5
GHG Credit 2.2	Training programs and capacity building	5

Documentation Required

1. Details of awareness program organized for employees on GHG emissions, inventorization and mitigation opportunities

2. Documentation on the number of employees being trained per year on GHG emission inventorization/ reduction

Approach

Awareness creation on the issues of global warming and climate change is the need of the hour. The day-to-day activities of every individual lead to direct or indirect GHG emissions and impact the environment on a global level. It is therefore important to train all the employees on taking up activities to reduce their GHG emissions. All the employees should be familiar with topics such as climate change, GHG inventorization and corporate sustainability. The trainings designed should be oriented to cater the needs of all the employees in understanding these concepts and also in applying them on a day-to-day basis.

Awareness sessions should be organized by the management on various occasions like world environment day, earth hour, etc. Different interactive activities like quiz programs, poster presentations, showcasing documentaries and short films, etc. will enlighten all the employees on the current levels of GHG emissions and what each of them can do to mitigate those emissions. GHG credit 2.1 awards 5 points for awareness creation among all employees.

A cross-functional team should be established involving employees from all the departments of the unit/facility like production, maintenance, dispatch, sales, logistics, human resources and many others. This team should meet up periodically, discuss and identify the training needs of the employees of different departments and establish a road map to address these areas for reducing the GHG emissions of the facility. The GHG team should attend training programs on GHG inventorization and monitoring. GHG credit 2.2 awards 5 points for capacity building of relevant employees working on GHG inventorization and mitigation.

GHG Management System

GHG Credit 3 **Points: 10**

Goal

To ensure the best quality and accuracy of GHG inventorization activities carried out in the unit.

Compliance Options

Implement a GHG management system for monitoring emissions under the three scopes on a continuous basis. The GHG management system should consist of the following:

1. Systems in place to monitor, update and validate various scopes of emissions, emission factors, boundary conditions for emission inventorization covering all 3 scopes of emissions

2. Systems to monitor the implementations of various GHG emission reduction opportunities and projects

The break-up for allocation of points under this credit is as below:

Credit	Description	Points
GHG Credit 3.1	Quality Management – GHG emission inventorization	5
GHG Credit 3.2	Monitoring system for mitigation efforts	5

Documentation Required

1. Documentation of the GHG management system established for carrying out activities of inventorization/ emission reduction projects in the facility.

Approach

GHG credit 3 focuses on establishing a GHG management system within a company. GHG management has many benefits:

- Track, verify, and achieve corporate social responsibility goals
- Identify opportunities to reduce waste and costs
- Benchmark performance & identifyopportunities to improve competitiveness
- Participate in GHG emission markets
- Provide information to shareholders and other stakeholders
- Participate in GHG reporting programs
- Assess liabilities & prepare for future GHG policies

As the inventorization of GHG emissions is carried out, it is required that there is a system established that monitors all the activities and their impacts on a continuous basis. The quality of inventory must be checked and various parameters and emission factors must be updated on a regular basis. Continuous monitoring of projects implemented for reduction of GHG must also be done. The data being entered and monitored is valuable and automated systems can be implemented which reduce the error factor. This data is very vital in analyzing the footprint of the organization along with helping the organization to track the sources of emissions which will serve as a feedback mechanism for establishing targets and reduction measures.

GHG emission management system can be a part of the existing quality (or) the environment management system. The implemented management system for GHG emissions should have a continuous monitoring system in place to review the emission sources and emission factors periodically. It should also incorporate performing GAP analysis (actual and target) on monthly basis. GAP analysis can help identify the sources of emissions and thus help strategize mitigation measures. GHG emission tools from WBCSD or GHG protocol can be used. Companies can also develop customized GHG tools for monitoring the emissions and their sources under all the three scopes of emissions as established by GHG protocol.

GHG credit 3.1 awards 5 points for the quality management for GHG inventorization. GHG credit 3.2 awards 5 points for implementing monitoring systems for mitigation efforts.

GHG Emission Intensity Reduction

GHG Credit 4 **Points: 20**

Goal

To ensure the plant/facility to achieve GHG emission intensity reduction to lessen the impact on climate change.

Compliance Options

The GHG emission intensity of the plant/facility has to have a reduced footprint over a period of 3 years of operation.

The criteria for awarding credit points are based on the percentage reduction of GHG emission intensity achieved in the 3 scopes for emissions.

The applicants can apply for this credit based on 3 options:

1. Internal Performance Approach
2. Benchmarking with National and International Performances
3. Public commitment (for facilities/units established in last 2 years)

Option 1: Internal Performance Approach

Percentage reduction in GHG emission intensity in last 3 years	Points
> 5%	5
> 10%	10
> 20%	15
> 30%	20

Documentation Required

1. Detail report of the actual emission intensity level monitored and accounted in the last 3 years and the percentage reduction achieved.
2. Annual report/Corporate Sustainability report/GRI report/CDP response or any other public commitment document that is published which describes the company's emission intensity reduction measures and achievement.

Option 2: Benchmarking with National and International Performances

Credit	National/International Benchmarking for GHG emission intensity in the same sector	Points
GHG Credit 4.1	Company is among the top 10% of the lowest GHG emission intensity companies in the country	5
GHG Credit 4.2	Company is among the top 5% of the lowest GHG emission intensity companies in the country	10
GHG Credit 4.3	Company is among the top 10% of lowest GHG emission intensity globally	15
GHG Credit 4.4	Company is among the top 5% of lowest GHG emission intensity globally	20

Documentation required for Option-2:

1. Provide GHG Inventorization document showing emission intensity
2. Provide documentary evidence with details on emission intensity at National/International level
3. Provide documentary evidence on the benchmark study conducted by a third party indicating the National/ International benchmark

Approach

GHG credit 4 awards points for the achievements made by companies in GHG emission intensity reduction. Various initiatives can be taken by companies to reduce GHG emissions. Some examples are given below-

Scope-1

- Energy conservation: Scope 1 emissions can be reduced by implementing energy conservation initiatives like installation of energy efficient motors, installation of energy efficient lighting system, etc. It is to be noted that any initiative on reducing GHG emissions reduces energy costs and thus leads to profitability.

- Process improvement: certain sectors like cement sector can achieve reduction in scope 1 emissions by making changes in the process such that the emissions are reduced.

- Altering source of energy: like switching fuel used from diesel to natural gas or adopting cleaner technologies like installation of waste heat recovery based power generation system can lead to reduction in Scope 1 emissions.

Scope-2

- Energy efficiency projects: can lead to reduction in scope 2 emissions in addition to scope 1 emissions as it reduces the electricity consumed from the grid. This is particularly true for sectors like engineering and buildings where scope 2 emissions are higher compared to scope 1 and 3 emissions.

- Substitution with renewable energy: substituting conventional energy derived from fossil fuels with renewable energy leads to reduction in scope 2 emissions.

Scope-3

- Change in product efficiency such that it uses less energy, water or other natural resources during its usage phase

- Using fuel efficient vehicles for transportation

- Optimizing logistics

- Procuring less material or material with higher recycled content

- Procuring supplies from local suppliers such that the distance traveled is reduced

- Organizing tele-commute for employees on certain occasions such that it avoids unnecessary travel

- Working with suppliers and reducing their GHG emissions

- Educating consumers such that the GHG emissions during the usage stage are reduced

- Reducing waste sent to landfills by organizing extended producer responsibility programs

The emissions vary depending on the type of sector. Manufacturing sector has significantly higher scope 1 emissions when compared with other sectors. Building sector has very high scope 2 emissions when compared to scope 1 and 3 emissions. Engineering sector also has very high scope 2 emissions. Each sector therefore needs to calculate the source of its emissions and implement strategies to mitigate emissions.

GHG credit 4 awards maximum of 20 points for reducing GHG emissions in the last three years by 30% or more. In case the company is in the top 5% or 10% of the lowest GHG emission intensity companies in the country, 5 or 10 points are awarded respectively. In case the company is in the top 5% or 10% of the lowest GHG emission intensity companies in the world, 15 or 20 points are awarded respectively.

Case Study 1 - Innovate to Develop a New Product to Reduce GHG Emissions of Customers

A leading networking company that believes in transforming how people connect, communicate and collaborate developed the 'Tele Presence' tool. Tele presence is a video conferencing tool to reduce travel emissions. Organizations that use this tool can substantially increase its global impact without increasing its carbon footprint. In addition to enabling "in-person" meetings without requiring travel, tele presence tool introduces new ways of interacting with partners, media, and customers.

Through a powerful combination of technology and design, local and remote participants often feel like they are in the same room. The tool created by the company offers the following advantages:

- Reduce the need for flying
- Lessen an organization's impact on the environment through reduced travel
- Meet with more locations more frequently at a fraction of the cost
- Solve problems faster by connecting people in multiple locations at once
- Accelerate corporate green initiatives

This helped the company reduce its own scope 3 emissions as well as their customer's emissions.

The company believes that the value of intercompany telepresence and the network service that makes it possible - can be expected to increase not linearly, but in proportion to the square of the number of users. The company projects that the worldwide revenue opportunity for telepresence and related services will reach US $5 billion by 2012.

Case Study 2- Reduction in GHG Emissions by Focusing on Energy Efficiency

In 2010, a leading multinational company lowered its GHG emissions to 5.7 million metric tons, a reduction of 24 percent from 2004 baseline. In 2010, the company's energy use was 50.8 million MMBtu, an 18 percent reduction from the 2004 baseline year. This reduction is attributable to the company's focus on improving energy efficiency. The company's energy intensity (measured as MMBtu/revenue in millions of U.S. dollars) in 2010 improved by 32.8 percent since 2004. By 2015, the company will improve the energy intensity of its operations by 50% and will reduce its absolute GHG emission by 25% (both using the 2004 baseline).

The company is taking the following initiatives to reduce its GHG emissions:

- For 15 years, 6 engineers and chemists of pollution prevention/energy efficiency team have been dedicated to the cost effective reduction of the company's environmental releases and GHG emission.
- The company invested more than $2 billion in renewable energy.
- Planned 84 projects where energy efficient T5 and T8 lamps will be used. In 2006, projects like relamping saved the company $70 million in energy costs.
- The company's employees have identified 5,400 projects which would reduce the company's GHG emissions by 648,000 MT.

Carbon Neutral Approach

GHG Credit 5 **Points: 30**

Goal

To encourage units to move towards carbon neutrality

Compliance Options

Companies are required to implement carbon offset or carbon sequestration projects to achieve points under this credit. The credit points are based on the percentage carbon offset / sequestration achieved.

Inclusion of Scope-3 emissions is compulsory in GHG emission inventory while estimating the carbon neutrality of the unit. The percentage offset / sequestration for GHG intensive & GHG non-intensive sectors are provided separately to encourage companies from all sectors to implement this credit.

Option 1: GHG intensive industries

Offset/Sequestration as a percentage of total GHG emissions	Points
>5%	5
>10%	10
>15%	15
>20%	20
>25%	25
>30%	30

Documentation Required

1. Provide the list of projects implemented in carbon offset/sequestration areas and % offset / sequestration with respect to overall emission

2. Spreadsheet calculation demonstrating emission offset values

Option 2: Non GHG Intensive Industries

Offset/Sequestration as a percentage of total GHG emissions	Points
>15%	5
>25%	10
>40%	15
>60%	20
>80%	25
>100%	30

Documentation Required

Provide the details of carbon offset/sequestration projects implemented through renewable power generation or green area development etc.

- Provide the details of carbon offset/sequestration projects implemented through renewable power generation or green area development etc.
- Spreadsheet calculation demonstrating emission offset values

The details carbon intensive and non-intensive sectors are:

GHG intensive sectors	GHG non-intensive sectors
Cement	Automobile
Chemical	Building
Fertilizer	Engineering
Iron & Steel	Service
Non-Ferrous Metal	FMCG
Pulp & Paper	Textile
Petrochemical	Pharmaceuticals
Refinery	Tyre Manufacturing
	Foundry

Approach

Carbon neutrality can be achieved by combination of various approaches. Some of the approaches have been described below:

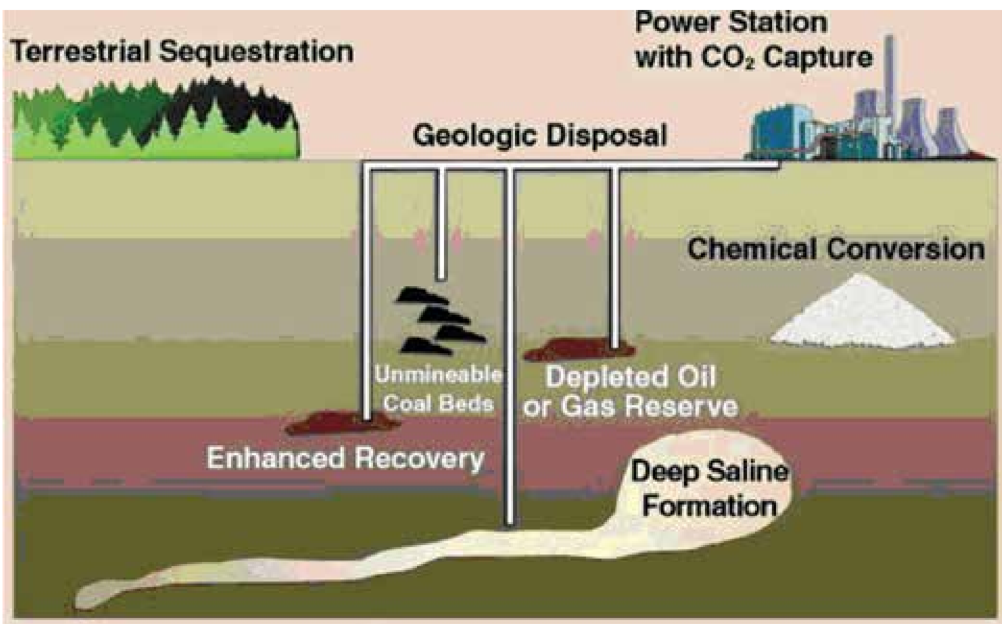
- **Maximizing energy efficiency -** Using energy efficient equipment and technology and efficient operating procedures can save a company tremendous amount of energy which can then be converted into equivalent reduction in tons of GHG emissions. Implementation of different energy efficiency projects has been described in detail in the Energy Efficiency chapter.

- **Substituting primary energy with renewable energy -** As the price of fossil fuels is on the rise, the ways and amount of energy being captured from renewable sources is also on the rise. Sources like wind, solar, and biomass are dominant in the market and substitution of power from primary to renewable sources can lead to not only profitability but also reduction in GHG emissions. Implementation of renewable energy (onsite and offsite) has been described in detail in the Renewable Energy chapter.

- **Carbon sequestration-** In order to attain carbon neutrality, the efforts in energy-efficiency and generation/utilization of power from renewable sources may not be sufficient. In such a scenario, taking up carbon sequestration projects will help attain carbon neutrality.

Carbon mitigation is evaluated as one of many services provided by ecosystems. Carbon sequestration (or refered as carbon capture and storage) is widely accepted as a carbon mitigation strategy. Carbon sequestration is the removal and long-term storage of CO_2 from the atmosphere into carbon reservoirs or carbon sinks. There are two types of carbon sequestration- (a) terrestrial sequestration: carbon is stored in forests or in the soils of farmland and range land or (b) geologic sequestration: as the process of carbon capture and storage, where carbon dioxide is removed from flue gases, such as on power stations, before being stored in underground reservoirs like rock formations, depleted oil reserve, saline aquifers.

The diagram below shows the different carbon sequestration options:



Source: http://www.bigskyco2.org/

Estimates of global carbon stocks in vegetation and soils to 1 m depth are shown in the table below (source: IPCC):

Biome	**Area (million km2)**	**vegetation**	**Carbon stocks(GtC) Soils**	**Total**
Tropical forests	17.6	212	216	428
Temperate forests	10.4	59	100	159
Boreal forests	13.7	88	471	559
Tropical savannas	22.5	66	264	330
Temperate grasslands	12.5	9	295	304
Deserts and semideserts	45.5	8	191	199
Tundra	9.5	6	121	127
Wetlands	3.5	15	225	240
Croplands	16	3	128	131
Total	151.2	466	2,011	2,477

- **Purchasing carbon credits -** Projects that fulfill the requirements of UNFCC can earn carbon credits through Clean Development Mechanism (CDM). These credits can be used to account for reductions achieved in GHG emissions. The CDM allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, each equivalent to one tonne of CO2. These CERs can be traded and sold and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. Companies in India can buy voluntary emissions reduction (VER) credits to meet a part of their emission reduction targets. VER credits are usually created by projects which have been verified outside of the Kyoto Protocol.

  GHG intensive companies are given maximum of 30 points for offsetting 30% or more of their GHG emissions through carbon sequestration or offsite renewable energy projects. Non-GHG intensive companies are given maximum of 30 points for offsetting 100% of their GHG emissions through carbon sequestration or offsite renewable energy projects.

Resources

1. Intergovernmental Panel on Climate Change www.ipcc.ch

2. Clean Development Mechanism http://cdm.unfccc.int/about/index.html

Case Study 1- Carbon Positive Company

A leading company has been carbon positive for six years in a row. The following strategies are being adopted to achieve carbon positive status:

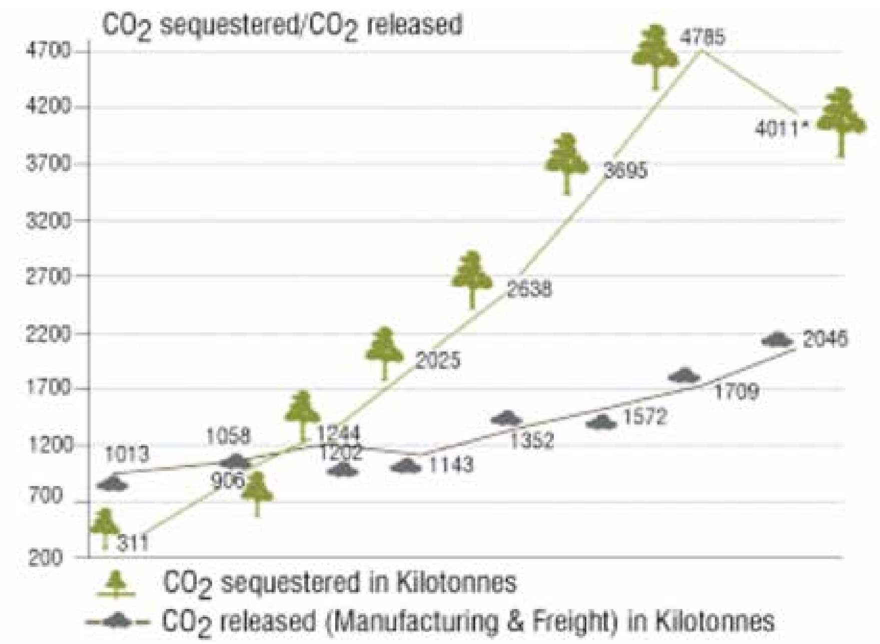
1. Reducing specific energy consumption

2. Increasing its share of renewable energy portfolio

3. Large scale carbon sequestration

The company has implemented several CDM projects under the Kyoto Protocol and ensured carbon dioxide (CO_2) sequestration through large-scale social and farm forestry initiatives. The company's social and farm forestry initiatives have created a green cover of over 125,000 hectares, consolidating its position as a 'Carbon Positive' corporation for six years in a row. The company has registered 8 CDM projects, with the CDM-EB (Clean Development Mechanism - Executive Board), set up by UNFCCC (United Nations Framework Convention on Climate Change) under the Kyoto Protocol which include two unique projects – one on social forestry, the first of its kind in India and the second is the only hotel in the world to earn carbon credits.

30.9% of the company's energy consumption is from renewable sources. Wind energy is selected as a focus area for enhancing its positive environmental footprint.



Scope 3 Emission Inventorization and reduction

GHG Credit 6 **Points: 20**

Goal

To encourage units to inventorize their scope 3 emissions and work towards reducing their scope 3 emissions.

Compliance Options

Individual units need to inventorize and account for their scope 3 emissions. The 15 categories of scope 3 emissions covered under the GHG Protocol include emissions due to purchased goods and services, capital goods, fuel- and energy-related activities, upstream transportation and distribution, waste generated in operations, business travel, employee commute, upstream leased assets, downstream transportation and distribution, processing of sold products, use of sold products, end-of-life treatment of sold products, downstream leased assets, franchises and investments.

The points for this credit are based on the number of categories that is accounted for and the percentage reduction achieved in the scope 3 emissions.

GHG Credit 6.1: Scope 3 Emission Inventorization

Credit	Emission Inventorization and reduction	Points	
GHG Credit 6	Scope 3 Emission Inventorization and reduction	20	
GHG Credit 6.1	Scope 3 Inventorization		5
GHG Credit 6.2	Reduction in scope 3 emissions		
	>5 % Reduction in scope 3 emission intensity		5
	>10 % Reduction in scope 3 emission intensity		10
	>15 % Reduction in scope 3 emission intensity		15

Documentation Required

1. GHG inventory report containing details of scope 3 emissions that are accounted and monitored
2. Calculation to support the % reduction in scope 3 emissions
3. List of projects that has helped achieve the % reduction in scope 3 emissions

Approach

Developing a full corporate GHG emissions inventory – incorporating scope 1, scope 2, and scope 3 emissions – enables companies to understand their full emissions impact across the value chain and focus efforts where they can have the greatest impact.

Scope 3 emissions can represent the largest source of emissions for companies and present the most significant opportunities to influence GHG reductions and achieve a variety of GHG-related business objectives.

- ♦ Identify GHG reduction opportunities, set reduction targets, and track performance

Scope 3 inventories provide detailed information on the relative size and scale of emission-generating activities within and across the various scopes 3 categories. This information may be used to identify the largest emission sources (i.e., “hot spots”) in the value chain and focus efforts on the most effective emission-reduction opportunities, resulting in cost savings for companies.

For example, a company whose largest source of value chain emissions is contracted logistics may choose to optimize these operations through changes to product packaging to increase the volume per shipment, or by increasing the number of low-carbon logistics providers. Additionally, companies may utilize this information to change their procurement practices or improve product design or product efficiency, resulting in reduced energy use. Conducting a GHG inventory according to a consistent framework is also a prerequisite for setting credible public GHG reduction targets. External stakeholders, including customers, investors, shareholders, and others, are increasingly interested in companies’ documented emissions reductions. Therefore, identifying reduction opportunities, setting goals, and reporting on progress to stakeholders may help differentiate a company in an increasingly environmentally conscious marketplace.

Engage value chain partners in GHG management developing a scope 3 inventory encourages the quantification and reporting of emissions from various partners across the value chain. For many companies, a primary goal of developing scope 3 inventories is to encourage supplier GHG measurement and reduction, and to report on supplier performance. A scope 3 inventory enables companies to identify their downstream hot spots so that they can credibly engage with customers to reduce their value chain emissions. By developing a scope 3 inventory, companies can identify where the largest energy, material and resource use is within the supply chain. This knowledge can inform cost savings through reducing material, energy and resource use, improving overall efficiency of companies’ supply chains, reducing regulatory risks, and strengthening supplier and customer relationships

List of scope 3 categories as per Green House Gas Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard is given below

- ♦ Upstream scope 3 emissions:
    1. Purchased goods and services
    2. Capital goods
    3. Fuel- and energy-related activities (not included in scope 1 or scope 2)
    4. Upstream transportation and distribution
    5. Waste generated in operations
    6. Business travel
    7. Employee commuting
    8. Upstream leased assets
- ♦ Downstream scope 3 emissions:
    9. Downstream transportation and distribution
    10. Processing of sold products
    11. Use of sold products
    12. End-of-life treatment of sold products
    13. Downstream leased assets
    14. Franchises
    15. Investments

Resources

1. Green House Gas Protocol, Corporate Value Chain (Scope 3) Accounting and Reporting Standard http://indiaghgp.org/

2. www.wri.org

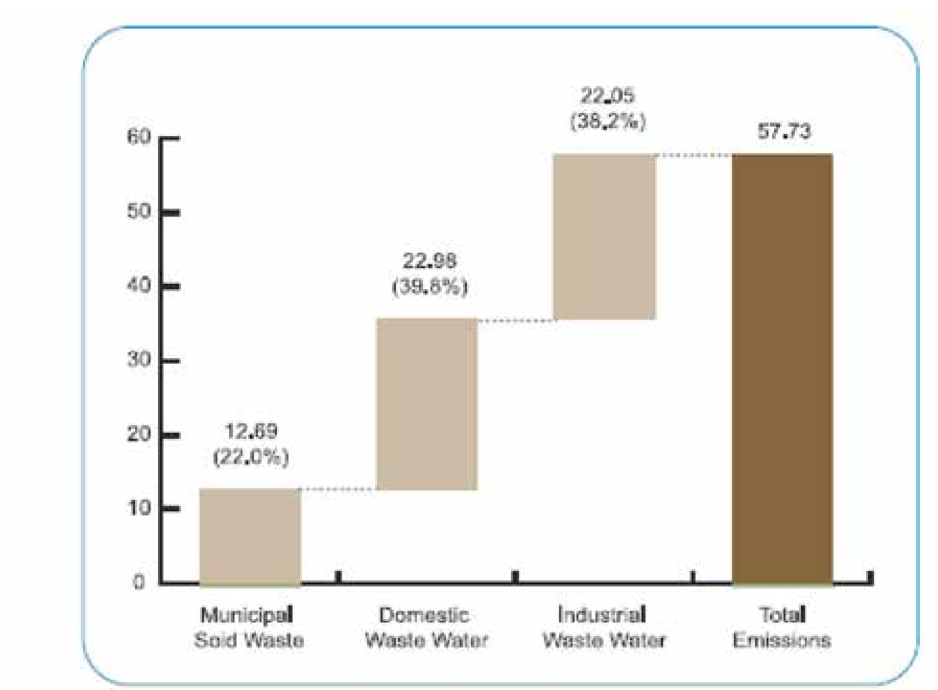
WASTE MANAGEMENT (WM)

Background

The development of science and technology has increased human capacity to extract resources from nature. It is only recently that industries are being held accountable for the detrimental effects of the waste generated. Increased government regulations and corporate accountability are brining issues like pollution control, waste treatment and environmental protection to public notice. The traditional approach adopted for clinical waste, agricultural waste, industrial waste and municipal waste is depleting the natural resources. According to a report by Indian Network for Climate Change Assessment published in 2007, waste management contributes to about 3% of global GHG emissions. Waste management is at its infancy in most industries leading to unhygienic and hazardous conditionsintheworkplace. Thesefactsnecessitate a well defined waste management approach in the industry. It is a major requisite in leading an industry towards environmental sustainability.

The main objective of this parameter is to ensure sustainable management of waste, promote industrial hygiene and safety and conserve natural resources. This can be achieved by 100 % utilization of all types of wastes through implementation of concepts like cradle to cradle and 'Integrated Sustainable Waste Management'. Integrated sustainable waste management differs from the conventional approach towards waste management by seeking stakeholder participation, covering waste prevention and resource recovery, including interactions with other systems and promoting an integration of different habitat scales. The parameter waste management paves the way for integrated sustainable waste management through waste collection, segregation and disposal, waste management policy, reducing specific waste generation, use of waste as alternative fuel, reducing wastewater discharge or achieving zero wastewater discharge and finally reducing non GHG emissions below statutory limits.

GHG emissions from waste (million tones of CO_2 eq.)



Source: INCAA, 2007

Waste Management Policy

WM Mandatory Requirement 1

Goal

Demonstrate the commitment of top management towards successful implementation of waste management system.

Compliance Options

The waste management policy provides direction for all waste management activities in the company. A unit can have a policy exclusively for waste management or it can be a part of environment / sustainability policy that is signed by the Chief Executive of the company or unit head. It will form the basis upon which the unit can set its short and long term objectives and targets. This policy should be transparent and has to be shared with all employees.

Documentation Required

1. Copy of the signed waste management policy

Approach

As a first step towards sustainable waste management, companies should demonstrate their commitment by framing a waste management policy. A policy should be viewed as a tool to achieve continuous environmental improvement rather than daily firefighting just to keep up with regulatory requirements.

A proper waste management policy will facilitate in achieving the following benefits-

- reduced environmental liability
- a boost to the business image for being environmentally conscious
- raised staff morale and environmental awareness
- systematic control of individual waste issues
- increased business opportunities

The waste management policy can be a separate declaration or be a part of wider environmental and sustainability policy of the organization. The policy may consist of goals/targets, ways of achieving the targets and strategies for stakeholder involvement.

It is essential for industries to have an effective collection, segregation and disposal mechanism in place. The following approach can be adopted to ensure a proper and effective waste collection, segregation and disposal system:

- Segregate different types ofwastes(process and non-process) at source based on the chemical, physical and biological characteristics.
- Identify place(s) in the unit to store different types of wastes (hazardous / non-hazardous; bio /non-bio degradable, etc).
- The segregated waste should then be properly collected and transported to a designated storage area on a regular basis.
- Treat / dispose / recycle the wastes as per approved technology.
- Refer and follow the guidelines, defined by Ministry of Environment and Forest (MoEF) / Central Pollution Control Board (SPCB) / State Pollution Control Board (SPCB) on good environmental practices and waste management.

The system should comply with various state and central government rules like:

- The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules 2009, The Batteries (Management and Handling) Rules z2001,
- The Municipal Solid Wastes (Management and Handling) Rules 2000,
- e-waste (Management and Handling) Rules 2011,
- The Bio-Medical Waste (Management and Handling) Rules 2003,
- The Rules for the Manufacture, Use, Import, Export and Storage of Hazardous micro- organisms Genetically engineered organisms or cells,
- The Recycled Plastics Manufacture and Usage (Amendment) Rules 2003,
- The Municipal Solid Wastes (Management and Handling) Rules 2000,
- The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules 2000, etc.

Resources

1. Integrated Solid Waste Management: Engineering Principles and Management Issues by George Tchobanoglous, Hilary Theisen, Samuel A. Vigil
2. Air Pollution Control Engineering by Lawrence K Wang
3. Handbook of Solid Waste Management by Frank Kreith and George Tchobanoglous

Case Study 1- Waste Management Policy

Waste management policy has been integrated as part of a wider environmental policy by a software company as shown below. The company has clearly stated their goal towards integrated sustainable waste management by stating the following – “Adopt the 3R philosophy for all types of wastes towards prevention of pollution and disposal of ‘inevitable waste’, especially electronic waste in line with regulatory requirements or industry best practices.”

Chief Executive Officer and
Managing Director

Environmental Policy

commitment to the environment stems from the Group's abiding concern for the environment and society, which is embodied in the Code of Conduct. The Group considers climate change to be the greatest threat affecting economic stability, vulnerable communities, and the society at large. The Group's Climate Change Policy mandates that all group companies assume leadership roles in climate change mitigation while pursuing their business aspirations and enhancement of shareholder value.

is in the business of providing IT services, business solutions, and outsourcing. Our environmental impacts result from our business operations globally and through the services and solutions that we provide to our customers. True to the spirit, regards climate change mitigation and environmental improvement as essential elements of its sustainable business philosophy. We are committed to continuously benchmarking and enhancing our own environmental performance through the reduction of our carbon and ecological footprints with the involvement of our business associates and partners; striving to be the leaders in our industry sector. Through our services and solutions, we shall endeavour to help customers improve their environmental performance towards their sustainability objectives.

aims to fulfil its environmental commitments through the following broad-level actions:

- Integrate energy and environmental considerations into the design of new infrastructural facilities
- Improve resource efficiency in operations, especially for key resources such as energy and water
- Adopt the ‘3-R’ (reduce, reuse and recycle) philosophy for all types of wastes towards prevention of pollution and dispose of ‘inevitable’ wastes, especially electronic waste, in line with regulatory requirements or industry best practice
- Promote ‘green procurement’ to the maximum extent possible
- Consider stakeholder expectations on our environmental performance in the design of infrastructure, operations, processes, and solutions to the extent feasible

....2/-

Leadership & Strategy

WM Credit 1 **Points: 10**

Goal

Demonstrate the commitment of top management towards successful implementation of waste management system.

Compliance Options

The waste management policy provides direction for all waste management activities in the company. A unit can have a policy exclusively for waste management or it can be a part of environment / sustainability policy that is signed by the Chief Executive of the company or unit head. It will form the basis upon which the unit can set its short and long term objectives and targets. This policy should be transparent and shared with all employees.

The unit should have short and long term targets for reduction in waste disposal. Short term targets should be complied within 3 years period, while long term targets can go beyond 3 years. The targets for reduction should be in terms of specific waste generation (waste / unit weight or volume of product) for all kind of wastes. Top management will ensure that appropriate resources (financial, infrastructural, technological, manpower, etc) are provided for effective implementation of waste management system.

The performance of the waste management system should be reviewed on a monthly basis by environment management cell or unit head.

S. No	Description	Points
WM 1.1	Short term & long term targets	5
WM 1.2	Action Plan & Resource allocation	5

Documentation Required

1. Copy of the signed waste management policy
2. A brief write up about the short & long term targets, resource allocation, how the policy and targets are communicated to all employees. Relevant supporting documents, photographs, etc. should be attached.

Approach

After framing the policy, the management should set specific short term and long term targets for reducing waste generation or waste sent to landfill. The unit should set up a base line of waste generated based upon the waste inventorization. Once the base line is calculated, waste reduction targets should be set. The management should then allocate resources (institutional, financial, technological or manpower) for achieving the set goals. A clear action plan should be developed for each target set. Ideally, every facility should try to send zero waste to landfill/incinerator and should treat its waste within the facility through changes in the process of manufacturing or by adopting the 3R approach (reduce, reuse, recycle).

WM credit 1.1 awards 5 points for framing setting short (3 years) and long (beyond 3 years) term targets and WM Credit 1.2 awards 5 points for devising an action plan and having allocated resources to achieve the targets.

Resources

1. Waste Management Summit organized by CII-Godrej Green Business Centre: http://www.greenbusinesscentre.com/site/ciigbc/viewevent.jsp?eventid=288782&event=dd

2. Ministry of Environment and Forests: www.envfor.nic.in

3. National Solid Waste Association of India: http://www.nswai.com/

4. International Solid Waste Association: www.iswa.org

5. Bureau of International Recycling: http://www.bir.org/

6. Waste Minimization Circle : http://wmc.nic.in

Employee Involvement & Capacity Building

WM Credit 2 **Points: 10**

Goal

Create awareness and encourage all employees to get involved in waste management.

Compliance Options

Strategies adopted for awareness creation and employee involvement –Programs and initiatives taken by the plant team for awareness creation and employee involvement like poster competition, displaying slogans, earth day, world environment day celebrations, incentives based on suggestion schemes, recognition awards, etc. These programs should be aimed at involving all the employees.

Training programs and capacity building– Training program to build capacity of employees so that they are able to contribute to waste management activities. The plant should identify the training needs of employees with regard to waste management and organize programs accordingly.

S No.	Description	Points
WM 2.1	Strategies adopted for awareness creation and employee involvement	5
WM 2.2	Training programs and capacity building	5

Documentation Required

1. A brief write up explaining the different awareness programs conducted during the year and strategies adopted for employee involvement. The write up should clearly explain the following- program calendar, topics of the program, participants, contents of the presentation, photographs, results, feedback, etc.

2. A brief write up explaining the training needs of the employees on waste management and the training programs conducted in the last three years.

3. Documentation on performance appraisal of employees based on waste management activities of the plant.

Approach

Awareness creation and employee involvement activities can be started off by the top management by initially identifying a cross-functional waste management team composed of employees from areas such as production, engineering, finance, marketing, and environmental safety and health. This team will be responsible to manage the unit's waste management program. General waste management awareness programs should be organized by the team and extended to all employees. Such awareness programs help build a strong culture of waste minimization in the organization and help reshape employees' thinking about waste and its impact on society.

The waste management team leader plays an important role in helping other team members understand the benefits of a waste minimization program, obtaining the necessary resources for it, and establishing program goals and objectives. The leader should establish written policies, procedures, and measurable performance standards for program outcomes. The leader of the waste management team should be someone who (a) can envision and communicate a goal of "zero waste," (b) has a good relationship with all the employees and (c) is knowledgeable about environmental issues, hazardous waste laws, and current waste management approaches and technology.

WM credit 2.1 awards 5 points for awareness and employee involvement programs. Apart from general awareness programs, skills of the waste management team should be regularly upgraded to achieve and implement waste management activities on a day to day basis. This would ensure integrated sustainable waste management as a part of the work culture in the long run.

Training and capacity building programs on waste management should include: (a) good housekeeping, material or product substitution, process modification, recycling or reusing, waste treatment, and waste disposal, (b) specific waste issues related to the industry; and (c) systematic techniquesonhowtoanalyze currentmanufacturing

inputs, processes, and wastes produced. The different awareness, training and capacity building programs conducted in the last three years should be properly documented. WM credit 2.2 awards 5 points for training and capacity building programs.

References

1. Cutting Waste with Employee Involvement Teams - Total Quality Waste Minimization by Douglas R. May, Brenda L. Flannery

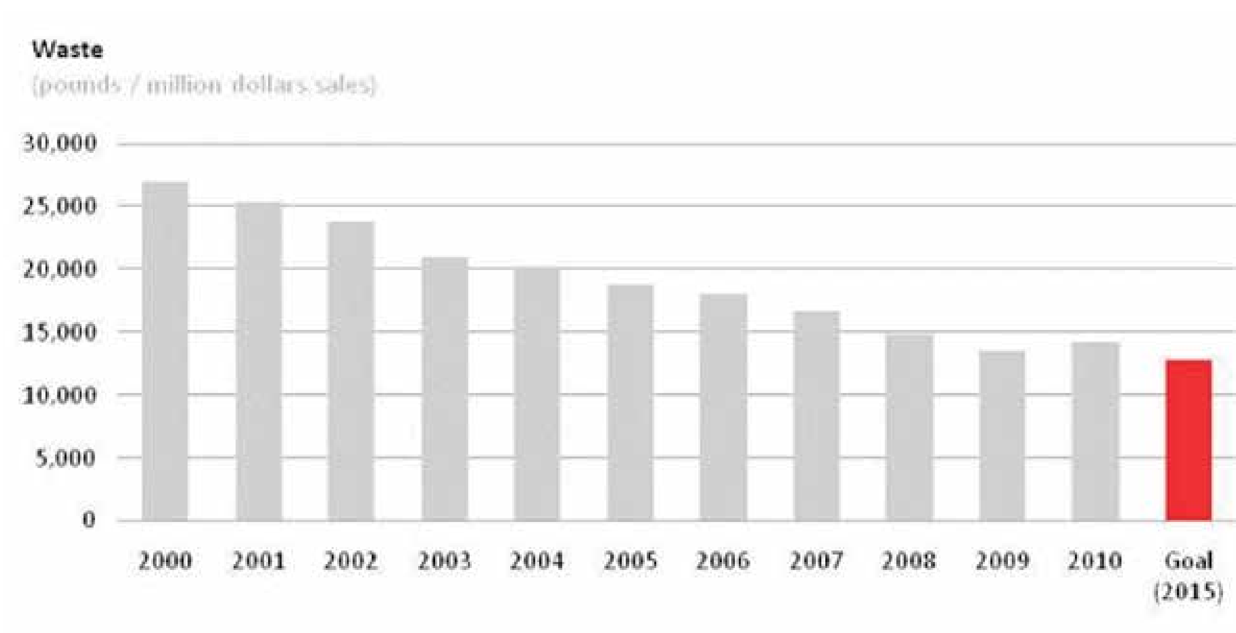
Case Study 1- Cutting Waste with Employee Involvement

Since 1975, a leading technology company has encouraged employees to propose changes that would both cut back pollution and generate revenue. Its “Pollution Prevention Pays (3P)” program is based on making pollution prevention a way of life--from the boardroom to the laboratory to the manufacturing plant. All employees are encouraged to participate in the 3P program. Every 3P solution has come from what might be called the “fourth P”—the people. The program relies on voluntary participation of all employees around the globe. The employees have completed more than 8,100 projects so far.

A project submitted for recognition under the program must meet four criteria:

- eliminate or reduce a pollutant
- benefit the environment additionally through reduced energy use or more efficient use of manufacturing materials and resources
- demonstrate technical innovation
- save money

3P has resulted in the elimination of more than 3 billion pounds of pollution and saved $1.4 billion. 3P is different because it reduces consumption of resources by preventing pollution up front—through product reformulation, process modification, equipment redesign, and recycling and reuse of waste materials.



Waste Management Systems and Inventorisation

WM Credit 3 **Points: 10**

Goal

Encourage continuous monitoring and accounting of different types of wastes generated to understand, quantify and manage various waste streams efficiently.

Compliance Options

Waste Collection, Segregation, Internal Transport & Handling, Storage and Disposal Mechanism –

The following compliance need to be ensured:

- Collection, segregation, storage and disposal mechanism should be available for different types of wastes (bio degradable, non bio-degradable, hazardous and non hazardous) & E-Waste.
- System to handle the internal transport of waste from the place of generation to the place of storage.
- Different types of wastes should be stored separately in a secured place until further processing / handling/ treatment/ disposal has taken place.
- All employees of the unit / facility should have the basic understanding of waste management system.

Waste Inventorization-

All types of hazardous and non-hazardous wastes should be quantified at each stage of waste management-

- generated
- recycled / reused
- recovered
- treated
- landfill / disposed off

Along with quantity, the inventorization should also include the source of each waste generated.

S No	Waste Management Systems & Inventorization	Points
WM 3.1	Waste Collection, Segregation, Internal Transport & Handling, Storage and Disposal Mechanism	5
WM 3.2	Inventorisation of Hazardous waste (Inclusive of E- waste) & Non – Hazardous waste	5

Documentation Required

1. Provide plant layout indicating the location of waste collection bins, scrap yard, etc.
2. Photographs of present waste management system.
3. A brief write up on the different training programs conducted for employees to educate them on waste collection, segregation and disposal mechanisms. Relevant supporting documents should be attached.
4. Documents showing the waste inventory for last 3 years
5. Details of the objectives set and waste reduction programs developed

Approach

Waste inventorization has many benefits- (a) assistance with planning and decision-making, (b) setting waste reduction or recycling goals, (c) identifying waste generation and recycling trends, (d) determining the viability and capacity of existing waste recycling and disposal facilities, (e) last but not the least, waste inventorization also helps identify the quality and characteristics of waste being generated so it can accordingly be reused elsewhere as a resource or raw material in the process.

Waste inventorisation consists of the following two steps:

1. Identification and classification

Identify all the waste generated within the facility and source of each waste. The waste generated then needs to be classified into hazardous or non hazardous waste. The classification should be further divided into solid, liquid and gaseous wastes. Examples of non hazardous waste materials-

- Metal Scraps (not mixed with used / waste oil)
- Plastic Wastes
- Paper/ Paper boards/ All kinds of waste paper
- Glass
- Thermocol
- Wood waste
- Packing materials
- All kinds of organic / bio-degradable wastes

Hazardous wastes that are mentioned in any of the following two rules should be classified:

- Any type of hazardous wastes, listed in schedule 1, 2 and 4 of Hazardous Waste (Management, Handling and Transboundary Movement) Rule, 2008 should be segregated from non hazardous / bio-decomposable wastes
- Any types of e-waste, listed in E-Waste Management and Handling Rule, 2010 (draft) should be segregated

2. Quantification and storage

Once all the wastes generated within the facility are identified and classified, quantify each waste type generated per unit time and obtain specific waste generation rate (quantity of waste generated / unit quantity of product produced).

After quantification, all the wastes generated within the facility should be stored in properly designed and designated storage areas, keeping hazardous and non hazardous wastes in separate locations. Even in the hazardous waste storage facility, the non compatible wastes need to be stored separately. The storage of hazardous waste should be as per Hazardous Waste Management Rules 2011 put forth by MoEF. Colour coding and labeling should be conducted for all the storage containers used for hazardous and non-hazardous waste. The label should consist of date of dispatch, contents of the container, source, etc.

The following needs to be measured to determine the success of any waste management program:

- waste generation rate at various points as well as overall waste generation rate in the unit
- waste recycling and diversion rate
- waste recovery rate
- waste treatment rate
- per unit waste generation rate (specific waste)
- amount of waste received at transfer stations

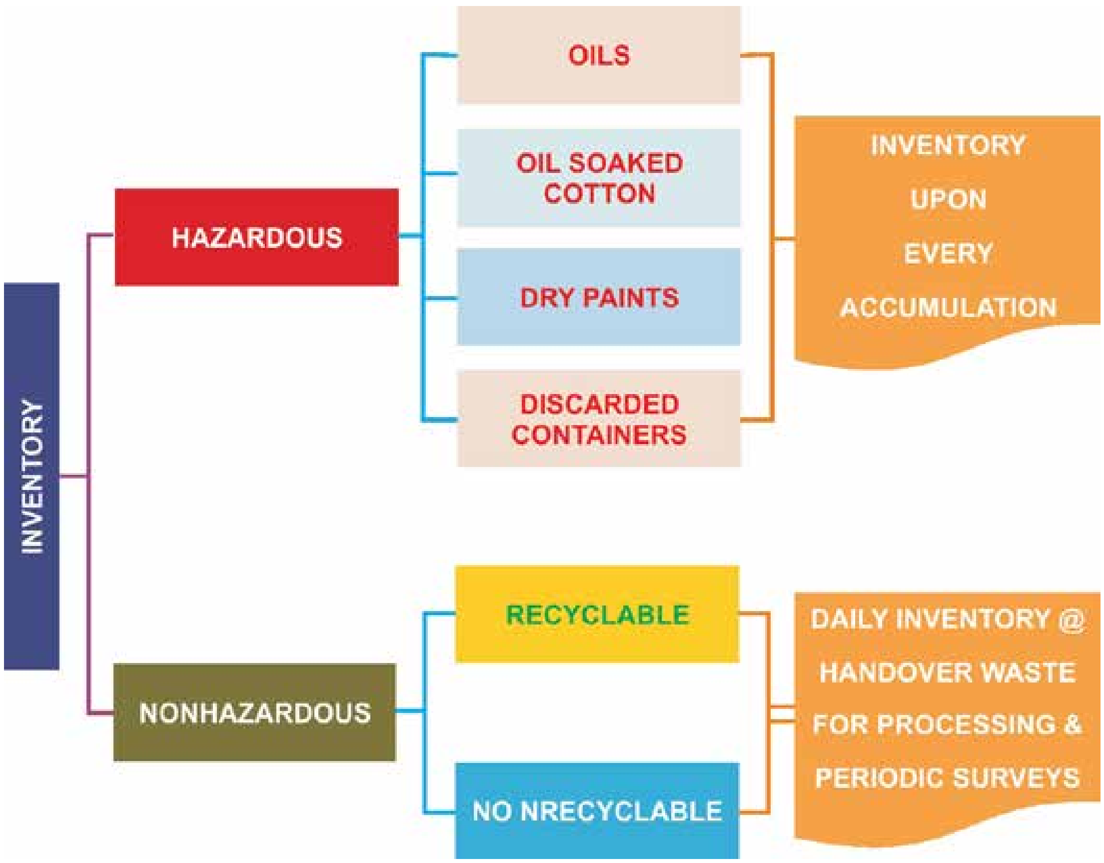
The table below gives examples of various kinds of wastes generated from different activities.

WASTE CATEGORIES BY ACTIVITY AREA

Office	Cafeteria Coffee Station	Shipping & Receiving	Equipment Maintenance	Plant Floor (Manufacturing)*
Fine Paper	Disposable Utensils	String	Solvents	Ferrous Metal
Envelopes	Stir Sticks	Plastic Wrapping	Plastic Containers	Non-Ferrous Metal
File Folders	Disposable Cups	Stretch Film Wrap	Paints	Aluminum/Steel Cans
Carbon Paper	Creamers	Shrink Wrap	Aerosols Cans	Glass Containers
Newspaper	Milk Cartons	Rigid Plastic	Antifreezes Containers	Rags/Textiles
Glossies	Individuals Pouches	Wood	Batteries	Newspaper
Magazines	Coffee Grounds	Polystyrene	Tires	Solvents
Boxboard	Food Waste	Cardboard	Rags/Textiles	Rigid Plastic
Cardboard	Kraft Bags	Boxboard	Wood	Polystyrene
Paper Towel/Tissues	Boxboard	Kraft Paper	Ferrous Metal	Waxed Paper
Blue Prints	Plastic Wrap	Carbon Paper	Non-Ferrous Metal	Cardboard
Plastic Wrap	PET Containers	Fine Paper	Lubricants	Boxboard
Pens/Markers	Aluminum/Steel Cans	Envelopes	Motor Oil	Wood
Binders	Newspaper	Newspaper	Rigid Plastic	Paper Towels
Cerlox Binding	Fine Paper	Ferrous Metal	Aluminum/Steel Cans	Aerosol Cans
Toner Cartridges	Cardboard	Non-Ferrous Metal	Glass Containers	Lubricants
Plastic Containers	Paper Towels/Tissues	Aluminum/Steel Cans	Newspaper	Kraft Paper
Aluminum/Steel Cans	Glass Containers	Plastic Containers	Paper Towels/Tissues	Shrink Wrap
Glass Containers		Glass Containers	Fine Paper	
Food Waste		Food Waste		

Case Study 1- Waste Inventorization

A leading international airport follows a thorough waste inventorization procedure as shown in the diagram below:



Quantity of different non hazardous wastes generated is maintained in an excel sheet as shown in the diagram below. The diagram below also shows the total quantity of waste sent to the landfill and quantity recycled. Hazardous waste is inventorized in a similar fashion. Thorough inventorization and implementation of the 3R principle has enabled the airport to achieve status of zero discharge for solid and liquid waste.

S.NO.	MATERIALS	Apr-09	May09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10
UNIT		MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT
1	PET BOTTLE	3.80	3.96	3.21	3.96	4.24	3.63	3.89	3.98	4.88	4.65	3.42	4.49
2	WATERIN PETBOTTLES	25.00	27.08	24.66	26.82	29.63	26.52	31.52	20.61	29.61	37.41	25.32	28.70
3	PLASTIC	1.32	1.25	1.49	1.45	1.41	1.33	1.55	1.74	1.67	1.35	0.94	1.41
4	POLY -I	0.98	1.33	1.12	1.12	1.06	1.42	1.07	1.59	1.91	1.26	1.28	1.50
5	POLY-II	1.51	1.31	1.27	1.13	1.77	1.26	1.70	2.38	3.04	1.95	1.11	2.64
6	NEWS PAPER	6.87	7.59	6.27	7.43	7.07	6.64	7.02	8.72	8.75	8.33	6.76	8.45
7	CORRUGATED BOX	0.98	1.12	0.75	0.55	0.71	0.91	0.94	0.95	0.97	0.78	1.03	0.79
8	CONTAMINATED PAPER	33.04	25.67	34.01	18.64	29.96	48.89	38.37	45.34	55.30	67.22	60.08	64.68
9	TETRA PACKS	0.46	0.86	0.57	1.25	0.71	0.73	1.07	0.79	0.85	0.58	0.86	0.91
10	GLASS BOTTLE	1.70	1.98	1.05	1.72	0.92	1.05	1.30	1.35	1.84	1.55	1.37	1.94
11	TISSUE PAPER	1.40	1.85	0.82	0.83	2.12	1.36	0.93	3.17	3.57	1.74	0.94	2.11
12	MIXED WASTE	65.44	72.63	81.15	97.64	85.28	60.70	82.54	72.75	83.83	76.21	71.39	75.46
13	FOOD WASTE	17.08	18.21	15.73	15.32	14.85	17.10	15.03	13.95	17.14	18.80	18.01	20.95
14	ALUMINIUM & MS CANS	1.34	1.21	1.12	1.13	2.26	1.22	1.25	2.46	2.79	1.55	1.97	1.67
15	OTHERS (RUBBER, WOOD ETC)	24.87	27.05	27.16	26.35	28.99	26.86	29.92	29.32	30.41	27.13	25.24	26.76
TOATAL	Total Quantity	185.78	193.10	200.38	205.74	210.98	199.62	218.10	209.08	245.56	250.52	219.72	242.47
	Recycled Quantity	139.97	142.26	143.58	137.19	151.28	157.13	160.32	158.16	187.88	197.17	169.75	189.64
	Quantity for landfilling	45.81	50.84	56.80	68.55	59.70	42.49	57.78	50.92	58.68	53.35	49.97	52.83
	% recycled Quantity	75.34	73.67	71.65	66.68	71.70	78.71	73.51	75.64	76.20	78.71	77.26	78.21
	% Quantity for Landfilling	24.66	26.33	28.35	33.32	28.30	21.29	26.49	24.36	23.80	21.29	22.74	21.79

Solid Waste Management

WM Credit 4 **Points: 25**

Goal

Reduce the amount of solid waste that are hauled to and disposed off in landfill to minimise the negative impacts on the environment.

Compliance Options

For managing solid wastes, the credit points are divided into hazardous waste management and non- hazardous waste management.

WM 4.1 Hazardous Waste Management (15 points)

The unit will be assessed based on either of the following options:

Option 1: Reduction in specific waste generation and disposal

Reduction of specific waste disposal through improvement in waste management over a period of 3 years.

Percentage reduction in specific hazardous waste generation and disposal	Points
Reduction in specific waste generation	
≥ 5 % Reduction in specific waste generation	5
≥ 10% Reduction in specific waste generation	10
Reduction in specific waste disposal	
≥ 10 % Reduction in specific waste disposal	5

(OR)

Option 2: Use of waste as alternate fuel/raw material

Waste generated is used as alternate fuel / raw material either internally or by sending the waste to other industries.

Percentage usage of waste generated as alternate fuel / raw material	Points
Usage of alternate fuel / raw material (at least 1 project implemented)	5
Usage of more than 10% of waste disposed as alternate fuel / raw material	10
Usage of more than 20% of waste disposed as alternate fuel / raw material	15

WM 4.2 Non-Hazardous Waste Management (10 points)

Reduction of specific waste generation and disposal through improvement in waste management over a period of 3 years.

Percentage reduction in specific non-hazardous waste generation and disposal	Points
Reduction in specific waste generation	
≥ 10 % Reduction in specific waste generation	5
Reduction in specific waste disposal	
≥ 10 % reduction in specific waste disposal	5

Note:

Units not generating any kind of hazardous waste, solid waste management credit 4 (25 points) will be allocated to non-hazardous waste management as shown below:

Percentage reduction in specific non-hazardous waste generation and disposal	Points
Reduction in specific waste generation	
≥ 10 % Reduction in specific waste generation	5
≥ 20 % Reduction in specific waste generation	10
≥ 25 % Reduction in specific waste generation	15
Reduction in specific waste disposal	
≥ 10 % reduction in specific waste disposal	5
≥ 20 % reduction in specific waste disposal	10

Documentation Required

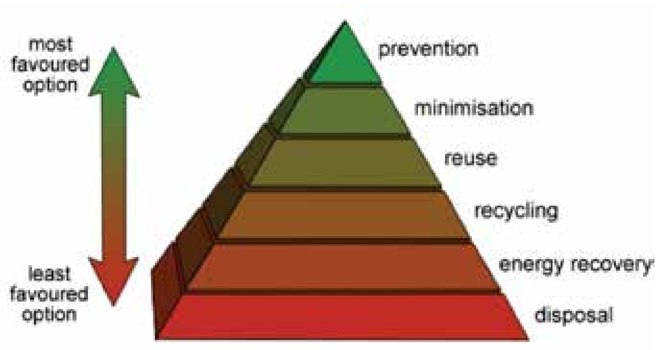
1. A brief write up explaining the percentage reduction in solid waste achieved in the last 3 years.
2. Inventory showing the reduction in waste (hazardous and non hazardous).
3. Detailed description of the projects implemented to achieve the reduction in solid waste (hazardous and non hazardous).

Approach

Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. There are many reasons to adopt various methods to reduce waste generation:

- Substantially higher costs of disposal of wastes
- Substantial liability for remedial actions
- Risk of third party liability, even where a generator may not be responsible for disposal of waste (especially hazardous waste)
- Potential for adverse public relations
- Public opposition to local setting up of waste management facilities
- Increasing cost of raw materials

The hierarchy mentioned below gives an overview of various waste management techniques:



In the waste hierarchy, the most effective approaches to managing waste are at the top. Waste management focuses on processing waste after it is created, concentrating on re-use, recycling, and waste-to-energy conversion while waste minimization is the policy and process of reducing the amount of waste produced. Waste minimization involves efforts to minimize resource and energy used during manufacture. For the same output, fewer materials are used and less waste is produced. Waste minimization usually requires knowledge of the production process, cradle-to- grave analysis (tracking of materials from extraction to return to earth) and detailed knowledge of the composition of the waste.

Industrial waste is the result of many choices made by the unit in the course of doing business. Some of the decisions that can be made by an individual unit are illustrated schematically in the figure below.

The choice of final product (step E) prescribes the voice of raw materials and processing procedures or process chemistry (steps A and B). At this step, waste reduction through minimization, process modifications and abatement could be considered (step C). The choices in turn determine the quantity and kinds of residuals (steps D and F). In the industrial context the non economic residuals can be either hazardous waste or other waste. There are 3 possible disposal mechanisms for process by-products/waste (steps G and H):

- Recycle, reuse or otherwise processed to yield economically useful products (step I) (example: refuse derived fuel or RDF, compost, etc).
- There may be opportunities for conversion of hazardous byproducts into non hazardous byproducts (step J).
- The least favored approach is to send the waste to landfill or incinerator (place the waste in the environment (step K)). The last step is not encouraged and will not add credibility for award of points under this credit.
- Although above figure is a simplification of actual layout of a unit, it indicates that the generation of waste is the result of numerous interdependent technological, production and marketing considerations.

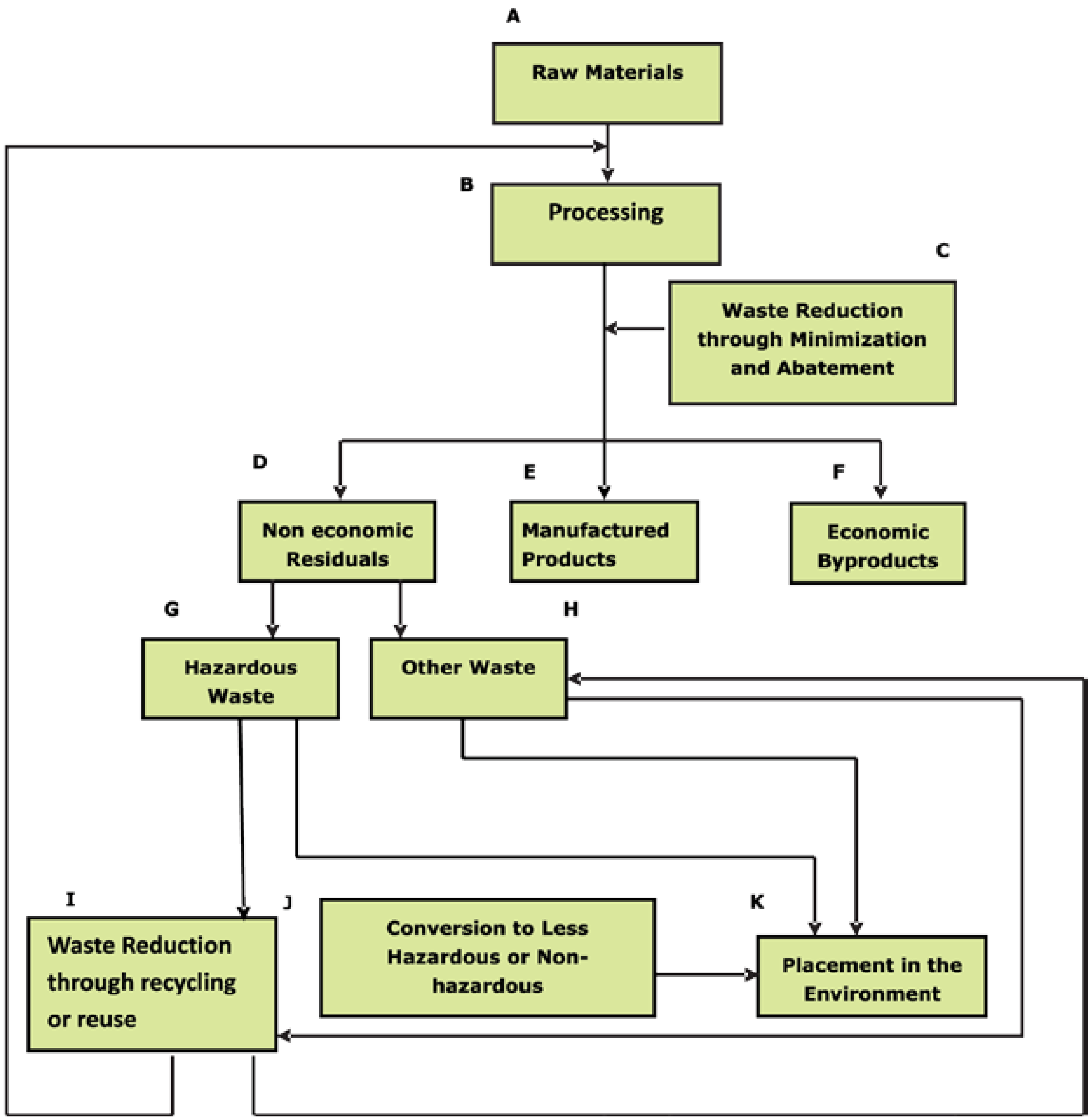


Figure: material flow diagram

A unit that reduces specific hazardous waste (waste per tonne of product) disposed to the environment (landfill/ incinerator) in the last 3 years by using any of the above said methodologies is eligible for maximum of 15 points under credit 4.1. Or if the unit uses its hazardous waste as a raw material or alternate fuel within the facility or sends the waste to external agencies or manufacturers for reuse, the unit is eligible for maximum of 15 points under credit 4.1. Units not generating any kind of hazardous waste, solid waste management credit 4 (25 points) will be allocated to non-hazardous waste management. Credit 4.2 awards maximum of 10 points for reducing specific non-hazardous waste generated in the last 3 years.

Resources

1. Publication by CII – Sohrabji Godrej Green Business Centre- In pursuit of 'GREEN' Excellence – India's Best Practices in Environment Management; Volume I&II

2. Reducing Hazardous Waste Generation – An Evaluation and Call for Action by National Academy Press Washington. D. C. 1985

Case Study 1- Utilization of Hazardous Waste as Raw Material

To reduce the impact on the environment, a leading automobile company re-utilizes the ETP sludge as a raw material in making pavement tiles.

The ETP sludge used to be disposed off through authorized recyclers. It was later tested at 3rd party chemical laboratory for its chemical and physical analysis for heavy metal, grease, oil, etc. The laboratory conducted tests to ensure that tiles could be made out of the ETP sludge. Microbial growth, disintegration, COD of the manufactured tiles was tested. The strength of the tile was found to be 10- 12 N/sq.mm. 1 kg of ETP sludge is now used to manufacture one new tile. This has lead to huge cost savings as well as reduced GHG emissions.

Results:

- Eliminated 201.6 tonnes of GHG emissions by re-using 120 MT of ETP sludge per annum.
- Net cost savings of Rs.3.6 million per year-
  - Rs.2.28 million saved by not disposing ETP sludge
  - Rs.1.32 million saved by not purchasing new tiles

Case Study 2- Zero Waste to Landfill

When it comes to waste management, a leading automobile manufacturer believes that prevention and recycling are preferable to disposal. Accordingly, the reconditioning and reuse of raw, process, and operating materials has been standard practice at the plants for many years.

In order to avoid the creation of waste from the very beginning, the company uses innovative technologies and eco-friendly production planning processes. The prevention of landfill waste is one of the top priorities in the United States. The first successful project was implemented in North America in early 2011. Since May 2011, the bus manufacturing facility in Canada has been officially certified as being a "zero waste to landfill" facility.

In addition, in less than a year, the van assembly plant in South Carolina also practically achieved its target of recycling 99.5 percent of its waste. In honour of this achievement, the plant received an Earth Day Award from the South Carolina Department of Health and Environmental Control. All of these successes are the result of everyone's tireless efforts to prevent waste, sort any unavoidable waste that does occur, and come up with new ways to recycle materials and energy.

Liquid Waste Management

WM Credit 5 **Points: 25**

Goal

Prevent / reduce the amount of liquid pollutants discharged to the storm drain system or to water bodies and minimize negative environmental impacts.

Compliance Options

WM 5.1 Process Effluent Management (15 points)

The unit should meet the conditions prescribed by SPCB or local authority with respect to process effluent and sewage discharge.

The unit will get points based on the % reduction in process effluent discharge in the last 3 years.

Percentage reduction in process effluent generation	Points
Reduction of Process Effluent Generation	
≥ 10% reduction	5
≥ 20% reduction / zero effluent discharge	10
Reclycing of Process Effluent	
≥ 20% recycling in process applications	5

WM 5.2 Sewage Management (10 points)

The unit will get points based on the % reduction in sewage discharge in the last 3 years.

Percentage reduction in sewage generation	Points
Reduction of sewage Effluent Generation	
≥ 20% reduction	5
Reclycing of Sewage Effluent for domestic application (other than gardening)	
≥ 20% recycling in process / domestic (other than gardening) application	5

Note:

1. If zero discharge of process effluent or sewage is a mandatory requirement then it should be complied.
2. If the unit has already implemented zero effluent discharge / zero sewage discharge systems, maximum points will be given.
3. For units that don't generate any kind of process effluent, the points under credit 5 on liquid waste management (25 points) will be allocated to credit 5.2 sewage management as shown below:

Percentage reduction in sewage generation	Points
Reduction of sewage Effluent Generation	
≥ 10% reduction	5
≥ 20% reduction	10
≥ 30% reduction	15
Reclycing of Sewage Effluent for domestic application (other than gardening)	
≥ 10% recycling for domestic application (other than gardening)	5
≥ 20% recycling for domestic application (other than gardening)	10

Documentation Required

1. A brief write up explaining the amount of liquid waste generated. The write up should explain in detail the initiatives taken to reduce the amount of liquid waste (process effluent and sewage) generated.

****Zero Liquid Discharge*** *– The effluents (process and sewage) generated from the plant needs to be treated appropriately and used within the facility thereby substituting usage of fresh water. Ultimately, no drop of water can leave the facility's premises.*

Approach

Continuous population growth, contamination of both surface and groundwater sources, uneven distribution of water resources and periodic droughts have forced government agencies and industries to search for new sources of water supply. Treating process effluent and domestic sewage and reusing it back in the process is one of the most promising ways of reducing not only pollution but also fresh water consumption.

Strategies for reducing domestic effluent include increased awareness, use of waterless urinals, efficient dishwashers in canteens, use of aerated taps, etc. The specific wastewater disposal can also be reduced by using treated water for landscaping, flushing or for meeting cooling water needs. Using advanced treatment systems like MBR and RO, treated effluent water can also be used as process feed water.

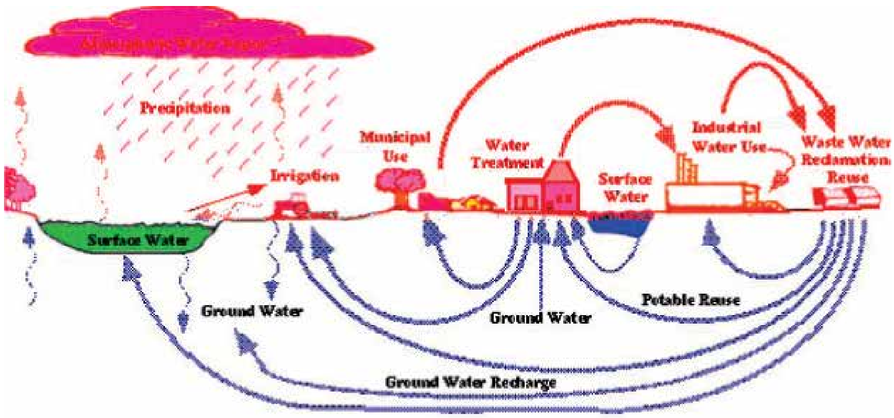


Figure: The role of treatment, reclamation and reuse facilities in the recycling of water through the hydrogeological cycle

The water used by the industries can be broadly divided into process feed water and domestic water. The water is used in the process as an integral part of product or indirectly for utilities and washing. The domestic water use consists of water used for drinking, cafeteria, sanitation, etc. On similar lines, effluents can be classified as process effluent and domestic sewage.

Planned water reclamation and reuse have gained considerable attention as an alternative in the context of integrated water resources management. In a closed loop recycle system the treated water from a single process stream is recycled and used back in the same process with some make up water. In other cases reclaimed municipal water is used for industrial applications such as cooling towers.

The strategies for minimising process effluent include reducing water usage through process modifications, improving the efficiencies of the system, reusing water as far as possible with use of more efficient ETPs, reducing wastage, etc.

The unit should have technologies to treat effluents before discharge into the environment. The treated effluent should meet the criterion for disposal as set by concerned Central and State Pollution Control Boards.

The unit should start with carrying out a comprehensive liquid waste audit to identify opportunities for improvement. Based on the audit observations, areas of major water consumption should be identified and the unit should take necessary steps as described above to reduce specific waste water (process effluent & sewage) discharge over and above the mandatory requirement set forth by local authorities. Maximum points will be awarded to units having zero discharge. However, if zero discharge of process effluent / sewage is a mandatory requirement (by local regulatory bodies), the same has to be complied.

WM credit 5.1 awards maximum of 15 points to units with zero discharge or to units that have achieved 50% reduction in effluent disposal. WM credit 5.2 awards maximum of 10 points to units with zero sewage discharge or those that achieve 80% reduction in sewage disposal.

Case Study 1- Zero Discharge Plant

A leading petroleum company has been a zero discharge plant since 2002. The company has taken the following initiatives:

1992	Sewage Reclamation Plant- I (475 m^3/hr)
2001	Zero Discharge Plant- I (150 m^3/hr)
2005	Zero Discharge Plant- II (200 m^3/hr)
2006	RO Rejects Recovery Plant (80 m^3/hr)
2006	Sewage Reclamation Plant – II (475 m^3/hr)
2009	Sea Water Desalination Plant (5.8 MGD)

The company has a water consumption of around 8 MGD out of which around 3.5 MGD is used from sewage reclamation and zero discharge plants, 4 MGD from desalination plants, 0.5 MGD from the municipality.

Three effluent treatment plants treat about 550 m3 of effluents per hour. Refinery treated effluent is recycled as:

- 65% is fed to ultra filtration and reverse osmosis unit and the output treated water is fed to DM plant
- Balance is used for fire fighting and landscaping

Case Study 2- Strategies for Zero Discharge

The following strategy was adopted by a leading chemical company that generated around 450 m^3 of wastewater per day to become a zero discharge plant:

- Segregate wastewater streams based on characteristics
- Treat as appropriate
- Recover and Re-use
  - Salts
  - Water
- Introduce monitoring at different areas

Wastewater generated is classified into two categories:

Category 1: wastewater generated from utility sources that have high & low TDS levels and low COD levels

- DM plant regeneration/ blow down:50-60 m^3/day
- Cooling tower blow down:125-150 m^3/day
- Pressure sand filter backwash:90 m^3/day
- AOS plant, SO scrubber water:15 m^3/day
- Glycerin dist. column cleaning water:1 m^3/day
- Cogen plant boiler blow down:20-25 m^3/day

Category 2: wastewater generated from various processes and domestic sources which has low TDS level and high COD level

- AO section wastewater:90 m^3/day x Hydrogenation section:15 m^3/day x Stearic acid section:5 m^3/day
- Fatty acid/Aldehyde frac:15 m^3/day
- Tank farm:15 m^3/day
- Sewage:35 m^3/day

The approach adopted was to segregate wastewater based on characteristics like TDS, COD and treat appropriately. This led to savings of 300 m^3 per day of wastewater sent to ETP that was instead diverted for reuse within the plant. It also reduced chemical sludge by 90%. The following initiatives were taken to achieve zero discharge:

- Segregate high TDS and low COD wastewater and treat using hot air (available in the plant) in the forced evaporation plant.
- The high TDS is due to the presence of sodium sulphite. This sodium sulphite has a commercial value and could be sold without any investments or treatment. Savings per annum: Rs. 4.5 lakhs.
- Wastewater having low TDS can be recycled after treatment- clarification, filtration, ultra filtration, RO.

Gaseous Waste Management (other than GHG emissions) **

WM Credit 6 **Points: 20**

Goal

Prevent release of VOCs, SPM, TPM, SOx, NOx and other gaseous pollutants to environment and maintain ambient air quality within the plant with respect to the upcoming statutory requirements.

Compliance Options

WM Credit 6	Gaseous Waste Management : Prevent release of VOCs, SPM, TPM, SOx, NOx and other gaseous pollutants to environment and maintain ambient air quality within the plant.	Points
WM Credit 6.1	Gaseous Waste Management (other than GHG emissions)	
	Reduction in Ambeint Air quality pollutants	
	>=15% reduction over and above the norms	5
WM Credit 6.2	Reduction in Gaseous Pollutants Emission with respect to latest norms released legal authorities	
	(Nox/NO2) Reduction	
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production	5
	SPM Reduction	
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production	5
	SO2/SoX Reduction	
	>=20% reduction over and above the norms / reduction in absolute emission per unit of production	5

Note: Incase the plant is not applicable for all the parameters or the parameters included above are not covered plant scope, points shall equally distributed for the applicable parameters like process emissions

Documentation Required

1. Document supporting the shop floor and ambient air emissions levels

2. Consent copy of "Air Pollution (Prevention and Control of Pollution) Act" issued from SPCB.

3. Documents detailing any other compliance options issued by the local authority, customer or corporate specific to air emissions control.

4. A brief write up explaining the details of activities done to achieve the reduction targets.

****Note:** The applicability of this credit point may vary sector wise. If it's not applicable to any sector (e.g.: service sectors like IT & ITES, hospitality, etc) the point allocated will be evenly distributed in solid and liquid waste management.

Approach

Understanding the chemical and physical proc- esses in the atmosphere and emission sources of various technologies is the key to the development of air pollution control strategies. A number of pollutants have been designated hazardous air pollutants or toxic air contaminants. Most of the air pollutants are directly emitted into the air but some pollutants have significant secondary sources, i.e., they are formed by chemical reactions in the air. There is no region in the global atmosphere that is unaffected by anthropogenic pollution.

Some of the major non greenhouse gases released into atmosphere are:

- Sulfur oxides (SO_x) - Coal and petroleum often contain sulphur compounds and their combustion generates sulfur dioxide. Further oxidation of SO_2 usually in the presence of a catalyst such as NO_2 forms H_2SO_4 which leads to acid rain.
- Nitrogen oxides (NO_x) -Nitrogen dioxide is one of the most prominent air pollutants and is emitted from high temperature combustion.
- Carbon monoxide - is a colourless, odorless, non-irritating but very poisonous gas that is released into the atmosphere by incomplete combustion of fuel such as natural gas, coal or wood.
- Volatile organic compounds - VOCs are often divided into two categories- methane (CH_4) and non-methane (NMVOCs). NMVOCs consist of aromatic compounds benzene, toluene and xylene that are suspected carcinogens and may lead to leukemia through prolonged exposure. 1,3-butadiene is another dangerous compound which is often associated with industrial emissions.
  - Particulate matter
  - Toxic metals such as lead, cadmium and copper
  - Chlorofluorocarbons (CFCs)
  - Ammonia (NH_3)
  - Odour

Different initiatives like changes in process, operating techniques, retrofitting equipment and system control could be taken to minimize the air pollution. These changes aim at preventing the formation of the pollutant. The cost of pollution control equipment depends on the volume of the gas to be treated rather than concentration of the pollutant.

The unit should meet emission standards set by State and Central Pollution Control Board as well as any other local regulatory bodies. Over and above the standards required by regulatory bodies, if the unit further reduces the emissions in terms of absolute emissions per Nm3 of air released then the facility shall be awarded points under this credit. The points awarded will be based on average reduction in emissions of different components like SO_x, NO_x, TPM, SPM, VOC, etc.

The unit can reduce emissions by using any of the following methods:

- Substitution of raw materials- If a raw material with a high pollution potential used in a process can be substituted by a raw material with a low pollution potential then the resultant pollutants emitted in the atmosphere may be eliminated or reduced. For example, low sulfur coal can generate less amount of sulfur dioxide than high sulfur coal; a gas fired boiler can totally eliminate the particulate emission when compared with coal fired boilers; low ash content coal can give relatively less particulate emissions than high ash content coal.
- Changingtheprocess- Changesintheprocess operations and retrofitting equipment can also result in eliminating the pollutant generated. Computer controlled operations can often eliminate fugitive emissions to the atmosphere. For example, substantial reduction of oxidation of SO_2 to SO_3 and formation of nitric oxides by varying the excess air while combustion, the electro smelting with closed electric arc furnaces reduces fugitive emission problems which are extensive with open furnace operations.
- **Operating the process equipment at optimum level and proper maintenance-** Operating the equipment at designed and optimumrates, periodic maintenanceandproper handling of equipment also results in reduced process emissions. An optimum system is one which can satisfy the manufacturing process as well as protect the environment. Operating control equipment at optimal conditions greatly improves efficiency. For example, fugitive emissions from open coal storage yards can be reduced by sprinkling water over coal piles. If water spray reduces the quality of the raw material suitable liquid spray can be proposed.

A unit that reduces its absolute emissions per unit of product or reduces emissions to a level that is below a certain percentage set by pollution control board agencies is eligible to get maximum of 20 points under this credit.

Case Study 1- Significant Reductions in Air Emissions

A leading paper company continued to invest in reducing air emission levels through

- adoption of cleaner technologies/fuels,
- monitoring of combustion efficiencies and
- investment in state-of-the-art pollution control equipments such as plasma filters, electrostatic precipitators, etc.

One of its units achieved a reduction of specific NO_x and SO_x emission of 16% and 12% respectively in the last three years. The unit also achieved an improvement of 14% from last year in particulate matter emissions. The unit monitors $H2_S$ and the average value measured in 2010-11 was 8.99 mg/Nm^3, compared to regulatory norms of 10 mg /Nm^3.

Nox (kg/tonne)			
2007-08	2008-09	2009-10	2010-11
0.43	0.69	0.6	0.58

Standards	
Sweden	1.2-2.4
EU	1.0-1.8
EU-BAT	1.0-1.5
Repor ted Values	
CEPI	0.84

SO2 (kg/tonne)			
2007-08	2008-09	2009-10	2010-11
0.5	0.84	0.79	0.74

Standards	
Sweden	0.5-1.4
EU	0.1-0.5
EU-BAT	0.2-0.4
Repor ted Values	
CEPI	0.29

MATERIAL CONSERVATION, RECYCLING AND RECYCLABILITY (MCR)

Background

Without the raw materials needed to drive production, development would grind to a halt. Sustainable development requires conservation of raw materials used for manufacturing by making processes more efficient and by using raw materials with maximum recycled content.

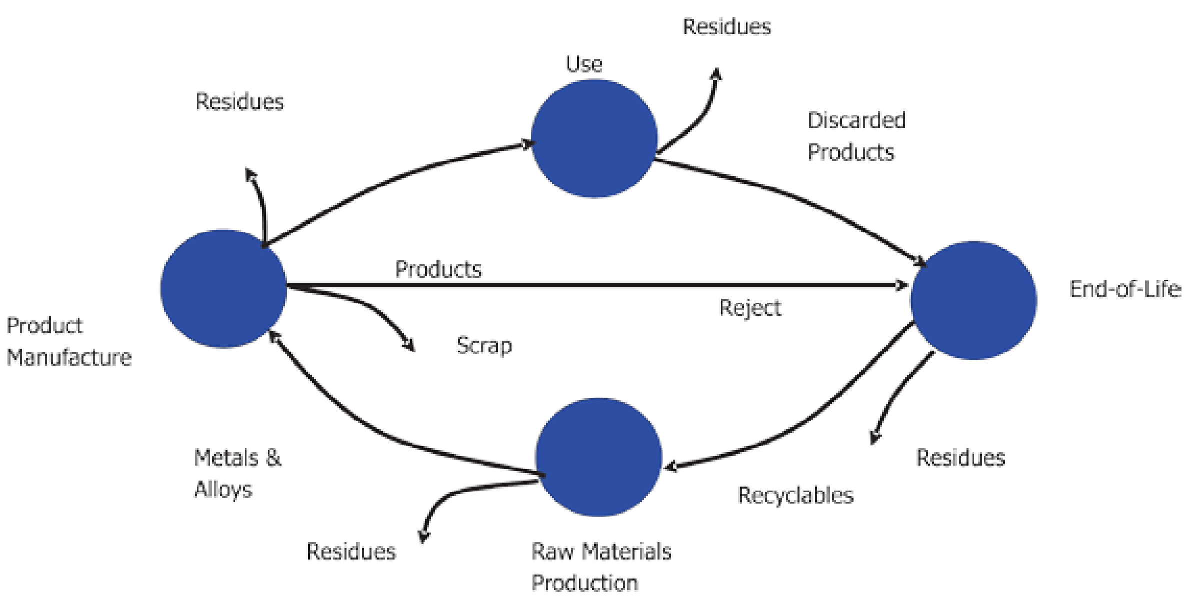
There are many benefits of having a material conservation and recycle policy-

- reduced environmental liability
- a boost to company's image for being environmentally aware
- raised staff morale and environmental awareness
- improved management of materials
- increased business opportunities – reduced costs and increased opportunities

According to a report by Bureau of International Recycling, recycling materials can provide 40% of the global need for virgin raw materials. The life cycle of a material consists of production, product manufacture, use and end-of-life as shown in the diagram below. The life cycle of a material is closed if end-of-life products are entering appropriate recycling chains, leading to scrap materials in the form of recyclables displacing primary materials. Material conservation, recycling and recyclability encourages use of raw materials over and over again, minimizing the need to mine and process virgin materials and thus reduce substantial amounts of energy and water while minimizing environmental degradation in the process.

Material conservation, recycling and recyclability focuses on- (a) reducing raw material consumption,

(b) reducing consumption of consumables like chemicals, additives, lubricating oils, etc, (c) reducing packaging materials and (d) increasing recycled or bio-degradable content in the product so it can be easily recycled at the end of its useful life. Points are awarded based on the sector as material consumption varies greatly depending on the type of industry.



Leadership & Strategy

MCR Credit 1   Points: 10

Goal

Demonstrate the commitment of top management towards conservation of raw materials and natural resources.

Compliance Options

The material conservation & recycling policy provides direction for resource conservation activities in the company. It can be a part of environment / sustainability policy signed by the Chief Executive of the company/unit head. It will form the basis upon which the unit can set its short and long term targets. The policy should be transparent and shared with all employees.

The unit should have short (3 years) and long term (beyond 3 years) targets for material conservation & recycling. Top management will ensure that appropriate resources (financial, infrastructural, technological, manpower, etc) are provided for effective implementation of material conservation activities.

The performance of the material conservation & recycling system should be reviewed on a monthly basis by the environment management cell/unit head.

Credit	Description	Points
MCR Credit 1.1	Material conservation & recycling policy	5
MCR Credit 1.2	Short & long term targets and allocation of resources	5

Documentation Required

1. Copy of the signed material conservation & recycling policy
2. Short & long term targets
3. Documents specifying resource allocation details for the current and following year

Approach

Material conservation, recycling and recyclability policy should be viewed as a tool to achieve continuous environmental improvement rather than daily "firefighting" just to keep up with regulatory requirements. The organization should start with framing a material conservation policy under the leadership of the top management. The material conservation policy can be a separate declaration or be a part of wider environmental and sustainability policy or EHS policy of the organization. The policy should be communicated to all the employees and stakeholders to ensure their participation. The policy should be publicly available on the website or should be part of annual sustainability report or be displayed in prominent locations within the facility. The policy should be signed by the CEO or plant head.

Oncethepolicyhas been framedandcommunicated among all stakeholders, the management should set achievable targets for reducing specific material consumption (raw material/unit product) and recycling rate in the plant over a period of time like short term (3 years) and long term (beyond 3 years).

The top management should allocate resources in the form of institutional, financial, technological investments for achieving the set goals and have steps in place to carry out regular reviews and check the implementation of the projects. The means of reducing specific material consumption can be process modifications, improved raw material quality and utilization, efficient process operation, reduce reuse recycle policy, etc.

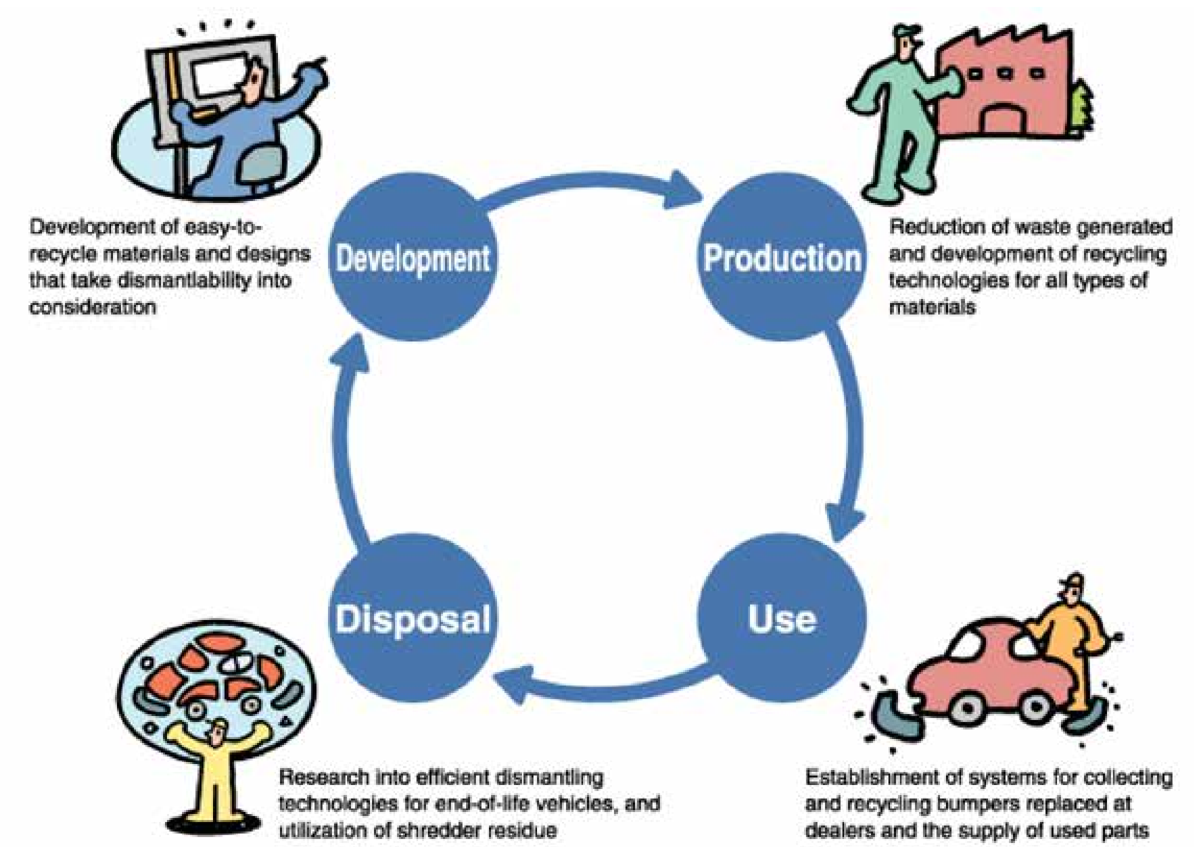
MCR credit 1.1 awards 5 points for framing a policy on material conservation and credit 1.2 awards 5 points for setting short term, long term targets and allocating resources.

Case Study 1- Material Conservation & Recycling Vision by Automobile Company

A leading automobile company initiated many innovative activities to ensure maximum material conservation and recycling. In order to contribute to creation of a recycling oriented society, the company set a goal of realizing 95% vehicle recycling/recovery rate. The following strategies were envisioned to achieve its target:

- Development of dismantling technology
- Development of recycling and recovery technology
- Use of recycled materials
- Use of renewable resources (plant materials)
- Expanding utilization of used parts (reuse)
- Reduction of substance of concern (SOC)
- Development of recyclable structures for vehicles

The diagram below illustrates how at every stage of the product lifecycle (development, production, use and disposal), achieving maximum material conservation and recycling are kept as a goal.



Employee Involvement & Capacity Building

MCR Credit 2 **Points: 10**

Goal

Create awareness and encourage all employees to get involved in material conservation & recycling.

Compliance Options

The unit should develop a plan for awareness creation, employee involvement, training and capacity building programs on material conservation and recycling. Awareness programs should be focused on involving all the employees. The records of trainings (training calendar, feedback, effectiveness, upgradation of skills matrix, etc) should be maintained. Training and capacity building programs should be focused on involving the relevant team members.

Credit	Description	Points
MCR Credit 2.1	Strategies adopted for awareness creation and employeeinvolvement	5
MCR Credit 2.2	Training programs and capacity building	5

Documentation Required

1. Details of the cross functional team involved in material conservation & recycling
2. Details of strategies and action plan for awareness creation and employee involvement
3. Details of training and capacity building
    - Training calendar, training record, feedback, effectiveness of trainings, skill matrix, etc
    - Topics of the training
    - No. of people trained/ year

Approach

Awareness creation and employee involvement activities can be started off by the top management by initially identifying a cross-functional material conservation and recycling team composed of employees from areas such as production, engineering, finance, marketing, and environmental safety and health. This team will be responsible to manage the unit's material conservation and recycling program. General awareness programs on the importance of conserving natural resources and materials and recycling should be organized by the team and extended to all employees. Such awareness programs help build a strong culture of material conservation and recycling in the organization and help reshape employees' thinking and its impact on society.

A company should establish written policies, procedures and measurable performance standards for material conservation and recycling program outcomes. The material conservation and recycling team should be lead by someone who (a) can envision and communicate a goal of "100% recycling," (b) has a good relationship with all the employees and (c) is knowledgeable about environmental issues, hazardous waste laws, and current material conservation and recycling approaches and technologies.

MCR credit 2.1 awards 5 points for awareness and employee involvement programs. Apart from general awareness programs, skills of the team should be regularly upgraded to achieve and implement material conservation and recycling activities on a day to day basis thus making it a part of work culture in the long run. Apart from general awareness programs, MCR credit 2.2 awards 5 points for training and capacity building programs. These programs should aim at improving the skills of the team such that it enables them to implement various material conservation and recycling projects.

Systems

MCR Credit 3 **Points: 10**

Goal

Encourage development of a comprehensive material conservation and management system.

Compliance Options

Implement a system and ensure implementation and continuous monitoring of material conservation and recycling activities. The system can be part of any existing quality/ environmental management system.

Credit	Description	Points
MCR Credit 3.1	Framework for material conservation and management	5
MCR Credit 3.2	Systematic monitoring plans	5

Documentation Required

1. A brief write up explaining the management system/framework in place for material conservation and recycling activities.
2. Overall material balance of the unit (include only the major resources consumed, don’t include water or energy).
3. Documents supporting the tools and technologies adopted for material conservation and recycling.
4. A brief write up that explains the monitoring mechanism and few sample monitoring reports.

Approach

Practicing proper control over materials used in the manufacturing process is an important way to reduce material consumption and waste generation. Optimization of material flow can have the following benefits:

- improved product quality
- reduced purchasing costs
- reduced freight/transportation cost
- reduced manufacturing waste
- increased production
- improved customer satisfaction
- reduced downtime
- reduced product cost
- increased cash flow

By reducing both the quantity of hazardous materials used in the process and the amount of excess raw materials in stock, the quantity of materials consumed as well as waste generated can be reduced. This can be done in different ways like establishing material-purchase review mechanisms, control procedures and inventory tracking systems.

Inventory is defined as the blocked working capital of an organization in the form of materials. As this is the blocked working capital of an organization, ideally it should be zero. However, inventory is maintained to take care of fluctuations in demand and lead time. In some cases it is maintained to take care of increasing price tendency of commodities or rebate in bulk buying. Inventory management must tie together the following objectives to ensure that there is continuity between functions:

- Company's strategic goals
- Sales forecasting
- Sales and operations planning
- Production and materials requirement planning

Developing review procedures for all materials purchased is the first step in establishing an inventory management program. Procedures should require that all materials be approved prior to purchase. In the approval process all production materials are evaluated to examine if they contain hazardous substances and whether alternative non-hazardous materials are available.

Another inventory management procedure for material conservation is to ensure that only the necessary quantity of a material is ordered. This will require the establishment of a strict inventory tracking system. Purchase procedures must be implemented which ensure that materials are ordered only on an as-needed basis and that only the amount needed for a specific period of time is ordered.

Just in Time (JIT) manufacturing is a philosophy of manufacturing based on planned elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product, from design engineering to delivery and includes all stages of conversion from raw material onwards. The primary elements include having only the required inventory when needed; to improve quality to zero defects; to reduce lead time by reducing setup times, queue lengths and lot sizes; to incrementally revise the operations themselves; and to accomplish these things at minimum cost. (Definition as per American Production and Inventory Control Society).

JIT is a collection of techniques used to improve operations. It can also be a new production system that is used to produce goods or services. When the JIT principles are implemented successfully, significant competitive advantages are realized. JIT principles can be applied to all parts of an organization: order taking, purchasing, operations, distribution, sales, accounting, design, etc.

JIT usually identifies seven prominent types of waste to be eliminated:

- Waste from overproduction
- Transportation waste
- Processing waste
- Waste from product pefects
- Waste of waiting/idle time
- Inventory waste
- Waste of motion

MCR credit 3 awards 5 points for establishing a framework for material conservation and recycling and 5 points for implementing a monitoring mechanism.

Raw Material Conservation

MCR Credit 4 **Points: 30**

Goal

Reduce demand for virgin material and conserve natural resources thereby reducing impacts associated with extraction and processing of virgin resources.

Requirement

Option 1: Replacement of raw materials by recycled materials or waste or equivalent

The unit should reduce consumption of raw materials by recycled or waste materials or equivalent. Points will be given based upon the % reduction or substitution of raw materials by waste.

Percentage usage of recycled or waste material or equivalent	Points
≥5% usage of recycled / waste material or equivalent	5
≥10 % usage of recycled / waste material or equivalent	10
≥15% usage of recycled / waste material or equivalent	15
≥20% usage of recycled / waste material or equivalent	20
≥25% usage of recycled / waste material or equivalent	25
≥30 % usage of recycled / waste material or equivalent	30

(OR)

Option-2: Internal performance improvement for reducing material consumption during manufacturing (during last 3 years)

The unit should reduce the consumption of raw material from manufacturing process by improving their internal performance

Percentage reduction in specific raw material consumption	Points
≥ 3% reduction in material consumption	5
≥ 5% reduction in material consumption	10
≥ 8 % reduction in material consumption	15
≥ 10 % reduction in material consumption	20
≥12 % reduction in material consumption	25
≥ 15 % reduction in material consumption	30

Documentation Required

1. A brief write up about the projects undertaken for replacing raw materials by recycled or waste material or equivalent and attach supporting documents. Clearly indicate the percentage usage of recycled or waste material.

2. A brief write up about the projects undertaken for reducing specific material consumption during manufacturing process and attach supporting documents. Clearly indicate the percentage reduction achieved in material consumption.

Approach

Conservation is the proper management of a natural resource to prevent its exploitation, destruction or degradation. The major objective of this credit is to promote and encourage material conservation.

Companies should look for opportunities to replace the use of virgin materials with recycled or reused material or waste material in the process. The material can be sourced from within facility or from external sources. A unit is awarded maximum of 30 points for replacing 30% or more of the raw material with recycled or waste material in the last 3 years.

The unit should also strive towards reducing the specific material consumption. This not only helps in reduction of environmental impacts associated with processing of raw material but also helps facilities to achieve substantial cost savings. Overall material consumption can be reduced by using either of the following options:

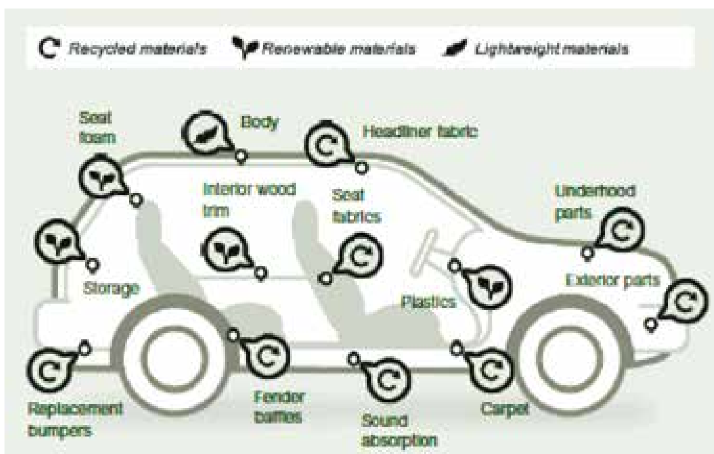
- Redesigning the product
- Use of high quality raw material
- Improving the production efficiency
- Changing the manufacturing process with improved technologies
- Production planning
- Good house keeping and preventive maintenance

A unit is awarded maximum of 30 points for reducing specific material consumption by 15% or more in the last 3 years.

Case Study 1- Substitution of Raw Material with Recycled Material

International automobile company focuses on the sustainability of its vehicles by using materials that are more sustainable from a total lifecycle perspective. This includes increasing the use of recycled, renewable, recyclable and lightweight materials. Recycled content is used in a wide range of parts including:

- Carpet backing and sound absorption
- Carpets
- Seat fabric
- Front bumper
- Trim panels
- Battery housing, cover and base plate
- Wheel arch liners
- Heating/ventilation components
- Fan shrouds
- Seat supports



- One of the company's new vehicles uses many recycled materials, including materials recycled from their own manufacturing processes. For example, the noise-dampening fender baffles, which fit between the vehicle's outer shell and its inner structure, are made from steel left over after stamping the door openings out of the body sides. As a result, virgin steel is reduced by an estimated 119 tons for one year of production.
- The vehicle uses between 25 and 40 percent recycled fiber in its interior fabrics, including seat upholstery, bolster and carpeting. The use of recycled fiber instead of virgin fiber for the seating material is estimated to reduce energy consumption by 20 percent, waste by 17 percent and CO_2 emissions by 14 percent.

Management of Packaging Material-Sustainable Packaging

MCR Credit 5 **Points: 25**

Goal

Minimise consumption of packaging material by efficient use of resources and reduce environmental impact without compromising on product quality and safety.

Compliance Options

MCR 5.1 Reduction in packaging material (15 Points)

Minimize packaging material by using the optimal combination of primary, secondary and/or tertiary packaging. Points are awarded based on reduction achieved in the last three years.

Description	Points
≥ 5% reduction in packaging material	5
≥ 10% reduction in packaging material	10
≥ 15% reduction in packaging material	15

MCR 5.2 Recycled content in packaging material (10 points)

Packaging should maximise the use of recycled material wherever possible and reduce the environmental footprint without violating health and safety standards. Points are awarded based on the recycled content of packaging materials used in the last three years.

Description	Points
≥ 5% recycled content in packaging material	5
≥ 10% recycled content in packaging material	10

Documentation Required

Details of activities carried out and projects undertaken for minimising packaging materials and maximising the usage of recycled content in packaging material.

Approach

Packaging not only protects the goods from possible damages but it also increases the efficiency of distribution. However, due to absence of effective recycling and management systems, materials used for packaging end up as waste in a landfill. The manufacture and disposal of packaging affects the environment in many ways - from the extraction of virgin resources, emissions associated with production, the space it takes up in landfills to the litter on roadsides.

A closed loop system for packaging materials would envision packaging that is sourced responsibly, designed to be effective and safe throughout its life cycle, meets market criteria for performance and cost, is made entirely using renewable energy, contains post consumer/recycled material, and once used, is recycled efficiently to provide a valuable resource for subsequent generations. According to Sustainable Packaging Coalition, sustainable packaging can be defined as:

- Is beneficial, safe & healthy for individuals and communities throughout its life cycle
- Meets market criteria for performance and cost
- Is sourced, manufactured, transported, and recycled using renewable energy
- Optimizes the use of renewable or recycled source materials
- Is manufactured using clean production technologies and best practices
- Is made from materials healthy throughout the life cycle
- Is physically designed to optimize materials and energy
- Is effectively recovered and utilized in biological and/or industrial closed loop cycles

MCR credit 5 focuses on reducing the amount of packaging material used and increasing the recycled content in the packaging material. Sustainable packaging initiatives offer multiple strategies to meet and even exceed market criteria for performance and cost, including: improved package design, resource optimization, informed material selection, design for recovery, and source reduction. Creating economically viable, closed loop systems for the recovery of packaging materials is an essential characteristic for sustainable materials management.

The main objective of MCR credit 5.1 is to reduce the consumption of packaging material and associated environmental damages without compromising on the product quality. If a unit reduces the amount of packaging used by at least 5% then it is eligible to get 5 points. Maximum of 15 points are awarded to units that reduce packaging by 15%.

The amount of packaging material used can be reduced by any of the following strategies:

- Change the dimensions of the primary/secondary packaging as per the product
- Change the product dimensions as per secondary packaging which would result in better handling and optimum use during stacking and loading of a container
- Thickness of the material used in packaging can be reduced with trials as long as the product is safe during transit
- Prefabricated boxes/cartons can be used instead of manufacturing cartons in-house
- Universal boxes and packaging material can be used for the product for multi location companies
- Alternate materials can be used
- Excessive packaging can be avoided
- Using automatic packing machines

The objective of MCR credit 5.2 is to increase the recycled content in packaging material. If a unit has increased the recycled content of packaging material by at least 5%, they are eligible for 5 points. Maximum of 10 points are awarded for increasing the recycled content by 10% or more.

Resources

1. Sustainable Packaging Coalition http://www.sustainablepackaging.org/

Case Study 1- Rethinking Packaging from Source to Shelf

A leading FMCG company is committed to reducing its packaging. It partnered with a molded fiber supplier, to develop a breakthrough package for their razor. The package was launched in Europe with 57% reduction in plastic and 20% reduction in gross weight compared to the original packaging material used. To minimize plastic, the design uses fiber material made from bamboo, sugarcane, and bulrush. The innovation stretches the boundaries of what moldable pulp can do, delivering a breakthrough package out of fiber material. Its structure stays strong under compression, sealing and opening forces, and distribution and transportation stresses, while also maintaining a strong visual presence on the shelf. The new packaging material is also 100% PVC free. One of the long term environmental goals of the company is to reduce packaging by 20% per consumer use by 2020. Using 100% renewable or recycled materials for all products and packaging is also part of their long term vision.

Recyclability and Biodegradability of the Product

MCR Credit 6 **Points: 15**

Goal

Increase the recycled or biodegradable content of the product so that the final product is recyclable or biodegradable.

Compliance Options

Points are awarded based on the percentage of recyclable or biodegradable content in the product.

Percentage recyclable / biodegradable content	Points
> 75% content of the product is recyclable / biodegradable	5
> 80% content of the product is recyclable / biodegradable	10
> 85% content of the product is recyclable / biodegradable	15

Documentation Required

1. A brief write up about the percentage of recycled or biodegradable content in the product.
2. List of projects implemented in the last three years to increase the percentage of recyclable or bio degradable content in the product.

Approach

The production and use of recyclable or biodegradable materials is coming out as a promising way to reduce the environmental impacts of the products. The product manufactured can be either recyclable or biodegradable to varying extents.

Recyclability is the characteristic of materials that still have useful physical or chemical properties after serving their original purpose and that can therefore be reused or remanufactured into additional products. Biodegradability is the end of life option that allows micro organisms present in the environment to biologically breakdown the material in a safe and effective manner without leaving any harmful residues. Both these kind of products or material reduce the end of life impacts on the environment while recyclable materials also reduce the virgin material consumption.

The main objective of MCR credit 6 is to increase the recyclable or biodegradable content in the product so as to reduce the negative environmental impacts at the end of life. The unit should demonstrate the recyclability and biodegradability of the product. MCR credit 6 awards a unit maximum of 15 points for increasing the recyclability and biodegradability of the product by 15% or more over the past 3 years. If the product manufactured is already 100% recyclable or biodegradable, the unit shall be awarded maximum points under this credit.

Initially the company can identify all the products or components where recyclable and biodegradable materials can be substituted instead of conventional materials. The unit should then create an executable action plan and steps to replace conventional materials with recyclable and biodegradable materials. The unit can then allocate resources for achieving the same over a period of time.

GREEN SUPPLY CHAIN (GSC)

Background

Due to an increased growth in global competitiveness, companies are striving hard and taking new steps to be ahead of the competition. Companies want to be recognized as a part of the new breed of world recognized companies called “environmentally responsible companies”. Universal awareness on global warming and on how customers feel about using their products is encouraging companies to incorporate life cycle thinking into their sustainability initiatives. Increase in environmental regulations and customers preferring to do business only with companies having a distinct environment friendly image is changing the way companies look at their supply chain. Environmental efficiency or environmental impact reduction is now being introduced as a decision variable in the supply chain.

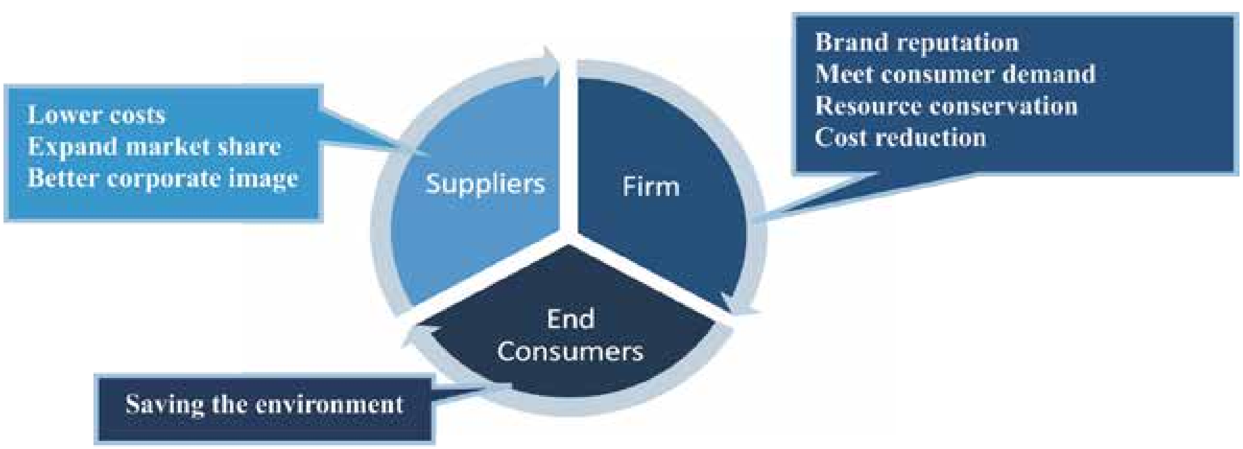
For example, typical electronics supply chain has five tiers - raw materials suppliers, component manufacturers, assembly operations, distribution companies and retailers serving end customers. Reducing the overall environmental impact requires looking at each of these tiers, identifying the entities within them, assessing the resources like water, energy they are consuming, emissions and waste they are generating, and determining what actions are required to help reduce the impact on the environment.

Initiatives on greening the supply chain has many benefits like conserving resources, reducing toxicity, improving environmental performance, mitigatingbusiness risks, reducingcosts, motivating better performing suppliers, preserving business continuity, enhancing market access and degrees of business strategy freedom.

Benefits of Green Supply Chain

From GreenCo perspective, greening the entire supply chain involves looking at each of the following-

- procurement,
- packaging,
- warehousing,
- distribution and transportation,
- supplier audits & recognition programs.



Leadership and Strategy

GSC Credit 1 **Points: 10**

Goal

Demonstrate the commitment of the top management towards improving environmental efficiency within the company's supply chain.

Compliance Options

Strategy and Targets: Company should have a clear strategy for reducing the environmental intensity in any one or more of the areas (energy, water, material, GHG, waste) across the major suppliers accounting for 80% of the purchase value of the company.

The strategy should also define the short term (upto 3 years) and long term target (more than 3 years)

for resource intensity reduction in at least one of the above mentioned areas.

Resource Allocation: Resources should be provisioned for activities and programs related to environmental intensity reduction within the supply chain in the annual budget. The credit points are based on the approved resource (financial, manpower, infrastructure, technology) allocation from the top management to carry out the activities. The point is awarded as given below:

Credit	Description	Points
GSC Credit 1.1	Strategy and Targets(Short and Long term)	5
GSC Credit 1.2	Approved allocation of resources (man power, financial, infrastructure, technology) for current year & ensuing year	5

Documentation Required

1. Declaration from the responsible authority of the company indicating the strategy and targets adopted for supply chain footprint reduction
2. Provide an approved budget allocation statement showing the finance allocation from the Chief Executive or the finance department of the company for the current year and ensuing year
3. Public disclosures through Company Website, Press Release, GRI Report, Annual Corporate Report

Education and Awareness Creation for Suppliers & vendors

GSC Credit 2 **Points: 10**

Goal

Create awareness and build capacity of the vendors and service providers on environmental sustainability covering energy, water, materials, waste and GHG to facilitate in greening the supply chain.

Compliance Options

Programs or initiatives taken by the company to educate and create awareness amongst all suppliers and vendors on the effective management of resources and improvement in environmental efficiency (energy, water, material, waste and GHG). Due to these initiatives, the company also communicates its policies, practices and expectations to the vendors or service provider on the environmental performance.

This can be through trainings and awareness programs conducted by the company through internal sources or external sources.

The allocation of points for the credit is based on the percentage of vendors and suppliers trained on environmental efficiency improvement and resource conservation in the last 3 years.

Education & Awareness creation for suppliers	Points
> 50 % of Suppliers	5
> 80 % of Suppliers	10

Documentation Required

1. Detailed documentation of the programs implemented by the company to educate and create awareness amongst all suppliers and vendors on areas related to environmental efficiency (Energy, Water, Materials, Waste and GHG, etc.)

2. Public disclosures through Company Website, Press Release, GRI Report, Annual Corporate Report

Approach

Greening the entire supply chain involves looking at each of the following phases as illustrated in the diagram below.

Green Supply Chain Management

1. Procurement

One of the most effective ways of addressing environmental problems is to focus on prevention of pollution at the source by greening of the purchasing function at the beginning of the supply chain. Green procurement/purchasing is defined as identifying, selecting, purchasing products or services with a significantly less adverse environmental impacts when compared with that of competing products. (Green procurement guidelines are explained in more detail in Credit 4.)

2. Packaging

Large packages take more energy to produce. Reengineering packages to reduce their size and weight will enable loading of additional products into shipping containers or trucks and deliver more in a single trip. Improved package designs can also help reduce the burden of recycling or eliminating packaging materials at the end of the chain. Reduction in packaging material and recycled content in packaging material has a significant impact on reducing the burden on the environment. This is applicable to packaging material used by suppliers to deliver raw materials to the company. Under the green supply chain parameter, the company is expected to influence its suppliers to reduce the packaging material used and increase the recycled content in the packaging material. Green supply chain doesn't address the packaging material used by the company to deliver its final product to the distributor or end user as it is already addressed in material conservation, recycling and recyclability credit 5.

3. Distribution and Transportation

By rationalizing sourcing, assembly and delivery channels in relation to markets, the company can reduce the distances that products must travel. Questions like what is the efficiency of vehicles used for transportation, where the products travel from and to, what kind of fuels are used to run transportation vehicles, etc should be answered. There are many ways to reconfigure the network to reduce the distances traveled to fulfill demand while maintaining the required service levels.

4. Warehousing

Warehouses play a major role in greening the supply chain and are no more just storage spaces. The following practices should be implemented to ensure warehousing has the least environmental impact- (a) constructing warehouses as green buildings that by design consume less energy, (b) handling wastes in the most environment friendly manner, (c) reducing the loss in materials during storage, (d) establishing performance measures for balance of material, (e) using efficient material/ product handling equipment that consumes less energy or fuel, (f) getting warehouses certified by Indian Green Building Council.

5. Supplier audits

In addition to the above four phases, for each supplier, the company would need to assess the environmental concerns in terms of air and water pollution, generation of solid and liquid waste, raw materials used, use of hazardous and toxic elements, land contamination and emission of toxic gases.

Certain suppliers may include big corporates that have already implemented environment management systems and are continuously monitoring their environmental performance. In such a scenario, greening the supply chain would

involve working with critical suppliers. Critical suppliers refer to those suppliers having maximum environmental impact in the supply chain. If the supplier is a big corporate implementing environmental sustainability initiatives on their own, the company should include the next level of suppliers whom they can influence.

Greening the supply chain involves working with suppliers and reducing the environmental impact caused at every stage of the life cycle starting from design and development to manufacturing, distribution, use and disposal. Since manufacturing is addressed in other parameters like energy, water, waste management, materials; this parameter includes only purchase, warehousing, transportation and distribution. Extended producer responsibility & end of product are also covered in the parameter product stewardship and are not addressed in green supply chain.

Once the environmental concerns are assessed, companies should set specific short and long term targets for reducing energy, water and material consumption, ghg emissions and waste generated by (a) its suppliers or by (b) taking initiatives in any of the four phases discussed- purchasing, warehousing, packaging, distribution and transportation. For example, in its "2008 Global Citizenship Report," a leading shipping company, which has one of the largest commercial hybrid fleets in North America, set a goal to improve its overall fuel efficiency by 20% by 2020. Clear strategy and action plan should be framed for achieving the targets. Green supply chain credit 0.1 awards 5 points for setting targets and framing an action plan.

Once the targets and strategy have been set, resources should be provisioned for activities and programs related to environmental intensity reduction within the supply chain. The credit points are based on the approved resource (manpower, financial, infrastructure, technology) allocation from the top management to carry out the activities. Green supply chain credit 1.2 awards a maximum of 5 points for resource allocation.

Many key factors are essential for success in greening the supply chain-

- Obtaining senior management commitment
- Providing direct, on-the-ground support to suppliers
- Acknowledging the wide range of supplier competencies
- Creating benefits for suppliers
- Recognizing external incentives for greener supplier performance
- Working within the national culture with local people

After setting targets and allocating resources, the next level to greening a company's supply chain is to educate and create awareness among all suppliers especially critical suppliers, through training programs, campaigns, media disclosures etc. These training programs should focus on improving environmental efficiency, conservation of various natural resources like energy, water, materials, reducing waste and greenhouse gas emissions. Green supply chain credit 2 awards 10 points for education and awareness creation among suppliers.

In order to increase awareness, companies could also learn from its suppliers and facilitate learning among suppliers. Initiatives like bringing together representatives from the supply base in non competing groups to share experiences and find environmental sustainability and other supply chain efficiency gains could help in learning among suppliers. For example, a clothing brand in the United States has created a forum for exchange through The Footprint Chronicles, its interactive website that includes video, supplier profiles and chat groups that track the impact of specific products. The company's director believes that more has been accomplished in its supply chain by suppliers viewing what other suppliers are doing than by almost anything else that the company has done.

Resources

1. United States Environment Protection Agency Environmentally Preferable Purchasing http://www.epa.gov/opptintr/epp/

2. Greening the Supply Chain by Purba Halady Rao

3. The Lean and Green Supply Chain: A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance

4. Pacific Northwest Pollution Prevention Resource Center http://www.pprc.org/pubs/grnchain/casestud. cfm#inv

Case Study 1- Green Supply Chain Management Policy

A leading automobile company framed a green supply chain management policy that focuses on working with suppliers to improve their environmental efficiency and in turn reducing environmental footprint of the company and its supply chain. Some of the key objectives of the policy are-

- Progressively achieve the goal of zero incidents, pollution, and occupational health illness at suppliers', transporters' and dealers' end.
- Develop competencies amongst suppliers, transporters, dealers in areas such as resource conservation, energy conservation, sustainable development, RoHS through training programs, sharing of good practices, education and communication.
- Ensure waste in the supply chain is minimized by studying the logistics and reducing the distance traveled by materials such as milk run systems.
- Promote suppliers to develop their sustainability report and make it public.
- Encourage suppliers to develop their next level of supply chain using GSCM tools.
- Create motivational work environment through suggestion schemes and award criteria.

Case Study 2- Education Programs for Suppliers

A shoe and sports apparel brand implemented extensive environment engineering program at some 40 footwear suppliers located in China, Vietnam and Indonesia. The program, which establishes performance baselines and sets improvement targets, focuses on increasing the efficiency of materials use, reducing the use of hazardous waste and petroleum-based solvents and maximizing scrap utilization. Benefiting from the efforts of seven full-time environmental engineers from the brand and close collaboration across technical functions, the suppliers' factories now generate one-third less non-hazardous materials waste and have reduced hazardous waste by almost 40% per pair of shoes manufactured since the program started. Their use of solvent-based chemicals has also fallen dramatically, by 96% from a 1995 baseline.

Case Study 3- Green Supply Chain Goals and Targets by a Retail Store

A leading retail store in the United States set the following goals to green their supply chain:

- All direct import, non branded and private label suppliers declare that their factories are compliant with local social and environmental regulations by the end of 2011.

- By the end of 2012, 95 percent of direct import factories are required to receive one of the two highest ratings in audits for environmental and social practices. (More than 94 percent of direct import factories have received one of the two highest audit ratings set by the company.)

- In October 2008, the company partnered with its suppliers to establish the goal of becoming 20 percent more energy efficient, per unit of production, in their top 200 factories in China by the end of 2012. The Energy Efficiency Program team has incorporated more than 300 factories into the program. Within these factories the company worked to identify opportunities for energy savings, and the action plans put into practice has resulted in measurable progress. By January 2011, 140 participating factories had improved energy efficiency by more than 10 percent, 119 of which have recorded greater than 20 percent improvement.

- Reduce phosphates in laundry and dish detergents in the Americas region by 70 percent by 2011. While some countries have regulations in place to limit the amount of phosphates suppliers can use in their products, others do not. This presents both with the challenge and opportunity to work with suppliers in countries where regulations are not present and help them through the process of phasing out phosphates in their products.

- Reduce packaging by 5 percent globally by 2013. Be packaging neutral globally by 2025.

Resource Conservation through Supply Chain Management Systems (SCM)

GSC Credit 3 **Points: 10**

Goal

Greening the supply chain by effective utilization of supply chain management systems.

Compliance Options

Management System

Company should employ systems which aim at reducing the supply chain environmental footprint (Carbon/ Material) without compromising on the quality of the product or process.

Systems can be software tools that are used for executing supply chain transactions, managing supplier relationships and controlling associated business processes aimed at achieving the delivery of quality products and services with minimum resource utilisation/material flow/loss.

Systems can be technological or manual interventions which help in optimising the resources in the following areas: Customer requirement processing, Purchase order processing, Inventory management, Goods receipt, Warehouse management and Supplier Management/Sourcing.

Monitoring System: Companies should also have a system to measure and evaluate the performance of systems employed for minimizing resource intensity (Carbon/Material) in the supply chain. It can be an internal or external interface integrated with the supply chain function to monitor and evaluate the performance metrics employed for supply chain intensity reduction on a regular basis. The points awarded are as given below:

Credit	Description	Points
GSC Credit 3.1	Management System for resource conservation through supply chain management	5
GSC Credit 3.2	Monitoring System for resource intensity in supply chain	5

Documentation Required:

1. Description of the tools and technologies adopted as part of the supply chain management system to reduce environmental impact in the supply chain.

2. Description of the tools adopted for measuring and evaluating the performance of the supply chain management system towards reducing environmental impact.

Approach

The goal of this credit is to ensure resource conservation through supply chain management systems. Systems can be software tools that are used for executing supply chain transactions, managing supplier relationships and controlling associated business processes aimed at achieving the delivery of quality products and services with minimum resource utilisation/material flow/loss.

Software tools help in ensuring product safety, regulatory compliance and reducing environmental impact of products. Sustainable supply chain management systems can be implemented for the following (Source: www.jda.com) -

- Sourcing and Procurement – Faster procure- ment negotiations, repeatable cost savings, increased visibility into supplier information, reduced risks and improved efficiency can be achieved by implementing sourcing and procurement management systems.

- Traceability and Recall – This helps in tracking and tracing product details across raw materials, manufacturing, distribution, and finished goods.

- Green Logistics – Integrating end to end logistics can help (a) reduce emissions, mileage, and costs during transportation management and optimization, (b) manage complexity through network wide visibility, (c) improve collaboration and (d) improve customer service by getting the right product to the right place at the right time.

- Supply Chain Design and Planning – This helps in synchronizing demand and supply to minimize stock outages while maintaining lower inventories. Creating a demand-driven supply chain can help in decreasing waste, natural- resource consumption and energy usage.

Green supply chain credit 3.1 awards 5 points for implementing a management system for resource conservation. In addition to implementing a management system, credit 3.2 also awards 5 points for monitoring systems implemented to check on resource intensity. Carbon reduction, energy reduction, water conservation, reduction in toxicity should be viewed as decision variables in the supply chain. Various management and monitoring systems should be used to implement this.

Resources

1. SAP http://www.sap.com/solutions/sustainability/offerings/business-cases/supply-chain-and-products/supply-chains/index.epx http://www.sap.com

2. JDA http://www.jda.com

Case Study 1- Making Profitable & Informed Choices through Supply Chain Software Tool

A cement company wanted to make more intelligent, more informed decisions about its supply chain investments in more than 40 countries. With the help of a software tool the company was able to allocate capacity wherever it is needed to meet demand. Having a better grip on demand, and where that demand is located, allows it to intelligently allocate capacity. It avoids unnecessary capital investments, and also has much lower transportation costs and distances, as the software tool strategically matches available supply with demand. This provides a significant cost advantage over competitors. It provided visibility into the company's global operations and supply chain. The software gives an ability to put all the relevant data into one supply chain model which is absolutely necessary to make sound decisions.

Case Study 2- Savings, service and growth through implementation of supply chain management systems

A paint manufacturing company wanted to make a competitive edge in the challenging marketplace and found a clear advantage in establishing a leaner, more agile and cost-efficient supply chain. The company began leveraging advanced i2 solutions for supply chain master planning, materials and distribution planning, production scheduling, and change management. They implemented the following key solutions from i2-

- Advanced master planning technologies to decide which products should be produced at which manufacturing plants, incorporating variables such as cost and demand volume, capacity, current inventory levels, environmental requirements and other factors, optimizing across multiple objective levels like capacity, demand satisfaction, safety stock requirements, inventory optimization and transportation costs.

- Since raw materials comprises 60% of its value chain, a sophisticated materials planning system is implemented to manage crucial supplies from both international and domestic suppliers.

- To ensure optimum raw materials selection across its complex, multi-site manufacturing operations, the company uses factory planning software to manage a wide range of variables, such as the inflow and use of raw materials among multiple possible alternates across multiple alternate vendors and possible production routes.

- Advanced scheduling software is used to set weekly timing requirements on a plant, unit and machine-by-machine basis.

- Since the demand for paint increases during festival season, the company implemented a sophisticated distribution planning system to address this variable demand and to move product smoothly to dynamic marketplace.

- Improved supply chain planning and execution systems have allowed the company to grow to four times its size in 10 years while dramatically reducing the on-hand inventory needed to serve its customers.

Green Procurement Strategy and Implementation

GSC Credit 4 **Points: 10**

Goal

Demonstrate the commitment to purchase products or services with lowest environmental impact and encourage suppliers to pursue environment management systems and processes

Compliance Options

Green Procurement Guidelines

Company should consider the following aspects while purchasing materials:

- ♦ Total Cost of Ownership (TCO) or Life Cycle Costing (LCC)
- ♦ Materials or substances with low environmental impact

Implementation of Green Procurement Guidelines

Company should implement guidelines on green procurement. The guidelines should be integrated with the existing procurement system of the company.

The points awarded are as given below:

Credit	Description	Points
GSC Credit 4.1	Green Procurement Guidelines	5
GSC Credit 4.2	Implementation of Green Procurement Guidelines	5

Documentation Required

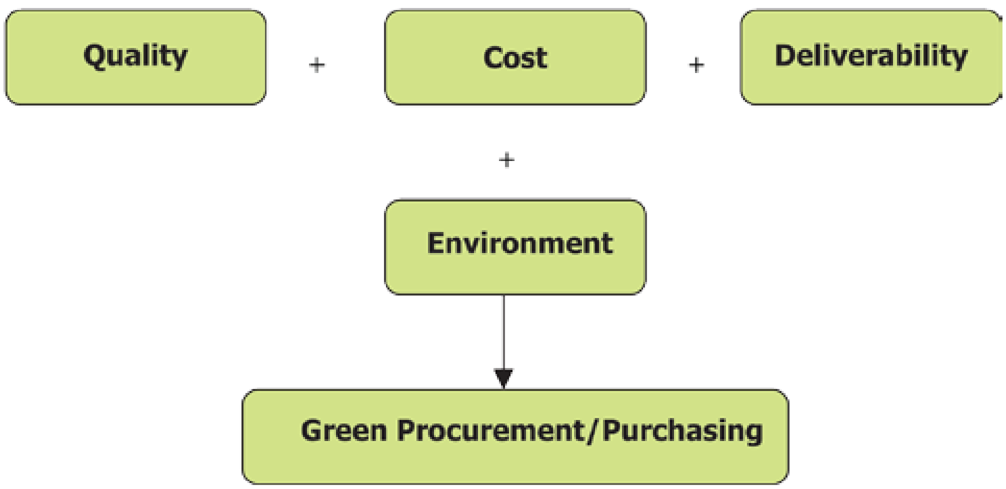
1. Declaration from the responsible authority of the company indicating the guidelines for green procurement of materials
2. Description of the systems and procedures which have been implemented for green procurement
3. Purchase contracts issued by the company for material procurement
4. Public disclosures through Company Website, Press Release, GRI Report, Annual Corporate

Approach

To be able to understand and reduce the negative impacts on the environment created at different points in the supply chain, it is important to understand where maximum intervention is required. One of the most effective ways of addressing environmental problems is to focus on prevention of pollution at the source by greening of the purchasing function at the beginning of the supply chain.

Green purchasing is defined as identification, selection and purchase of products or services with a significantly less adverse environmental impact when compared with that of competing products.

Green purchasing practices in the plant may reap several benefits like conservation of energy, water and other natural resources, lowering of costs incurred towards waste management, easier compliance with the environmental regulations, improved brand image & reputation among customers as the organization is focusing towards greener product, improved employee health and lesser environmental impact. Environmentally preferable products are sometimes more expensive to purchase. Nevertheless, buying “greener products” doesn’t necessarily mean paying more, especially when overall life cycle cost of the product is considered.



The development of green purchase/procurement guidelines is aimed at:

- Reducing the usage of hazardous (toxic) products / chemicals in their manufacturing facilities & phasing out toxic chemicals use over a period of time.
- Purchasing energy efficient equipments/ products to reduce the energy use & conserve energy, which in turn minimizes greenhouse gas emissions.
- Purchasing water efficient fixtures to reduce the usage of water & conserve water.
- Purchasing more amounts of recycled or reused material or more amounts of items that can be recycled or reused later.
- Minimizing the generation of waste by increasing the utilization of products with higher recycled content & also using products that can be recycled.
- Adopting environment friendly green building practices for new construction.
- The major purchasing groups where green procurement guidelines can be implemented include-
- capital goods
- raw materials
- maintenance consumables(electrical, mechanical, oils)
- fuel
- packing materials
- building materials
- office products & other consumables

Green supply chain credit 4 awards 5 points for framing green procurement guidelines and 5 points for implementation of the green procurement guidelines. The following step by step approach should be adopted for framing and implementing green procurement/purchase guidelines:

Case Study 1- Green Purchasing Guidelines

To encourage employees to examine the environmental impacts of their purchasing decisions, a company established a companywide purchasing guidelines emphasizing multiple environmental considerations. As a result of these guidelines, the company's purchase of environmentally preferable products is increasing. Several departments within the studio are purchasing "environmentally friendly" products including paper, janitorial supplies, construction materials, transportation products, computers, copiers, and printers. The guideline asks employees to maximize one or more of the following attributes: post consumer recycled-content, recyclability, durability and reusability, reduced packaging, decreased use of toxic chemicals in manufacturing.

Copy of the policy is shown below:

recognizes that purchasing practices can have a profound impact on the environment. Purchasing environmentally will help create and sustain markets for products and technologies that reduce waste, conserve resources, prevent pollution, and enhance worker health. has already established itself as a leader in environmental purchasing, and we are committed to continued growth in this area. Please make sure your department adheres to the following policies and plan your purchases environmentally.

I. Purchase "environmentally friendly" products which include one or more of the following attributes:
   A. High recycled post-consumer content
   B. Recyclability
   C. Durability/re-usability
   D. Reduced packaging
   E. Decreased use of toxic chemicals in manufacturing (e.g., chlorine, CFCs)

II. Include the following criteria in the selection of vendors:
   A. Commitment to supply and increase availability of environmentally sound products
   B. Willingness to urge their suppliers to improve their products and go beyond minimum standards
   C. Flexibility in reducing packaging
   D. Environmentally sound practices in manufacturing (pollution, toxins, employee safety)

III. If you find that the cost of an environmentally preferred product exceeds that of a standard product, call at ext. 4-3470 for assistance, before placing your order.

IV. Foster internal communication and education about environmental purchasing practices which will include, but not be limited to:
   A. Purchasing choices, volume and pricing updates to executive management
   B. Education and information to studio employees and purchasing staff on company purchasing practices (e.g. instruction, newsletters, product labels)
   C. The inclusion of environmental criteria in all bid processes

V. Require construction and demolition contractors to include in the bid process measures for salvaging and recycling of construction and demolition (C&D) waste, proper handling of solid and hazardous waste, and tonnage reports. In addition, will require that recycled and non-toxic construction materials, as well as energy efficiency features, be incorporated as bid alternates in contracts for new construction and renovation projects.

printed on 20% post-consumer recycled paper

Case Study 2- Green Procurement Standards

A company formally announced its multiple attribute green purchasing program in 1997 with the publication of the Green Procurement Standards and the GreenProcurement Standards Guidebook. These books include an index for evaluating purchases based on the potential environmental impacts of both the product and the product's manufacturer. The index rates potential suppliers' corporate environmental structure along 35 parameters in 7 categories and examines 28 product-specific parameters in 11 categories. A product's environmental preferability is based on the overall combined score. The company established a preference for products with scores above a predetermined threshold. The box below shows additional information:

When making environmentally preferable purchasing decisions, examines the environmental performance of both the product and the product's manufacturer and assigns an overall environmental score. The product-specific portion of the score is based on 28 attributes in the following 11 categories:

- Legal and voluntary environmental regulations.
- Resource conserving features.
- Energy saving features.
- Environmental impacts during use.
- Hazardous chemical substances contained in products.
- Recyclability.
- Proper treatment of used product.
- Minimal packaging.
- Lifecycle assessment.
- Eco-labels.
- Product information disclosure.

The product manufacturer's score is calculated from 35 parameters in the following seven categories:

- Corporate environmental philosophy.
- Environmental planning.
- Corporate organization with respect to environmental issues.
- Environmental management systems.
- Environmental evaluations.
- Corporate environmental reporting.
- Employee environmental education programs.

A product's overall environmental preferability score is computed by combining the product-specific and product manufacturer scores.

Efficiency Improvement Programs for Suppliers (Carbon, Material, Water and Toxicity)

GSC Credit 5 **Points: 15**

Goal

Aims to help suppliers improve their environmental performance and reduce costs, thereby enabling the companies to improve business competitiveness and sustainability.

Compliance Options

Supplier Audits - Company can employ internal or external sources to carry out the study. The points will be considered only if the study attributes to evaluating the performance of the vendors or supplier for efficiency improvement and resource conservation in the following areas - carbon, material, water and toxicity. There can also be an internal performance scorecard for vendors/supplier or a study conducted at the supplier or vendor premises for measuring the ecological performance.

Note: The point will be awarded only for studies carried out during the last 3 years

Recognition Programs - Company should have a system to recognise the performance of suppliers/ vendors who have reduced either their resource intensity or improved the material/equipment efficiency. The recognition can be in the form of public programs like awards, certificates, financial incentives, etc

The points awarded are as given below:

Credit	Description	Points
GSC Credit 5.1	Supplier Audits	10
	> 5 % of critical suppliers	5
	> 10 % of critical suppliers	10
GSC Credit 5.2	Recognition programs for suppliers	5

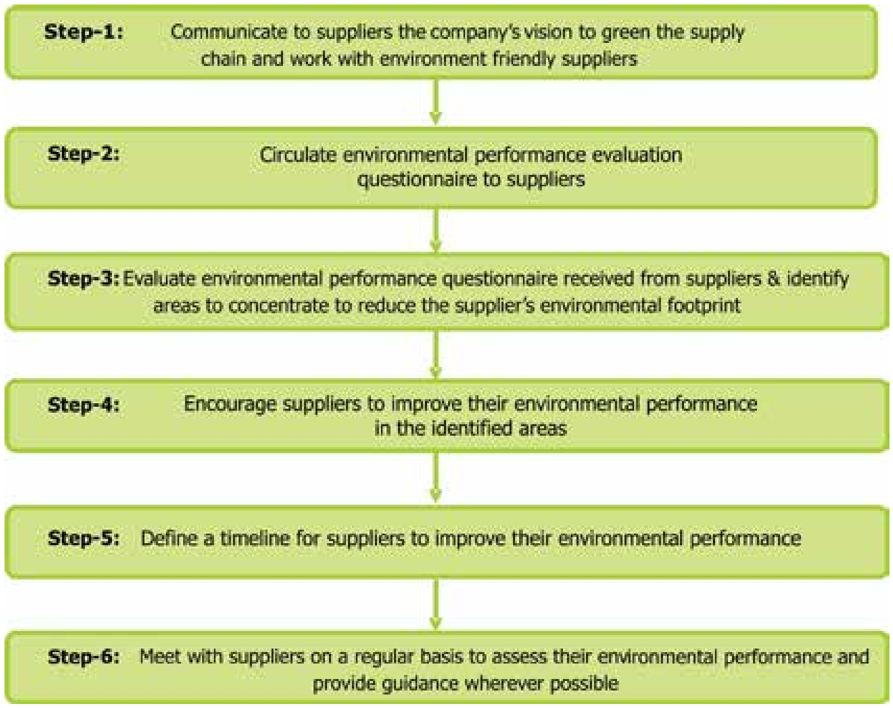
Documentation Required

1. A brief write up on the number and percentage of suppliers audited during the last 3 years. The write up should also include information about the various programs and initiatives implemented for evaluating and recognizing the environmental performance of suppliers/vendors. Relevant documents like public disclosures through company website, press release, GRI report, etc. should be attached.

Approach

Companies that arm themselves with better knowledge can design a supply chain that is not only cleaner but also cheaper. To achieve this it's important to build visibility into the supply chain. The objective of green supply chain credit 5 is to ensure that companies help their suppliers in improving their environmental performance through efficiency improvement programs.

The following step by step process should be adopted to work with suppliers in improving their environmental performance:



Many multinational companies conduct regular audits of their suppliers to ensure EHS compliance. But these audits may not yield expected results if a check list or standing guard approach is adopted. Suppliers might hide their environmental problems or bribe auditors. There is no incentive for the suppliers to disclose their problems. Instead, companies should try to incentivize suppliers to look for and disclose deficiencies themselves. For instance, if a supplier identifies a problem, it should not be shamed for the problem with a downgrade in its EHS rating, which would discourage self- reporting.

Companies should work with suppliers in identifying ways of improving environmental efficiency. Supplier audits should unleash opportunities for optimization of resources and thus leading efficiency improvement and resource conservation. It's essential that the company invests time and money in driving environmental initiatives at its suppliers and training personnel rather than simply auditing them for EHS compliance. The team that audits the suppliers should be part of the decision making group that decides on which suppliers to source materials from or transport products with. For example, if the CSR team at a company carries out supplier audits, they should be involved in the purchasing decisions from get to go. Green supply chain credit 5 awards 10 points for carrying out supplier audits.

Thetablebelowisasamplequestionnairetoevaluate the environmental performance of a supplier. The objective of circulating this questionnaire is to encourage suppliers to adopt best environment friendly practices. The questionnaire can be fine tuned based on type of suppliers.

Sample Questionnaire for Evaluating Supplier Environmental Performance

S.No	Survey Question	
1.	Is your company certified for ISO 14001? (If yes please provide the year of certification)	Yes/No
2.	Is there any other system followed in your plant to monitor your environmental performance?	Yes/No
3.	Are you measuring your environmental performance? (If yes, please attach relevant information)	Yes/No
4.	Have you identified environmental impacts as a result of your activities? (If yes, please attach relevant information)	Yes/No
5.	Have you defined any goals & implemented measures to reduce energy consumption of your plant? (If yes, please attach information about the initiatives undertaken)	Yes/No
6.	Have you defined any goals & implemented measures to reduce water consumption of your plant? (If yes, please attach information about the initiatives undertaken)	Yes/No
7.	Have you identified all the legal requirements?	Yes/No
8.	Is there any procedure to monitor the compliance of legal requirements?	Yes/No
9.	Have you identified various wastes generated in your plant?	Yes/No
10.	Are you segregating the waste generated in your plant?	Yes/No
11.	Have you developed any written procedure for the safe disposal of waste?	Yes/No
12.	Are you disposing the waste generated from your plant in an environmentally friendly way as prescribed by statutory bodies?	Yes/No
13.	Do you purchase energy efficient & environment friendly products?	Yes/No
14.	Are you conducting regular awareness programs for your employees on energy & environment?	Yes/No
15.	Please mention your future plan for reducing energy consumption, water consumption and implementation of ISO 14001.	

Case Study 1- Supplier Environmental Sustainability Scorecard

FMCG company deployed a supplier environmental sustainability scorecard in May 2010. Suppliers are asked to complete the scorecard annually so they can be appropriately evaluated and rewarded for their environmental sustainability improvements. Buyers may use components of the scorecard as a template to gather comparable sustainability measures for business award decisions, tracking supplier progress against specific goals set by the company, gathering data for studies/activities to improve the sustainability of its products and processes, or calculating the environmental impact of a particular supply chain at the company. Suppliers are also encouraged to use the scorecard with their other customers and suppliers to further improve total supply chain environmental sustainability.

The suppliers are rated based on the following parameters-

Measure	Unit	Desired Trend (from previous year to current year)
(Electric) Energy Usage	Giga-Joules or GJ / Unit of Output	iDown
(Fuel) Energy Usage	Giga-Joules or GJ / Unit of Output	iDown
(Input / Withdrawal) Water Usage	Cubic Meters or M3 / Unit of Output	iDown
(Output / Discharge) Water Usage	Cubic Meters or M3 / Unit of Output	iDown
Hazardous Waste Disposal	Metric Tons or MT / Unit of Output	iDown
Non-Hazardous Waste Disposal	Metric Tons or MT / Unit of Output	iDown
Kyoto Greenhouse Gas Emissions Direct (Scope 1)	Metric Tons of CO2 Equivalent or MT of CO2e / Unit of Output	iDown
Kyoto Greenhouse Gas Emissions Indirect (Scope 2)	Metric Tons of CO2 Equivalent or MT of CO2e / Unit of Output	iDown
Environmental Mgt. System	Yes or No	Yes
Renewable Energy	Giga-Joules or GJ / Unit of Output	hUp
Potential Waste Material Recycled, Reused, Recovered	Metric Tons or MT / Unit of Output	hUp
Transportation Fuel Efficiency	CO2 / ton-km	iDown
Violations & Sanctions	$	iDown

The scorecard also proved to be an effective way to generate sustainable innovation ideas from suppliers, 38% of whom submitted ideas in the first year. From 2011 the scorecard factors into a supplier's rating and affects its ability to do more business with the company.

Case Study 2-Supplier Environmental Management by Automobile Company

A leading automobile company in Australia believes in working with suppliers and developing best practice collaboration through their Supplier Environmental Management Policy. The company has a dedicated resource devoted to the environmental risk management of suppliers. Environmental risk management activities include:

- Continuing to support, where required, any suppliers in achieving ISO14001 certification
- Continuing to promote management and further reductions in the use of substances of concerns- lead, cadmium, mercury and hexavalent chromium
- Implementing a CO_2 reduction strategy for suppliers
- Fostering a zero-waste culture towards manufacturing and environmental leadership in the supply chain
- Sharing best practice initiatives with the wider community.

To conform to ISO14001 an organisation must implement an EMS that includes the following core elements:

- Environmental Policy
- Identification of Significant Environmental Aspects
- Identification of Legal requirements and other Organisational Obligations
- Emergency Preparedness and Response
- Training
- Monitoring, Measurement, Auditing and Corrective Action
- Management Review
- Documentation and Record Keeping

Its aim is to encourage suppliers to go beyond achieving ISO14001 certification and leading suppliers are in contention for the annual supplier Environmental Award. One of the automotive components suppliers won the Environment Award at the Annual Supplier Awards in recognition of its innovative environmental initiatives including:

- Recycling plastic packaging from electronic manufacturing areas which has resulted in 20 tonnes of plastic packaging being diverted from landfill in 2010 and a cost saving of $4,300.
- Reducing plastic shrink wrap usage by working with suppliers to replace the wrap with two plastic straps. This has resulted in a reduction of 40,000 metres of shrink wrap usage compared to the previous year and saved $4,500.
- Reusing pallets which has resulted in 19.5 tonnes of pallets being reused, saving $10,000.

Resource Intensity Reduction in the Supply Chain (Carbon, Material, Water and Toxicity)

GSC Credit 6 **Points: 45**

Goal

Encourage vendors and service providers to improve their environmental efficiency thereby increasing business competitiveness of the company and suppliers.

Compliance Options

Baseline and Target - Company should clearly define the baseline and target for reduction in any one of the following areas (carbon, material, water and toxicity) over a specified timeframe

Reduction in Supply Chain Footprint - Company should have a mechanism to ensure intensity reduction in the resources of supplier/vendors. Resource conservation can be in terms of the intensity reduction in any of the following aspects: Carbon, Material, Water and Toxicity.

The points awarded are as given below

Credit	Description	Points
GSC Credit 6.1	Baseline and Target	5
GSC Credit 6.2	Reduction in Supplier resources (carbon/material/water/toxicity)	40
	At least one project	5
	> 0.75 % reduction	10
	> 1.5 % reduction	15
	> 2.25 % reduction	20
	> 3.0 % reduction	25
	> 3.75 % reduction	30
	> 4.5 % reduction	35
	> 5.0% reduction	40

Note: % reduction is valid only if at least 25 % of the total suppliers/vendors in Category A accounts for reduction in their resource intensity over the last 3 years. The % indicated are weighted average of all the four parameters

Documentation Required

1. A brief write up indicating the baseline and targets for reducing the resource intensity in the supply chain.

2. Detailed documentation pertaining to reduction of specific resource intensity by the vendor/supplier.

3. Public disclosures like company website, press release, GRI report, annual corporate sustainability report, etc.

Approach

Green supply chain credit 6 awards companies points for the percentage of reduction achieved in resource intensity in the supply chain. The goal of this credit is to award companies that have succeeded inworkingwiththeirsuppliersinreducing their water consumption, material consumption, carbon emissions or reducing toxicity in the supply chain. Companies can achieve these savings by working with their suppliers and reducing their environmental footprint as well as working towards greening the following phases of the supply chain, namely, procurement, packaging, transportation and distribution and warehousing.

Transportation and Distribution

Companies source raw materials from foreign suppliers for many reasons- to establish a presence in foreign markets, competing prices, supplier ranking, etc. Sourcing materials over long distances increases the environmental footprint. In addition, in order to reduce financial risk in case of uncertain demand, companies also like to keep less inventory. This means that companies make smaller but more frequent shipments which in turn results in increased environmental footprint. Transportation has a very big impact on the environment and is essential for top executives to include impact of transportation in any environmental analysis of their supply chain.

Companies need to evaluate the environmental impact of a transportation system which constitutes of the following:

1. vehicles such as cars, trains, vessels and aircraft

2. energy sources such as petrol, LPG, diesel oil and electricity

3. infrastructure such as roads, railways, airports and harbours

4. vehicle operators

Companies have to thus decide on vehicles to be used for product delivery, type of fuel used, bunching of product deliveries so that number of trips made is fewer, vehicle operators are aware of emissions caused due to idling, etc.

Steps to Greening Transportation in the Supply Chain

1. As discussed in green supply chain credit 1, in order to green the supply chain, companies should start with developing goals for limiting the impact from transportation, decide metrics to be used to measure that impact and/or build partnerships with other organizations.

   - Introduce an environmental clause in transportation related contracts, set specific targets of reducing emissions from transportation in a specified time frame, etc.

   - Measurement is a fundamental starting point for reducing the environmental impact of transportation activities in the supply chain. Companies should tract fuel usage and its associated impacts.

   - Certain companies partner with government organizations, non government organizations, supplier and/or customer companies to help them reduce their environment footprint. For example, in the United States, few companies have partnered with SmartWay program run by the Environment Protection Agency. The program is targeted at helping shippers and carriers reduce emissions.

2. Companies can also change internal practices like using more efficient delivery vehicles. For example, Johnson & Johnson had the largest corporate fleet of hybrid vehicles in the United States as of March 2008, with 978 hybrids in operation and 508 more ordered. Freight carrier CSX Corp. has invested more than $1 billion since 2000 to upgrade its fleet with more efficient clean air locomotives; it plans to reduce fuel consumption by another 10 million gallons by upgrading 1,200 additional locomotives.

3. Many technological and operational tactics can be used to further reduce the environmental impact of transportation. Companies can decreasefuelus e,switchtomoreenvironmentally friendly modes of transportation like rail, adopt technology to increase shipment efficiency, identify smarter delivery routes and reduce

shipment volume. For example-

- FPL Group Inc. in Florida used 2 million gallons of soybean diesel in 2005.
- FedEx, Johnson & Johnson and Wal-Mart report using wider tires on their trucks, and Tyson Foods uses aluminum wheels on its tractors, reducing road friction and thus increasing fuel efficiency.
- HP, Dell, Limited Brands and Estée Lauder are converting air shipments to ground or ocean transport.
- Tyson Foods Inc. uses software to remotely monitor engine diagnostic information to help reduce truck engine idle time.

4. Companies can also position their local offices and distribution centers in such a way that the physical distance between themselves and supply chain partners is decreased.

5. Lastly, implementation of certain technologies may not have a quick payback like using alternative fuels but companies could use savings from other environmental projects and invest in technologies that help reduce the impact of transportation in the supply chain. Companies could hire and utilize skilled knowledgeable personnel with skills in logistics and environmental sustainability to implement the supply chain transportation strategies.

Environment - Friendly Packaging

With huge amounts of packaging filling up the rapidly disappearing landfill facilities, companies can take initiatives to reduce the amount of packaging entering the waste stream. For example, a company in Thailand not only delivers its detergent and other house cleaning products in plastic containers that are picked up by the sales force and recycled but also insists that its suppliers deliver the raw materials to the company in paper cartons that are given back to the supplier for reuse.

In addition to convincing the suppliers to reduce the quantity of packaging material, companies also need to convince the suppliers to use packaging materials that are biodegradable in nature, causing least hazard to the environment. A lot of plastics are used for packaging- High Density Polyethylene (HDPE), Polyethylene Terephthalate (PET), Polysterene (PS). These are non biodegradable and harmful to the environment. Thus suppliers are encouraged to provide corrugated cardboard boxes and paper packaging that are more environmentally friendly.

Environment - Friendly Procurement

Green purchasing has a direct impact on reducing water, energy and raw material consumption and also reducing toxicity and carbon emissions. Green Procurement has been discussed in detail in green supply chain credit 4.

Green supply chain credit 6.1 awards companies 5 points for establishing a baseline of their supply chain. This involves measuring and monitoring carbon, material, water consumption and toxicity of their suppliers. Credit 6.2 awards maximum of 40 points for successfully reducing suppliers' resources (water, carbon, material, toxicity) by 5%.

Case Study 1- Sustainable Packaging by Pharmaceutical Company

A retail store in the United States challenged its suppliers to help it achieve a goal of zero waste. A pharmaceutical company that sold medicines over the counter at the retail store formed a working group with colleagues in Purchasing, Product Supply, Manufacturing, Marketing and Sales. The pharmaceutical company developed a number of packaging initiatives that would reduce the carbon footprint, thus improving its rating on the Retail Store's Supplier Sustainability Scorecard.

Activities

- In 2007, company came out with "out of the box" program, removing the outer packaging cartons from all Excedrin 100 and 250-count bottles sold at retail stores across the United States.

- In addition, in late 2009, the company created a breakthrough solution for Prevacid®24HR, a treatment for frequent heartburn sufferers, with displays made of recycled and recyclable materials to be installed in all 3,000 retail stores in the United States.

Results

- By end of 2009, the Excedrin out of the box initiative produced savings of 50 tons of packaging materials and a 30 percent improvement for the Excedrin brand on Retail Store's Sustainability Scorecard.

- For its part, the Prevacid 24HR semi-permanent endcap display has been installed in 3,000 stores and is expected to save more than 80 tons of packaging materials annually. Traditional displays would have used three times the amount of corrugated board. The nature of the display and its positioning also led to increased merchandising and messaging opportunities for the brand.

Case Study 2- Green Supply Chain Management by Automobile Company

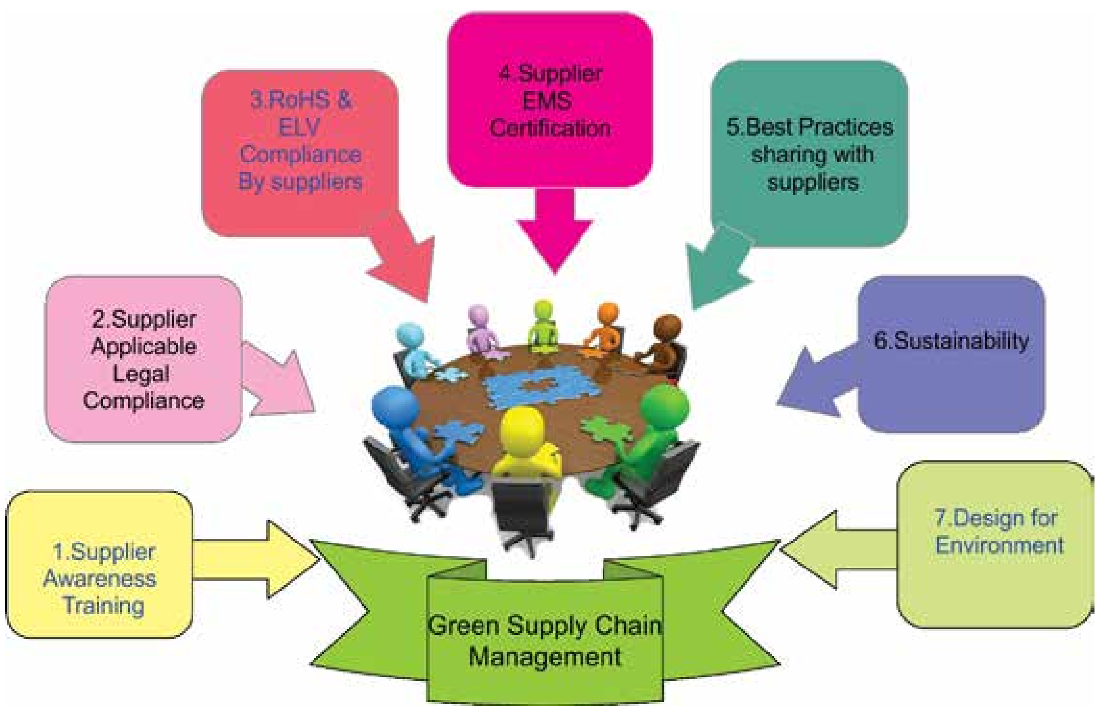
Automobile company in Maharashtra developed a master plan for green supply chain management as shown in the diagram above. The company took the following initiatives to reduce resource intensity in the supply chain:

- Organizing yearly training sessions, workshops, exhibitions for suppliers to make them understand the plant requirements with respect to environment standards.
- Promoting reusable packaging & reducing use of corrugated boxes and wooden boxes.
- Promoting milk runs to minimize CO_2 emissions (Milk-run is a tested and proven method of optimizing vendor's vehicle movement for delivering goods).
- Reduction in logistics costs by utilization of full load of containers.

The company surveyed 201 vendors out of which 154 suppliers have processes involving hazardous substances and 47 suppliers with non hazardous substances. 71 suppliers are EMS certified and 6 suppliers are in final stage and remaining 76 suppliers in work in progress (WIP).

The following reduction in resource intensity was achieved by working with suppliers:

- Reduced wood packaging waste from 2208 MT to 554 MT in two years
- Reduced 74 % of wood & 45 % of card board box used for packaging
- 487 MT/ annum of CO_2 emissions have been reduced due to transport optimization



PRODUCT STEWARDSHIP (PS)

Background

The flip side of higher economic growth is increased consumption of natural resources, increased waste generation and hence ecological degradation. The cost of environmental damage is estimated to be over 5% of India's GDP. In 2001, around 338 million tones of hazardous waste was generated globally. In India alone, more than 35,000 industrial units contribute to 6 million tones of hazardous waste per year. However, treatment, storage and disposal facilities can only handle 50% of this waste.

Global warming is a looming problem caused by the release of greenhouse gases into the atmosphere. These gases surrounding the earth trap heat and thus an increase in their emissions results in increased temperatures on earth. In order to reduce the adverse effects of climate change, several initiatives focused on reducing green house gas emissions are being implemented.

Product Stewardship is one such initiative that helps reduce waste generated as well as toxicity of hazardous substances. Product stewardship is also an initiative that can assist in reducing greenhouse gas emissions by reducing the amount of fossil fuel required to manage a product throughout its life cycle. Product stewardship means being responsible for all phases of a product's lifecycle – from design to end of life and places the primarily responsibility with the producer. This is a paradigm shift from current practices that places the primary burden on local governments for handling waste disposal. It is in the best interest of governments, companies and citizens to reduce the adverse health, safety and environmental impacts of products/services.

From GreenCo perspective, product stewardship intends to address the following five key areas. Each of the below key areas are described in detail in the seven credits that follow.

- ♦ Design for environment or environmentally conscious design
- ♦ Extended producer responsibility
- ♦ Quality management and environment risk assessment
- ♦ Influence consumer behaviour
- ♦ Reduce toxicity or hazardous substances used in the product and process

Leadership and Strategy

PS Credit 1 **Points: 10**

Goal

To make health, safety and environmental protection an integral part of designing, manufacturing, marketing, distributing, using, recycling and disposing of products.

Compliance Options

The allocation of points for the credit is as below:

Credit	**Description**	**Points**
PS Credit 1.1	Strategy & Targets (Short and Long term)	5
PS Credit 1.2	Action Plan	5

Strategy & Targets - Procedures and guidelines adopted by the company to reduce the environmental impact of the product or process. It should reflect the company's commitment towards-

- ♦ Influencing consumer behaviour
- ♦ Reducing toxic/hazardous substances in the product/process
- ♦ Design for environment or environmentally conscious design
- ♦ Extended producer responsibility
- ♦ Quality management and environment risk assessment

The strategy and targets should clearly specify the short term and long term targets for reducing the environmental impacts associated with product or process focusing on the above five key areas.

Action Plan - The company should also have a detailed action plan for achieving the targets set over a scheduled timeline.

Documentation Required

1. Declaration from the responsible authority of the company indicating the guidelines (or code), strategies, targets and action plan for reducing the negative impact of the product/service covering the five key areas listed above.

Approach

Product stewardship ensures that all those involved in the lifecycle of a product share responsibility for reducing its health and environmental impacts, with producers bearing primary responsibility.

Companies should have a goal to reduce the entire life-cycle impacts of a product, process of manufacturing and its packaging including energy, water and other raw materials consumption, emissions to air, soil and water, the amount of toxics in the product, worker safety and waste disposal, not only in product design but also in end-of-life management. Since raw material, energy and water consumption is addressed in other parameters, product stewardship focuses on-

- Influencing consumer behaviour
- Reducing toxicity or hazardous substances used in the product or process
- Design for environment or environmentally conscious design
- Extended producer responsibility
- Quality management and environment risk assessment

Different strategies can be adopted as part of product stewardship guidelines. For example- a change in the design of a product such that it reduces energy or water consumed during its usage, a process that minimizes the toxicity of the waste generated or hazardous substances used in the product, changes in consumer behavior that result in reduction of waste, eliminating toxins from products, reusing products- customer consumption and planning also plays a role in source reduction, recycling and composting- even though recycling requires energy it is better for the environment than using new resources, product take back and recycling programs, etc.

Product stewardship credit 1.1 awards 5 points to companies that clearly define short term (3 years) and long term (beyond 3 years) targets and strategies towards product stewardship and credit 0.2 awards 5 points for framing an action plan for implementing strategies promoting product stewardship.

Resources

1. Product Stewardship Institute http://www.productstewardship.us
2. U.S Environment Protection Agency http://www.epa.gov/epawaste/partnerships/stewardship/index.htm

Programs for Stakeholders

PS Credit 2 **Points: 10**

Goal

Engaging stakeholders through awareness programs/information sharing on handling, use and ultimate disposal of our products without creating risk to employees, customers, the public or the environment.

Compliance Options

Education and Awareness Creation - Programs or initiatives adopted by the company to educate and create awareness on product handling, use, hazard and risk information to all stakeholders.

This can be through internal or external training programs for the employees in the company and awareness campaigns for consumers.

Communication - Showcase the various communication methods (print or media) adopted for conveying the safe handling, use and disposal of the product. It should also state the hazard and risks associated with the product or process.

The points are awarded as given below:

PS Credit 2	**Defining Stakeholders**	**Points**
PS Credit 2.1	Type & No of Stakeholder	5
PS Credit 2.2	No of Training Programs conducted for Stakeholder	**5**

Documentation Required

1. Detailed documentation of the programs implemented by the company to educate and create awareness amongst all stakeholders on the product usage, disposal and recycling.

2. List of stakeholders approved by plant/corporate

Approach

The responsibility for reducing the health and environment impacts of the product should be shared among all stakeholders- designers, manufacturers, retailers, recyclers, government as well as consumers. The greater the ability an entity has to minimize a product's health and environment impacts, the greater is its degree of responsibility and opportunity for addressing those impacts. Product stewardship credit 2 awards 5 or 10 points for involving greater than 40% or 80% of stakeholders respectively.

Industries should take leadership in conducting dialogue and creating awareness between stakeholders. As a first step, the goal of the dialogue should be set. For example, the Tire Product Stewardship Project (project of Product Stewardship Institute, U.S.A.) has the following goal, "To reach an agreement among government officials, manufacturers, retailers, environmental groups, tire recyclers and other participants that will result in fewer waste tires; the efficient collection, reuse, and recycling of waste tires; increased and sustained waste tire markets; maximum value from waste tires; and fewer waste tires going to landfills." The agenda for these dialogues should be to discuss targets, key issues and propose strategy/solutions to each of those issues. Different stakeholders should be interviewed to get this information. An action plan should be developed as a result of the dialogue meetings.

Companies should also plan and invest in organizing internal and external training programs that educate and create awareness on product handling, use, disposal, hazard and risk information among employees and consumers. Manuals should be published that contain information on product handling, use and recycling.

Case Study 1- Tire Product Stewardship Project

Tire Stewardship Action Plan was started in January of 2004 with the following goal- "To reach an agreement among government officials, manufacturers, retailers, environmental groups, tire recyclers and other participants that will result in fewer waste tires; the efficient collection, reuse, and recycling of waste tires; increased and sustained waste tire markets; maximum value from waste tires; and fewer waste tires going to landfills."

The following steps were taken to engage various stakeholders to achieve the above stated goals:

1. Phone interviews with 20+ stakeholders including tire manufacturers, recyclers, haulers, end use manufacturers, Cement kilns, government, trade associations, transportation officials, other technical resources.

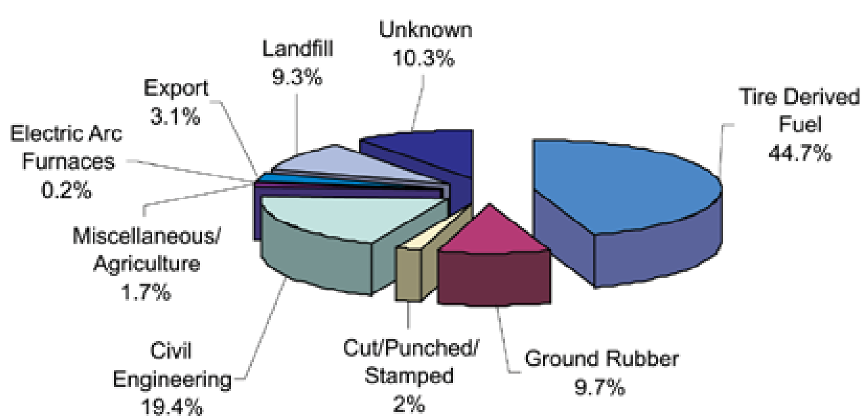
2. Conducted surveys with all stakeholders listing issues and strategies. Respondents of the survey commented on the issues and strategies listed.

3. Based on the surveys, issues were prioritized. For example, Issue 1: waste tire generation, Issue 2: waste tire markets, Issue 3: tire reuse and retread, Issue 4: collection and transportation, Issue 5: crumb rubber markets, Issue 6: recycled content in new tires, Issue 7: Rubberized Asphalt concrete markets, etc.

4. After issue prioritization, the challenges and strategies for each issue was discussed in detail with all stakeholders. For example, for Issue 1, it was suggested to increase consumer education tire maintenance, provide free air and pressure gauges. For issue 2, solutions proposed were promote use of retreads among government and commercial vehicles, reduce liability concerns, etc.

5. Success metrics were set for the program like few stockpiled and disposed, of the waste tires collected, increased levels of tires reused, retreaded and recycled, increased amount of tire derived products available, etc.

U.S. Scrap Tire Disposition 2003



Product Responsibility Management

PS Credit 3 **Points: 10**

Goal

To ensure quality and reliability is maintained across the entire product lifecycle thereby reducing the environmental impact of the product in the supply chain.

Compliance Options

Quality Management - Companies should have a system to ensure that the quality of the products and

services is being maintained as per the requirements until its final delivery to the end user.

The system should help in continual improvement, through reduction of waste in the supply chain by defect prevention and material utilization.

Environment Risk Assessment - Companies should have a system for evaluating the environmental risk associated during transport, use and disposal of the product. The system should assess and reduce environmental risks associated during the transport, use and disposal of the product.

The points are awarded as given below:

Credit	Description	Points
PS Credit 3.1	Quality management system for reducing waste during manufacturing, dispatch, storage and usage	5
PS Credit 3.2	Environment Risk Assessment for new and existing products	5

Documentation Required

1. Detailed description of the tools & technologies adopted by the company to ensure the quality of the product is maintained throughout the product lifecycle.

2. Detailed descriptions of the tools & technologies adopted by the company for environmental risk assessment of the products.

3. Detailed report of the study conducted by an internal or external agency on the environmental risk assessment of the products.

Approach

Quality Management

Product stewardship credit 3 focuses on quality management during manufacturing, dispatch, storage and usage of the product. Quality needs to be defined firstly in terms of parameters or characteristics, which vary from product to product. Everybody in the company, the salesmen, designers, plant engineers and testing staff, packaging, dispatch and so on, are all responsible for product quality. It is important to ensure that everyone in the company works together towards achieving quality standards. Quality management systems help reduce waste and conserve resources in the supply chain.

For example, a leading automobile company defines quality as one of the key ingredients to becoming factory of the future. It delivers world class quality products through- product quality, process quality and people quality. The company has upfront systems to capture voice of the customer and turn into design standards and templates and works towards continuously improving these standards. The company has 21 step quality improvement process where different tools and technologies are used to ensure quality. Improvement in quality management is reflected through parameters like customer concerns and warranty. Customer concerns per 1000 concerns per month of production reduced by 52% in one year. Over 59% reduction in warranty was achieved over the last 2.5 years by rigorously analyzing and addressing “every warranty claim every day”.

Automobile companies receive automobile component parts from different vendors. Reduction in rejection rate of these components leads to reduction in waste and conservation of resources required to manufacture the component. Therefore, automobile component manufacturing companies should focus on reducing the rejection rate of their products sent to automobile companies. Similarly, other sectors should also focus on quality management to reduce waste.

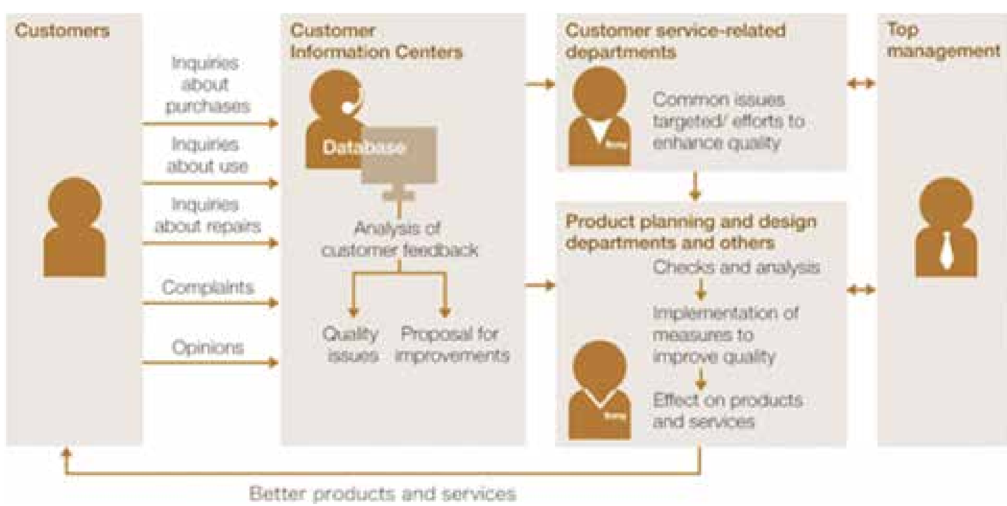
Environment Risk Assessment

Hazard is defined as the inherent potential of something to cause harm. Hazard can include substances, machines, energy forms, or the way work is carried out.

Risk is the likelihood that the realization of a hazard will cause harm either while the work is being carried out or when a particular substance is used. Risk = Hazard × Exposure

Risk assessment has become a commonly used approach in examining environmental problems. A risk based approach attempts to examine the actual risks imposed by an environmental issue rather than potential hazards that may or may not arise. Risk management is a decision making process through which choices can be made between a range of options that achieve the required outcome.

Policy decisions require that scientific, social, economic and political information is taken into account and risk assessment and management helps bridge between the scientific and the social. They help breakdown complex systems and identify areas of processes or plant where



Typical flow diagram for utilizing customer feedback system risk reduction options can be most effective. It is also a method for highlighting and prioritizing research needs. Product stewardship credit 3 awards 5 points for doing environment risk assessment for both existing and new products.

ERA addresses the following questions:

- What can go wrong with the project?
- What is the range of magnitude of these adverse consequences?
- What can be done and at what cost to reduce unacceptable risk and damage?

Environment Risk Assessment (ERA) includes the following steps:

Problem Formulation: answers questions like - what are we assessing? What is the risk source? Is it a single chemical or plant or process like transportation? Are we concerned with the use, transportation or disposal of the hazard? What hazards should be included in the assessment? Are regulatory standards being used as a guide to determine acceptable risk?

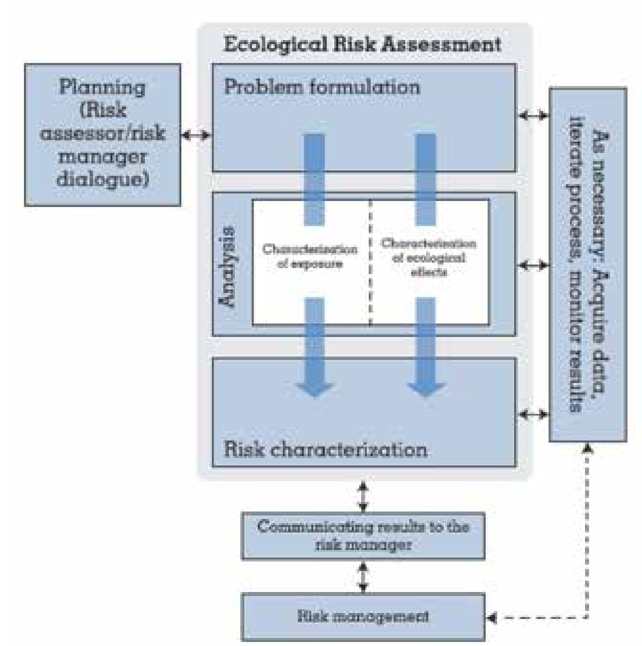
Hazard Identification: involves establishment of those agents that could cause harm to the receptor like people or ecosystem. While assessing plants or processes, hazard identification will arise from examining possible outcomes of routine operation and identifying consequences of deviations from normal operation.

Release Assessment: describes the type, amount, timing and probability of the release of the hazards into the environment and a description of how these attributes might change as result of various actions or events.

Exposure Assessment: describes intensity, frequency and duration of exposure, routes of exposure and nature of population exposed.

Consequence Assessment: will examine the consequences of release of hazards into the environment and quantify the relationship between the specified exposures to the hazard and the health and environmental consequences of those exposures.

Risk Estimation: involves integrating results obtained from release assessment, exposure assessment and consequence assessment to produce measures of environmental and health risks. Risk evaluation is the examination of what the risk estimation means in practice.



Risk Assessment of possible incidents should indicate the following aspects:

- worst events considered;
- route of worst events;
- timescale to lesser events along the way;
- size of lesser events if their development is halted;
- relative likelihood of events;
- consequences of each event.

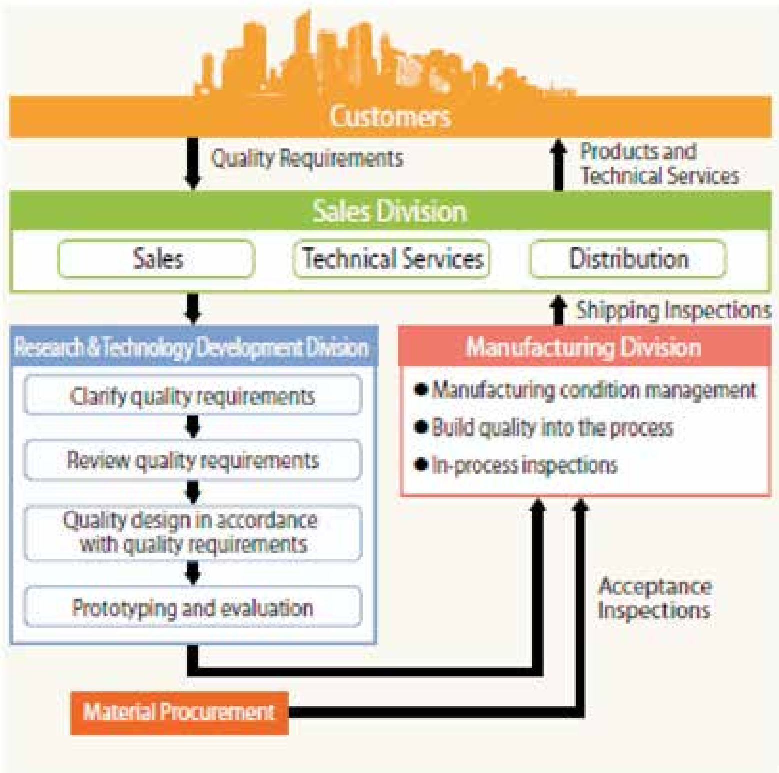
At the end of the risk assessment process, existing controls should be recorded and further measures may need to be considered to reduce or eliminate the risks identified.

Resources

1. CII Institute of Quality: http://www.cii-iq.in/CII/index.html
2. Society for Environmental Toxicology & Chemistry: www.setac.org
3. Royal Society of Chemistry: www.rsc.org
4. European Environment Agency: www.ea.europa.eu

Case Study 1- Product Responsibility Management

Quality Policy- "By pursuing quality designs that meet users' needs and providing quality assurance, our customer satisfaction shall be enhanced."



A cement company in Japan implemented a quality management system (as shown above) to ensure high quality, safe and reliable products.

To strengthen production focused on quality that meets customer expectations, the company ensures robust communication between different departments- sales, production and R&D, and effectively implement Plan Do Check Act (PDCA) cycles throughout all processes and systems for continuously improving operations and enhancing customer satisfaction. Higher volumes of increasingly diverse recycled resources (like blast furnace slag, coal ash, by product gypsum, etc) are used; the quality of final cement products is maintained and environmental safety is ensured. They also publish material safety data sheet (MSDS), which records information about hazardous and harmful substances and enables customers to safely handle products.

Case Study 2- Quality Improvement Program

The incorporation of Quality Improvement Program (QIP) along with implementation of global product monitoring systems, web based training and improved internal metrics and reporting systems has helped a healthcare products manufacturing company to achieve world class standards, improve product quality and regulatory compliance record.

QIP defines 4 work streams- quality culture, operating systems, management systems and quality systems. It includes assessment tools that help identify and prioritize product quality areas. It defines processes for continuous improvement from management down to operator level.

Each facility is given a score between 1 and 5. Depending on the results of the assessment, facilities may be awarded bronze, silver or gold status. Each facility is continuously challenged to improve by at least 0.2 points each year.

Achievements:

Baseline in 2007- 75% bronze, 23% silver, 2% gold

Improvement as of 2009- 23% gold, 77% silver

Reduction of Toxic or Hazardous Substances in Products & Process

PS Credit 4 **Point: 15**

Goal

To ensure reduction in usage of toxic and hazardous materials in the products/service & process in order to avoid negative impacts to human health and environment.

Compliance Options

Company should substitute or phase out toxic/hazardous materials or substances in products & process by substances of low environmental impact.

Reduction of Toxic or Hazardous Substances in process & products	Points
≥ 10% reduction	5
≥ 20 % reduction	10
≥ 30 % reduction	15

The list of the toxic/hazardous materials is classified as per Schedule 1: Part II (List of Hazardous and Toxic Chemicals) in the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989.

Documentation Required

Detailed Toxicity analysis of product

Note: *If the product does not contain any toxic or hazardous substance, the company is entitled to the entire marks. The company needs to provide a self declaration indicating all the products are free of any hazardous or toxic substances*

The list of the toxic/hazardous materials is classified as per Schedule 1: Part II (List of Hazardous and Toxic Chemicals) in the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989.

Candidate List of substances of Very High Concern for Authorization (published in accordance with Article 59(10) of the REACH Regulation) Source: European Chemical Agency - http://echa.europa.eu/

2-Ethoxyethanol
2-Ethoxyethyl acetate
2-Methoxyethanol
Benzyl butyl phthalate (BBP)
Dibutyl phthalate (DBP)
Diisobutyl phthalate
Lead diazide, Lead azide
1,2-bis(2-methoxyethoxy)ethane (TEGDME,triglyme)
1,2-Diethoxyethane
1,2-dimethoxyethane,ethylene glycol dimethyl ether (EGDME)
Acetic acid, lead salt, basic

Bis(2-methoxyethyl) ether
Bis(2-methoxyethyl) phthalate
Boric acid
Diboron trioxide
Dihexyl phthalate
Diisopentylphthalate
Dipentyl phthalate (DPP)
Disodium tetraborate, anhydrous
Fatty acids, C16-18, lead salts
Formamide
Lead di(acetate)
Lead monoxide (lead oxide)

N,N-dimethylacetamide
N,N-dimethylformamide
N-methylacetamide
Sodium perborate,perboric acid, sodium salt
Sodium peroxometaborate
Tetraethyllead
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)
Anthracene
Bis(tributyltin) oxide (TBTO)
Bis(pentabromophenyl) ether (decabromodiphenyl ether) (DecaBDE)
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)
2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)
Bis (2-ethylhexyl)phthalate (DEHP)
4-Nonylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof]
4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof]
Cyclohexane-1,2-dicarboxylic anhydride [1], cis-cyclohexane-1,2-dicarboxylic anhydride [2], trans-cyclohexane-1,2-dicarboxylic anhydride [3] [The individual cis- [2] and trans- [3] isomer substances and all possible combinations of the cis- and trans-isomers [1] are covered by this entry]
Hexahydromethylphthalic anhydride [1], Hexahydro-4-methylphthalic anhydride [2], Hexahydro-1-methylphthalic anhydride [3], Hexahydro-3-methylphthalic anhydride [4] [The individual isomers [2], [3] and [4] (including their cis- and trans- stereo isomeric forms) and all possible combinations of the isomers [1] are covered by this entry]
Sodium dichromate
Ammonium dichromate
Potassium dichromate

Sodium chromate
Lead sulfochromate yellow (C.I. Pigment Yellow 34)
1,2,3-trichloropropane
Lead chromate
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)
Potassium chromate
Acrylamide
Chromium trioxide
Diethyl sulphate
Methyloxirane (Propylene oxide)
Cadmium
Cadmium oxide
Cadmium chloride
Cadmium sulphide
2,4-Dinitrotoluene
4,4'- Diaminodiphenylmethane (MDA)
Acids generated from chromium trioxide and their oligomers. Names of the acids and their oligomers: Chromic acid, Dichromic acid, Oligomers of chromic acid and dichromic acid.
Diarsenic pentaoxide
Diarsenic trioxide
Furan
Hydrazine
o-Toluidine
Strontium chromate
1,2-Dichloroethane
Arsenic acid
Phenolphthalein
Trichloroethylene

Documentation Required

Detailed toxicity analysis of the various releases or emissions during the process.

Note: *If the process does not use any toxic or hazardous substances, then the company is eligible for maximum points. The company needs to provide a self declaration to indicate that the processes do not use any hazardous or toxic substances.*

Approach

Under Product stewardship Credit 4, the first step is to create a list of hazardous or toxic substances directly present in the product/service or used in the manufacturing process. This list of hazardous and toxic substances can be obtained from List of Hazardous and Toxic Chemicals in the Manufacture, Storage and Import of Hazardous Chemical Rules 1989.

Once an inventory of hazardous substances used is created, the next step is to analyze and create an action plan on how these hazardous substances can be eliminated in the long term and substituted or gradually phased out in the short term. Various policies based on precautionary principle should be framed. These policies should have a goal to manufacture products that don't contain any hazardous substances that pose a threat to human health or environment. It is essential to work with all the stakeholders and suppliers in identifying the hazardous substances present in the products (or used in the processes) supplied by them. A special team dedicated to this activity should analyze each and every raw material that goes into manufacturing a product and its chemical compound. It is equally important to address the concerns raised by public about impact of these substances.

Regular monitoring mechanism is required to ensure that products and processes are analyzed for their toxicity to human health and environment and that goals are met. Companies can also go one step further in identifying what are the substances that may pose a threat in the future to the safety of its employees and environment at large.

Product stewardship credit 4 awards 5, 10 or 15 points for reducing the percentage of hazardous or toxic substances used in the product/service by 10, 20 or 30 percent respectively. Similarly, credit 5 awards 5 or 10 points for reducing the percentage of hazardous or toxic substances used in the process by 10 or 20 percent respectively.

Case Study 1- Reduction in Hazardous Substances in Product

A leading IT company not only launched 100% Restriction on Hazardous Substances (RoHS) complaint greenware products, but also committed to "Beyond ROHS". They set a target to launch a line of desktops that are Poly vinyl chloride (PVC) and Brominated flame retardant (BFR) free. The following approach was applied to achieve the goal:

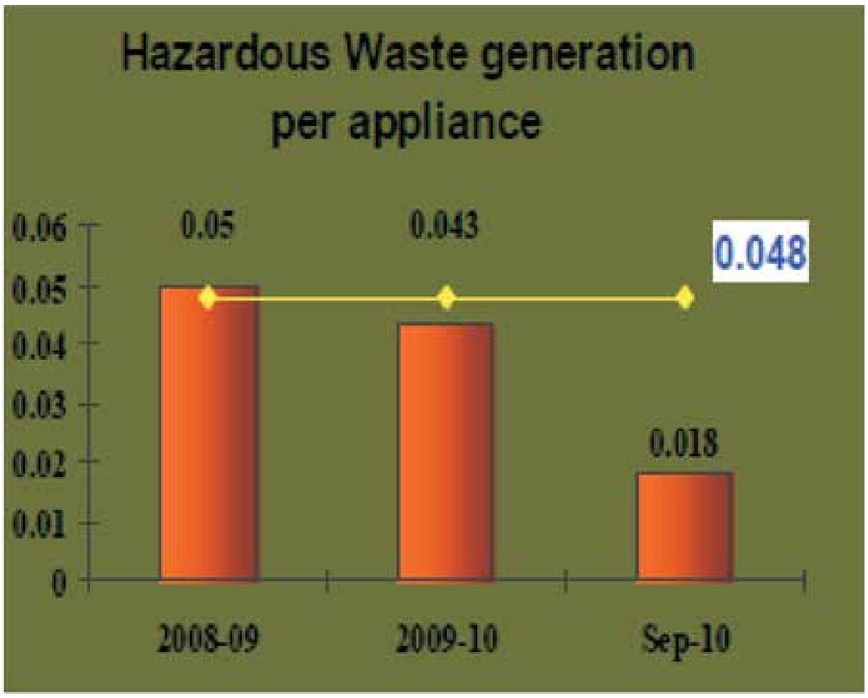
1. Understand composition of component products (PVC, BFR and also chemicals like phthalate, beryllium and antimony)
2. Joint review of data provided between the procurement team and the supplier.
3. Devise action plan for eliminating identified substances from the components.
4. Compliance monitoring – with a focus on mentoring in the first year.
5. Renewed procurement policy and contracts.

Based on the material analysis of components, the company identified 13 products sourced from vendors that contained 'Beyond RoHS' hazardous substances. These 13 products were sourced from a list of 37 vendors. The team worked closely with the suppliers for a year to ensure compliance of 30 vendors (81%) covering 100% of the targeted components. External auditing and self declaration were added in the contracts as part of renewed procurement. Vendor performance ratings now include compliance and performance on the agreed initiatives. The company identified hazardous substances and created a phase out plan as shown below.

S. No.	Name	Permissible Quantity (PPM)	Strategy
1	Polychlorobiphenyls (PCB)	1000	Banned
2	Refractory Ceramic Fibers	Restricted	Banned
3	Asbestos and its compounds	Restricted	Banned
4	Azo dyes/colorants	100	Banned
5	Ozone depleting substances	Restricted	Banned
6	Nickel and its components	1000	Banned
7	Mineral Wool	Restricted	Banned
8	Lead and its compounds	1000	Aligned to ROHS EU norms 2006
9	Cadmium	100	Aligned to ROHS EU norms 2006
10	Chromium IV	1000	Aligned to ROHS EU norms 2006
11	Mercury	1000	Aligned to ROHS EU norms 2006
12	Polybrominated Biphenyl (PBB)	1000	Aligned to ROHS EU norms 2006
13	Polybrominated Diphenyl Ether (PBDE)	1000	Aligned to ROHS EU norms 2006
14	Polyvinyl Chloride (PVC)	Restricted	Eliminated *
15	Brominated Flame Retardants	Restricted	Eliminated *
16	Phthalates	1000	Elimination by FY 2010
17	Short chain Chloro Paraffin, Alkanes	1000	Control within Limits
18	Antimony and its compounds	1000	Elimination by FY 2010

Case Study 2- Reduction in Hazardous Substances in Product

Ozone layer in the earth's atmosphere has a high concentration of ozone that absorbs ultra violet rays which are harmful to life on earth. Use of Chlorofluorocarbons (CFC) and Hydrochlorofluorocarbons (HCFC) causes depletion of this ozone layer. In its pioneering effort to protect the environment, a leading appliance manufacturing company manufactures both CFC and HCFC free refrigerators. Normally R134a is used as refrigerant which is CFC free (Ozone Depletion Substances=0 but Global Warming Potential=1600). The company uses CARE-30 as refrigerant (Ozone Depletion Substances=0 & Global Warming Potential=3). The company is also reusing/ recycling other hazardous wastes like hydraulic oil after filtration is reused, installation of new powder coating booths that results in reduction of epoxy polyester powder rejection, elimination of phosphate sludge due to use of new cold degreasing process for pretreatment. Foam pieces from rejected cabinets and doors are also reused in new doors.



Case Study 3- Reduction in Hazardous Substances in Product

Propellants used in inhalers for asthma and chronic obstructive pulmonary disease represented approximately 40% of a pharmaceutical company's total carbon footprint. They contained either hydrofluoroalkanes (HFAs) or chlorofluorocarbons (CFCs) which are potent greenhouse gases. CFCs also damage the ozone layer. By end of 2010, the company had completely eliminated the use of CFCs, replacing them with HFAs. This has reduced emissions associated with inhaler products from 24 million tonnes CO2e in 1998 to approximately 4.7 million tonnes in 2010. Dry powder inhalers which do not use a propellant are being promoted.

Research programmes to find effective ways to further reduce the impacts from these products include:

- Using different valves on metered dose inhalers that require less propellant and therefore release less gas
- Developing all new drug molecules only in dry powder formulations which do not require propellants
- Searching for alternative propellants with a lower global warming potential than HFAs
- Investing in programmes to recycle devices when the patient has finished taking their medication, including recovering residual propellant. Take-back schemes began in the US in 2010 and a pilot scheme will start in the UK in 2011.

Extended Producer Responsibility

PS Credit 5 **Points: 10**

Goal

To ensure appropriate steps are taken for reclaiming and reusing the products at the end of their useful life.

Compliance Options

Product take back & Recycling - Company should have a system for product take back which will involve the following steps:

- Collection
- Environmentally-sound treatment of collected products
- Use of products and materials in the form of re-use and recycling

Mechanisms should have the capacity to provide efficient and easy product recovery options directly to customers to facilitate responsible product retirement.

Safe Disposal - Employ an environmentally friendly treatment procedure or method to dispose off products which cannot be reused or recycled. The disposal method for the product should be as per the law of the country.

The points are awarded as given below:

Credit	Description	Points
PS Credit 5.1	Product take back and recycling - Company should have a system for product take back which will involve collection, environmentally sound treatment of collected products, use of products and materials in the form of reuse and recycling. Mechanisms should have the capacity to provide efficient and easy product recovery options directly to customers to facilitate responsible product retirement.	5
PS Credit 5.2	Safe Disposal - Employ an environmentally friendly treatment procedure or method to dispose off products which cannot be reused or recycled. The disposal method for the product should be as per the law of the country	5

Documentation Required

1. Detailed documentation of the programs implemented by the company to ensure the end of life management of the product.
2. Detailed documentation of the various modifications adopted in new and existing products or processes to reduce their negative impact during procurement, manufacturing and use of the product.

Approach

Product take back & recycling:

The rapid increase in production and consumption of products has led to an increase in the volume of products for disposal. This has resulted in large volumes of waste showing up at municipal landfills, leading to global collaboration to promote producer responsibility for proper disposition and recycling of products.

Globally responsible producers of products should provide end-of-life programs that reduce the overall impact on the environment. These end- of-life programs are designed to reuse or harvest the material commodities contained in the product collected and return those materials to the market where they are made into new products. This promotes efficient and sustainable production and consumption. Product take back and recycling program also enables businesses and consumers to properly dispose of surplus products that have reached their end-of-useful-life.

Company should have a system for product take back which will involve the following steps:

- collection of products
- environmentally-sound treatment of collected products
- use of products and materials in the form of re- use and recycling

Product stewardship credit 6 awards 5 points for product take back and recycling programs.

Safe Disposal: Unsafe disposal of products that contain hazardous materials can pollute the environment and poses a threat to human health. Companies should employ an environmentally friendly treatment procedure or method to dispose off products which cannot be reused or recycled. Product Stewardship Credit 6 awards 5 points for safe disposal initiatives adopted by the company.

Design for Environment: Design for environment employs a variety of design approaches that attempt to reduce the overall human health and environmental impact of a product, process or service, where impacts are considered across its life cycle. This ensures that raw material extraction (mining, drilling, etc.), processing (processing reusable materials, metal melting, etc.) and manufacturing are done using materials and processes which are not dangerous to the environment or the employees working on said processes. This includes the minimization of waste and hazardous by-products, air pollution, energy expenditure and other factors.

Company should indicate the various modifications adopted in new and existing products or processes to reduce the negative impact during procurement, manufacturing and use of the product. This can be a modification or change in any of the following areas: material innovation, modular design, energy efficiency, hazardous material substitution and design for recycling. Product Stewardship Credit 6 awards 5 points for design for environment program.

Case Study 1- End of Life Vehicle Recycling

A leading automobile company with an aim to make vehicle dismantling and recycling more environment friendly has set clear quantified targets for reuse, recycling and recovery of vehicles. The company is committed to comply with European Union Directive 2005/64/EC. The legislation mandates an environment friendly treatment of vehicles reached to end of their useful life. A four step procedure is adopted for the implementation of recyclability of end of life vehicles:

- Defining standard material classification: Various material grades used in the vehicle are characterized as per their recyclability potential. Based on the recyclability potential and position in the vehicle, the masses of materials are used to calculate performing recyclability and recoverability rates of complete vehicle as per ISO standards. To ease recycling of plastics used in the vehicle, a list of proven recycling technologies has been created.

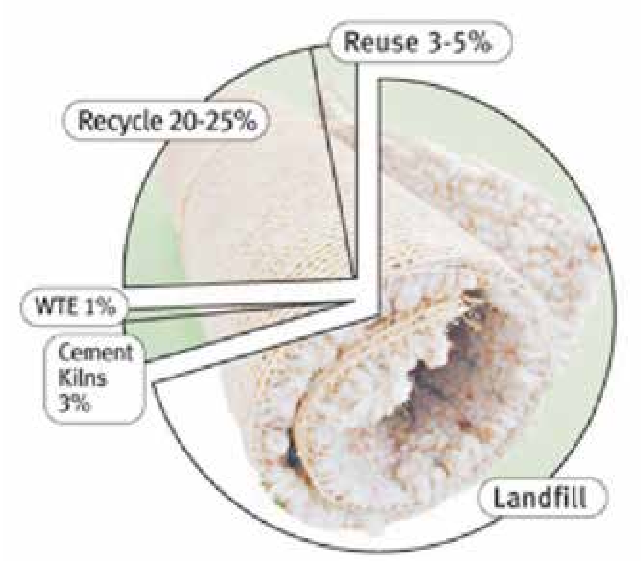
- Material breakdown- data collection from full supply chain: Suppliers are instructed to compile complete material breakdown details in a particular format and submit to the company during production part approval process stage.

- Managing material breakdown details of parts- The compliance manager verifies the data provided by the supplier on a software and cross checks for weight details, material breakdown, polymeric park marking and hazardous content of parts.

- Reporting recyclability & recoverability levels against vehicle bills of materials as per ISO 22628:2002- final recyclability and recoverability levels of each part of the vehicle are analyzed. This is used to enhance the recyclability level for complete vehicle.

Case Study 2- Extended Producer Responsibility by Carpet Manufacturing Companies

As a result of mounting quantities of discarded carpet, a National Carpet Dialogue was held where carpet manufacturers helped set goals for reuse, recycling, energy recovery, and landfill diversion, as well as to set up a non-profit organization to meet the goals. This approach aims to reduce the environmental impacts of carpet throughout its life cycle – from design to end-of-life management. Carpet America Recovery Effort (CARE) funded and administered by the carpet industry involves multi-stakeholder group including members from the carpet industry and government was set up and is responsible for monitoring, evaluating, and assessing progress toward meeting the goals. More information can be obtained from www.carpetrecovery.org



Case Study 3- Extended Producer Responsibility

A healthcare products manufacturer focuses on extended producer responsibility in the following areas:

- Packaging
- Waste electrical and electronic equipment
- Batteries

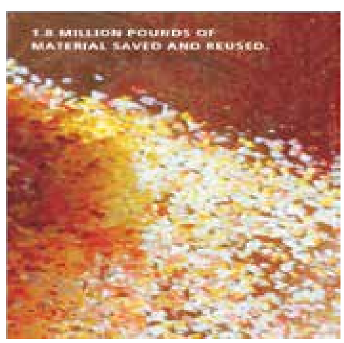
Medical devices are excluded from the requirements of RoHS legislation but the company has recognized the strategic importance of acting now to ensure affected products are RoHS-compliant ahead of the expected introduction of medical devices into RoHS legislation.

Packaging Sustainability Initiative: The goal of this initiative is to establish a corporate wide environmental strategy and design criteria for packaging systems. It focuses on creating sustainable designs that will support and optimize packaging systems from a lifecycle perspective. The following factors are considered while designing new packaging:

- Increasing use of recycled content
- Using packaging materials derived from renewable sources
- Optimizing packaging designs to use least amount of packaging necessary
- Using packaging materials that can be readily recycled
- Avoiding packaging materials with known negative impacts on the environment
- Increasing use of reusable packaging systems

Eco-footprint software tool has been purchased to benchmark existing and new packaging designs. Health care professionals are regularly trained on the proper use of products.

Even though most of the equipment manufactured by the company is intended for only a single use, the company has worked with regulators to allow pulse oximetry monitoring leads to be re-manufactured for reuse. Similarly, a program has been developed for reusing sterilized orthoscopic surgical tools. The facility in Raleigh has reclaimed 27 tonnes of material that otherwise would have shipped to landfills. The new manufacturing process has reduced the product weight of 3 to 5 percent saving raw material and disposal costs for customers.



Case Study 4- Wealth out of Waste

A leading paper company launched a recycling and product take back programme that has been instrumental in creating awareness amongst the public on the benefits of the Reduce-Reuse-Recycle approach. The recycling initiative works towards spreading awareness about recycling and encouraging people to segregate and dispose waste responsibly. It reaches out to schools, institutions and homes through its awareness building teams about source segregation of waste. After a stipulated period of time, the team goes back to collect the waste kept aside by schools/institutions/homes and pays them for the recyclables collected.

The initiative of taking back paper and recycling has several environmental benefits. Recycling of one tonne of waste paper saves 17 trees and 7,000 gallons of water. For example, one of the paper units of the company exclusively depends on recycled fibre. By end of 2011, the company had used close to 210,000 tonnes of waste paper per annum.

There are over 100 corporates supporting the program and more than three lakh households across South India are participating in the program. It is an internationally recognised initiative and has even won the prestigious Papyrus award by Bureau of International of Recycling.

Design for Environment

PS Credit 6 **Points: 15**

Goal

To demonstrate company's committment towards desinging of product which are environment friendly & sustainable.

Compliance Options

Design for Environment - Company should indicate the various modifications adopted in new and existing products or processes to reduce the negative impact during procurement, manufacturing and use of the product. This can be a modification or change in any of the following areas: Material Innovation, Modular design, Energy Efficiency, Hazardous material substitution and Design for Recycling.

PS Credit 6	Description	Points
	Sustainable Design (-ve impacts of the products/service) - Material Innovation, Modular design, Energy Efficiency of product, Hazardous material substitution, Design for Recycling and design for longevity of product.	15
PS Credit 6.1	Reduction of resources for product usage (Ex: Water, Energy, Material)	
	≥ 5% Reduction	5
	≥ 10% Reduction	10
PS Credit 6.2	Design for longevity of product.	5

Documentation Required

1. Documents to authenticate the process/product modifications adopted in new or existing product/process.

Engagements to voluntary Codes and Standards and also Directives for Reducing Environmental Impacts

PS Credit 7 **Points: 5**

Goal

Be part and support voluntary programs or initiatives aimed to reduce the environmental impact of the product / service

Compliance Options

Participation of the company in non-binding, voluntary initiatives and programs which are aimed at reducing the environmental impact of the product or service

Documentation Required

1. Documents to authenticate the participation in external initiatives.

Approach

Companies can engage in voluntary programs that work on reducing environmental impacts of products/ processes. Some of these programs have been listed below:

Mission on Sustainable Growth is a program initiated by Confederation of Indian Industry (CII). CII - Code for Ecologically Sustainable Business Growth was developed aiming to involve the top management of companies and seek voluntary commitments towards reducing the specific consumption of energy, water and other natural resources and promote ecologically sustainable growth in their companies.

Global Reporting Initiative is a non profit organization that promotes economic, environmental and social sustainability. GRI provides all companies and organizations with a comprehensive sustainability reporting framework that is widely used around the world.

forest Stewardship Council is an independent, non-governmental, not-for-profit organization establishedtopromotetheresponsiblemanagement of the world's forests. Established in 1993 as a response to concerns over global deforestation, FSC is a pioneer forum where the global consensus on responsible forest management convenes and through democratic process effects solutions to the pressures facing the world's forests and forest- dependent communities.

Ceres (Coalition for Environmentally Responsible Economies)

Ceres is the leading U.S. coalition of environmental, investor, and advocacy groups working together for a sustainable future. A community of forward-looking companies that have committed to continuous environmental improvement by endorsing the CERES principles, a ten-point code of environmental conduct.

Cement Sustainability Initiative (by World Business Council for Sustainable Development) is a global effort by 24 major cement producers with operations in more than 100 countries who believe there is a strong business case for the pursuit of sustainable development. Collectively these companies account for about one third of the world's cement production and range in size from very large multinationals to smaller local producers.

Responsible Care is the chemical industry's unique global initiative that drives continuous improvement in health, safety and environmental (HSE) performance, together with open and transparent communication with stakeholders. Responsible Care embraces the development and application of sustainable chemistry, helping industries contribute to sustainable development while allowing to meet the world's growing need for essential chemicals and the products those chemicals make possible.

Program for Endorsement of Forest Certif-

-ication is an international non-profit, non- governmental organization dedicated to promoting Sustainable Forest Management (SFM) through independent third-party certification.

Waste Electrical and Electronic Equipment forum is a not-for-profit association of 42 WEEE producerrespon sibilityorganisations(orcompliance schemes) in Europe. It was founded in April 2002 preceding the entry into force of Directive 2002/96/ EC on WEEE. The aim of the WEEE Forum is to provide a platform for these organisations to foster ideas and share best practices while optimizing environmental performance through a proper management of electrical and electronic waste.

Resources

1. CII Godrej Green Business Centre http://www.greenbusinesscentre.com/site/ ciigbc/greenbuild.jsp?servid=184748
2. GRI www.globalreporting.org/Pages/default.aspx
3. WRI http://www.wri.org/
4. FSC http://www.fsc.org/
5. Cement Sustainability Initiative http://www.wbcsdcement.org/
6. PEFC http://www.pefc.org/
7. WEEE http:// www.environment- agency.gov.uk / business/topics/waste/32084.aspx/ http://www.weee-forum.org/
8. Responsible Care http://www.icca-chem.org/en/ Home/ Responsible-care/

LIFE CYCLE ASSESSMENT (LCA)

Background

Awareness of the unsustainable levels of resource consumption and significant impacts of products on the environment is growing among consumers, policy makers and businesses. Companies have not always considered environmental impacts of the supply chains or the use and end-of-life processes associated with their products. Without attention to the full life cycle of goods and services (supply/use/end-of-life), the environment suffers, resulting in depletion of natural resources. There is a strong need to move towards more sustainable patterns of consumption and production. The challenge is to create a virtuous circle: improving the overall environmental performance of products throughout their life cycle.

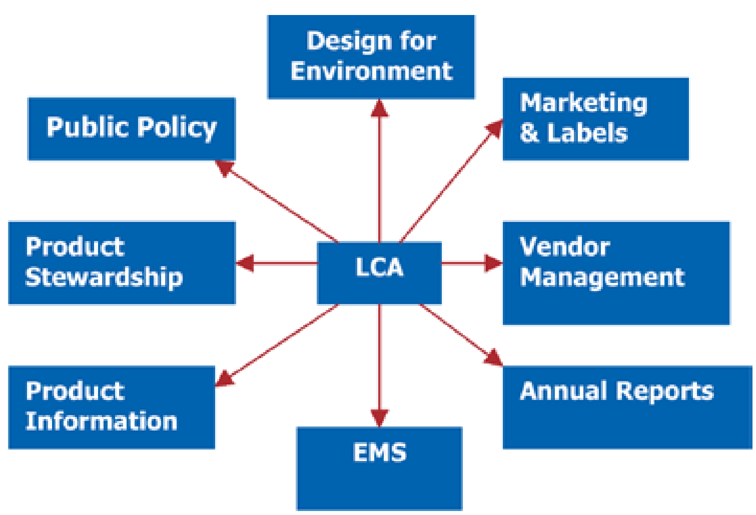
Life Cycle Assessment (LCA) is the most comprehensive method to assess the environmental impacts of a product, process or activity throughout its life cycle; from the extraction of raw materials through to processing, transport, use and disposal.

In early days it was primarily used for product comparisons, for example to compare the environmental impacts of disposable and reusable products. Today LCA has many applications. It is used as the basis for eco-labeling and consumer education programs throughout the world. LCA has emerged as a valuable decision-support tool for both policy makers and industry in assessing the cradle-to-grave impacts of a product or process.

LCA helps companies determine risks and environmental optimization potential for a product/ process at each stage of the life cycle. It helps companies in making the right choice as LCA considers all the life cycle stages of a product. It also helps consumers in making the right choice among various alternatives available. It helps spur environmental innovation. It generates an understanding of life cycle thinking and helps integrate it into day to day business at all levels.

LCA has many applications like:

- Marketing (does the product have less impact than others?)
- Purchasing (which product has the least impact?)
- Design (what should be changed to make product more environment friendly?)
- Benchmarking across an industry (who is best/ worst? where do we stand?)
- Year to year tracking of environmental performance (are we getting better or worse?)
- Policy (where should we have regulations to get bigger benefits?)



Leadership and Strategy

LCA Credit 1 **Points: 10**

Goal

Demonstrate the commitment of the organization to reduce the environmental impact of the product during its entire lifecycle

Compliance Options

Company should have a clearly defined strategy and target for conducting Life Cycle Assessment studies within a planned timeframe.

The strategy should also define the short term (upto 3 years) and long term target (above 3 years) for conducting Life Cycle Assessment studies.

A detailed action plan for conducting Life Cycle Assessment studies of new or existing products needs to be specified.

The points are awarded based as follows:

Credit	Description	Points
LCA Credit 1.1	Strategy & Targets (Short and Long Term)	5
LCA Credit 1.2	Action plan for conducting LCA	5

Documentation Required

1. Declaration from the responsible authority of the company indicating the commitment for conducting LCA studies over a given timeframe

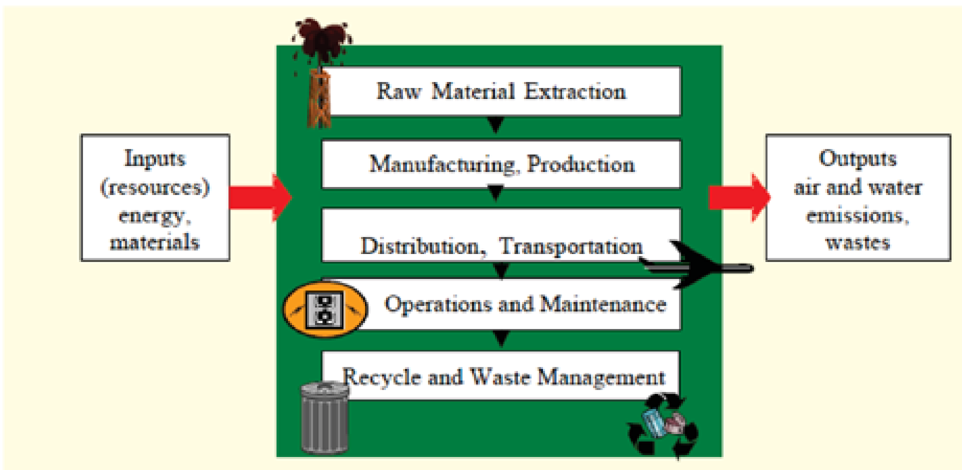
2. Description of the detailed action plan developed for conducting LCA studies

3. Public disclosures through company website, press release, GRI report or annual corporate report

Approach

LCA for a company's product will give important input on where the major environmental impacts occur. These major impacts can be either in the supply chain, in the processes owned by the company, or in the use or end-of-life of the product. With this knowledge, a company can formulate its environmental strategy aiming to improve their product's life cycle to reduce the overall impacts associated with the product.

The diagram below gives on overview of what is involved in conducing LCA.



Source: American Center for Life Cycle Assessment

There is a series of international standards for LCA, ISO 14040-14044. According to ISO 14040 (1997),

LCA is defined as "a technique for assessing the environmental aspects and potential impacts associated with a product by:

- compiling an inventory of relevant inputs and outputs of a product system;
- evaluating the potential environmental impacts associated with those inputs and outputs;
- interpreting the results of the inventory analysis and impact assessment phases in relation to the objectives of the study."

Resource use, human health and ecological consequences are the three general impact categories to be considered. In LCA the concept product refers not only to material products but also to services. LCA team is usually cross– functional and includes people from engineering, manufacturing or operations, environmental, marketing, and purchasing functions. The knowledge embodied in these different groups is essential to assure a successful outcome of the study.

Companies should identify products, services or processes that they intend to conduct LCA studies on. Credit 1 awards 5 points for setting short term and long terms targets for conducting LCA studies within a specified timeframe. Credit 2 awards 5 points for having a detailed action plan on how to conduct LCA.

Resources

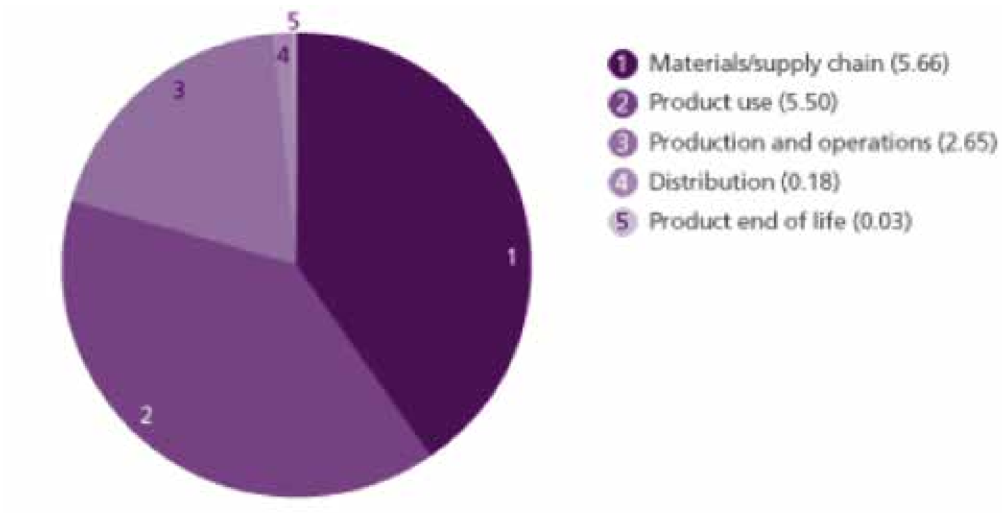
1. CII- Godrej GBC http://www.greenbusinesscentre.com/LCA
2. The Hitch Hiker's Guide to LCA by Henrikke Baumann and Anne Marie Tillman
3. American Center for Life Cycle Assessment: http://www.lcacenter.org/
4. Ecoinvent Centre http://www.ecoinvent.org/
5. http://www.life-cycle.org

Case Study 1- LCA by Pharmaceutical Company

A leading pharmaceutical company is committed to assess and minimize the cumulative environmental impact or footprint of their activities across the entire life cycle of the product, including the supply chain, use and disposal. They carried out LCAs of several key products and a carbon footprint of the entire value chain.

The company performed several LCAs, including assessing the footprint of products comparing packaging options and technology alternatives. The findings from the studies were integrated into product, device and packaging development to reduce their environmental impacts. In 2010 the company developed packaging and device life cycle tools and simplified webtool known as Fast Life Cycle Assessment for Synthetic Chemistry (FLASC) to be used by chemists and engineers. They routinely evaluate the environmental footprint of products and processes to explore ways to minimize their impacts. R&D and manufacturing operations use Fast Life cycle Assessment for Synthetic Chemistry (FLASC), a web-based tool that helps to identify the most sustainable processes and materials.

The diagram below shows the results of the carbon footprint study done in 2009 (million tones CO2 e per annum) over the entire lifecycle of the product-



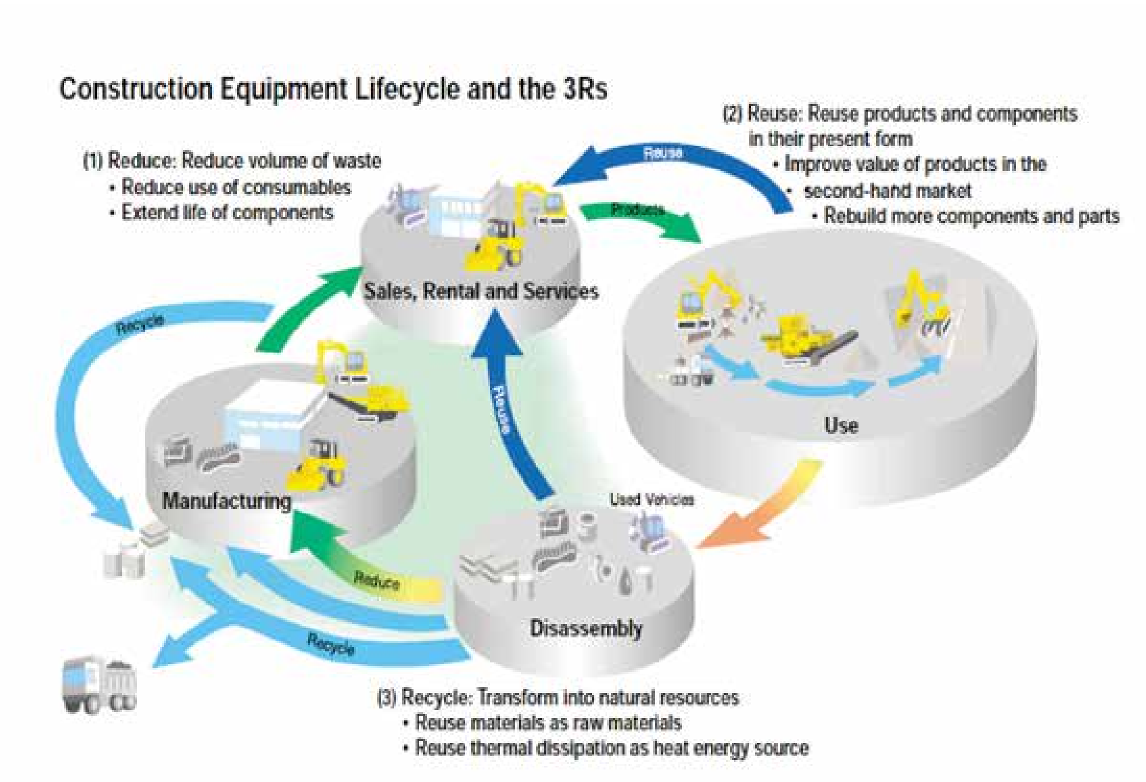
The above analysis emphasizes that the company needed to work with suppliers and others beyond the company's sites.

Case Study 2- LCA by Construction Equipment Manufacturer

A leading construction equipment manufacturer set four medium-term environmental technology development targets based on LCA as their operational guidelines for reducing the overall environmental impact of construction equipment. To fully implement these targets, they developed a software application in Fiscal 2000 to easily assess the environmental compatibility of construction equipment. Each of their divisions took operational initiatives to achieve these targets.

Targets:

- Reduce CO_2 emissions by 10 percent by 2010.
- Raise the recyclability rate to over 99.5 percent by 2010. (81 percent in 1998 for the PC200-6 hydraulic excavator, the top-selling model)
- Reduce environmentally burdensome substances by 50 percent from 1998 level by 2005 and by 75 percent by 2010.
- Reduce O&O (owning and operating) cost by 20 percent from 1998 level by 2005.



Life Cycle Management for Products/Service

LCA Credit 2 **Points: 10**

Goal

Create a management system to minimize environmental impact associated with a product during its entire life cycle.

Compliance Options

Life Cycle Management is a framework for business planning and management that helps businesses to analyze and identify the potential economic, social, or environmental risks and opportunities at each stage. Company should conduct Life Cycle Management review for new and existing products on priority basis. The review can be based on identifying and managing the environmental impacts in terms of carbon emissions, material consumption, water consumption and toxicity.

The points are awarded based on the percentage of products which have undergone a Life Cycle Management review:

Credit	Life Cycle Management for Products	Points
LCA Credit 2.1	> 25 % of Products covered	5
LCA Credit 2.2	> 50 % of Products covered	10

Documentation Required

1. Detailed documentation for Life Cycle Management reviews implemented for the products
2. Description of the tools & technologies which have been adopted for LCM review of the product or the process

Approach

Life cycle management (LCM) is a concept closely related to life cycle thinking. According to a publication "Business Guide to Sustainability" by UNEP and SETAC, LCM is a business management approach that can be used by all types of business (and other organizations) in order to improve their sustainability performance. LCM can be used to target, organize, analyze and manage product-related information and activities towards continuous improvement along the product life cycle. LCM is about making life cycle thinking and product sustainability operational for businesses that are aiming for continuous improvement. These are businesses that are striving towards reducing their footprints and minimizing their environmental and socio-economic burdens while maximizing economic and social values.

One key characteristic of LCM is for companies to look beyond their operations and look at downstream and upstream activities that are outside the company's direct control. If a company is serious about sustainability then it needs to incorporate new concepts like LCM into its sustainability agenda. Several different strategies have been used by companies to implement LCM in their operations. Among these concepts and tools are (eco-) design methods, green procurement, LCA, LCC, eco- and energy labeling, environmental product declarations, ecological and carbon footprint analyses, environmental performance indicators, and social sustainability assessments and approaches, in addition to organizational strategies that are essential for actual implementation.

From GreenCo perspective, since some of the above strategies areaddressed inotherparameters, it is essential for companies to consider life cycle thinking and conduct LCA for their products/ services. LCA credit 2 awards a maximum of 10 points for life cycle management of products/ services conducted by a company.

For example, life cycle of a mobile phone consists of the following stage:

- The product is first designed and then developed
- Raw materials are selected, procured and supplied
- The mobile phone is then manufactured, marketed, packaged and distributed
- It is then retailed, purchased, used and serviced
- Finally, it is recycled or disposed of

LCM would require a mobile phone manufacturer to look into each of the above stages from cradle to grave, conduct LCA studies to determine where the maximum environmental impact occurs, come up with strategies to reduce the impact at each stage, etc.

Resources

1. Life Cycle Management – A Business Guide to Sustainability by UNEP/SETAC http://www.unep.org/pdf/dtie/DTI0889PA.

Case Study 1- Life Cycle Management

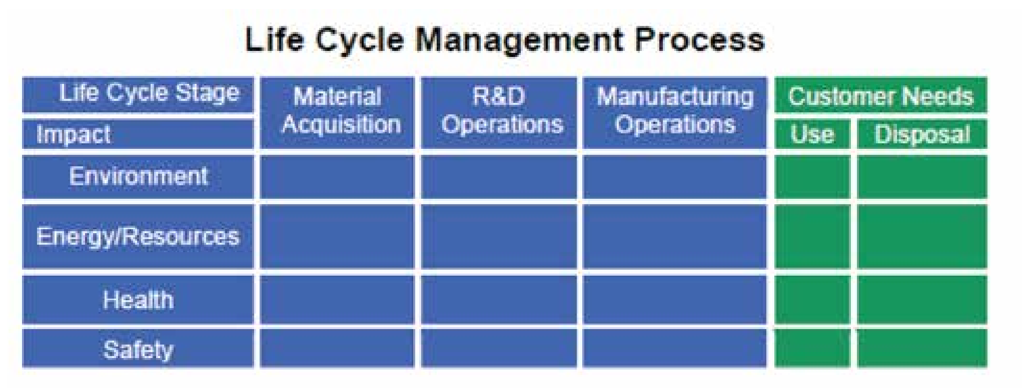
A leading company's commitment to sustainability pre-dates current thinking as shown in the diagram

below. The company has saved over US$1.2 billion since the program's inception. Back in 1975, the group introduced the Pollution Prevention Pays (3P) program, which aims to prevent pollution at source in products and manufacturing process, rather than remove pollution already created. In 2007, for example, the company had a total of 438 3P projects running, reporting a total of 51 million kg of pollution prevented, as well as a reduction of 2.5 million tonnes of CO_2 -equivalent greenhouse gases.

LCM is the company's second "arm" of sustainability. Since 2001, LCM has been part of corporate policy and is used as a process for:

- ♦ Identifying and managing the environmental, health, safety and regulatory risks and opportunities
- ♦ Efficiently using resources in the company's products throughout their life cycle

The company introduces about 500 new products each year, and LCM is a formal part of the company's new product introduction process worldwide. Cross-functional, new product introduction teams use a LCM matrix to systematically and holistically address the environmental, health and safety (EHS) opportunities and issues from each stage of their product's life.

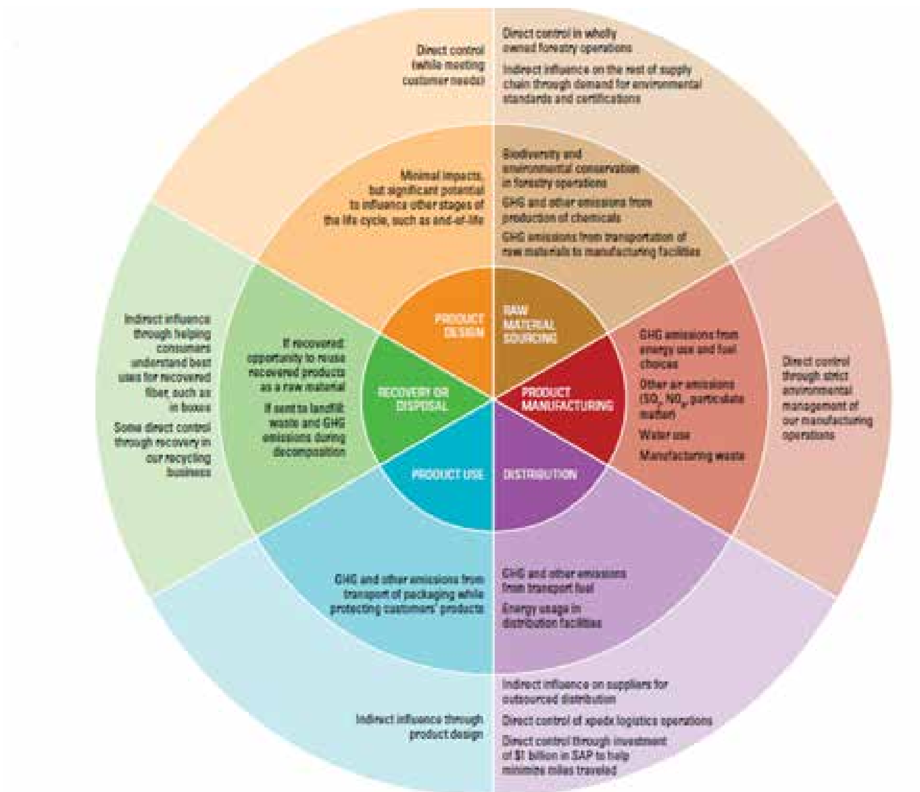


Life Cycle Management Process

Life Cycle Stage / Impact	Material Acquisition	R&D Operations	Manufacturing Operations	Customer Needs: Use	Customer Needs: Disposal
Environment					
Energy/Resources					
Health					
Safety					

Case Study 2- LCM by a Paper Company

Sustainability is integral to a leading paper company's approach at each stage of the product life cycle. In the diagram below, inner ring denotes the life cycle stage. Middle ring denotes the potential environmental impacts. Outer ring denotes the level of control the company has over the potential environmental impact. The company has direct control while sourcing raw materials, product manufacturing and product design. The company also practices indirect influence while distribution, recovery for disposal and product use.



The company's current efforts on LCA include:

- A completed pilot LCA for Coated Paperboard business to evaluate the environmental footprint of solid bleached sulfate products for ongoing improvement, including virgin fiber and recycled content product options.
- Assisting customers with their own internal LCA studies.
- Attending the University of Pennsylvania's conference on Life Cycle Assessment organized through Wharton's Initiative for Global Environmental Leadership.
- Participating in the development of data for corrugated and paperboard packaging that can be contributed to the U.S. Life Cycle Inventory (U.S. LCI) database as representative, average data for public use in LCA studies.
- Assessments are on-going of Foodservice and Imaging Papers products.

Life Cycle Assessment for any of the Products/Process

LCA Credit 3 **Points: 10**

Goal

Enables companies to analyze and make choices taking into account all the relevant impacts on the environment

Compliance Options

Company should conduct Life Cycle Assessment for any of the products/service in its major product line to identify the environmental impact

The assessment of the product environmental impact can be made adopting a cradle-grave or cradle – cradle approach.

The life cycle study should address any of the environmental impacts in terms of Carbon emissions, Material Consumption, Water Consumption and Toxicity.

Internal Study: Company should have conducted an internal Life Cycle Assessment study for its product to identify the various environmental impacts.

Internal LCA Study with Peer Review: Company should conduct a Life Cycle Assessment study for the product based on the ISO 14040-14044 standards. The study should be reviewed by a third party.

Credit	Description	Points
LCA Credit 3.1	Internal LCA Study	5
LCA Credit 3.2	Internal LCA Study with Peer Review	10

Documentation Required

1. Self declaration or third party certification of the LCA conducted by the company

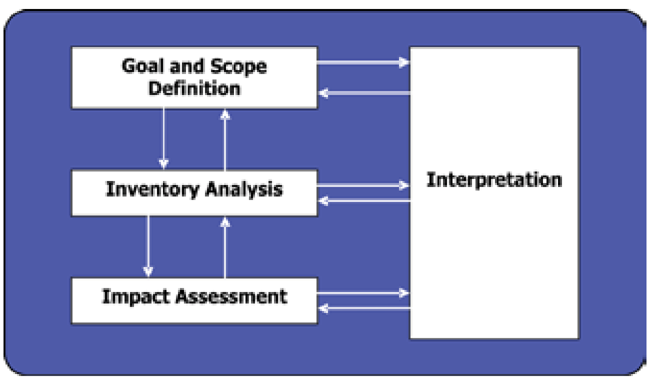
Approach

In the past, company efforts and policies to reduce their footprint were focused on production processes that have yielded significant results. Today, however, it is increasingly recognized that footprints can also be reduced by looking at procurement/material extraction as well as downstreamactivities, includingconsumer behavior and interrelations between product components (e.g., product and packaging).

LCA Methodology

LCA consists of four main stages:

- Goal and scope definition
- Inventory analysis
- Impact assessment and
- Interpretation

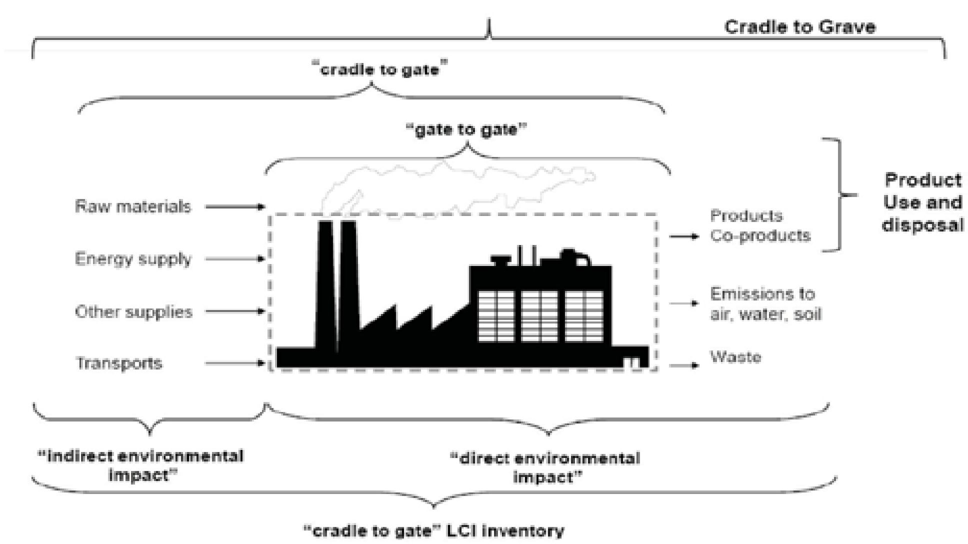


The above steps are outlined in International Organization for Standardization (ISO) standard ISO 14040, which is part of the ISO 14000 series on environmental management. ISO 14040 provides an internationally accepted framework for conducting LCA.

In the goal and scope definition, the product to be studied and the purpose of the study are decided on. The goal definition includes stating the intended application, the reasons for carrying out LCA and to whom the results are intended to be communicated. The goal and scope of the study should be clearly defined and consistent with the intended application. For example, LCA study by a detergent company included the following purpose: (1) to perform an inventory of all ingredients in two different detergent, (2) to compare two different detergent formulations with respect to environmental impact and (3) to identify the activities in the life cycle making the largest contributions to the total environmental impact.

Goal and scope definition also includes functional unit. Functional unit depends on the goal of the study. It is a measure of the function of the system being studied. It provides a reference to which inputs and outputs can be related. It also enables comparison of two essential different systems. For example, the functional unit for a paint system may be defined as 10 m2 wall surface protected for 10 years. A comparison of the environmental impact of two different paint systems with the same functional unit is therefore possible.

The following are also included in goal and scope definition: system boundaries such as which processes to include, types of environmental impacts being considered, decide if the study should include a review, whether to use site specific data or average data from multiple production sites, etc.



The scope of the study may be defined from cradle to gate, cradle to grave or cradle to cradle as shown in the diagram below. A classical LCA follows a cradle-to-grave approach covering the full life cycle from material extraction ('cradle') through the manufacture and use phase to the disposal phase ('grave'). A variant of the classical LCA is the cradle-to-gate approach. Cradle-to-gate is an assessment of a partial product life cycle from material extraction ('cradle') to the factory gate, i.e. before it is transported to the consumer. The use phase and disposal phase of the product are not considered.

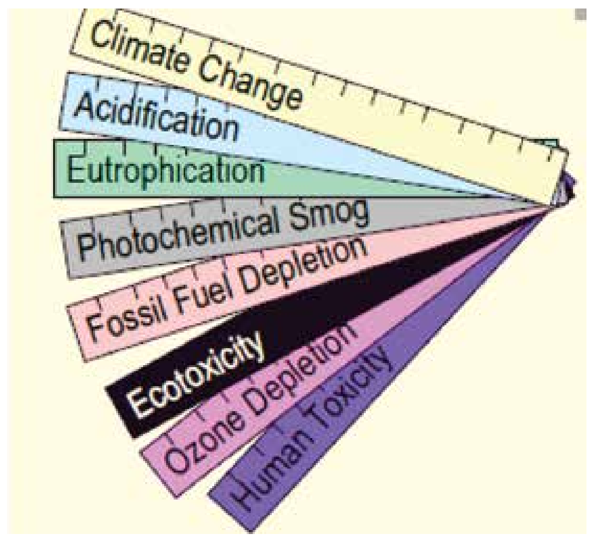
In the inventory analysis detailed information on materials, water and energy consumed as well as emissions and wastes generated in each step of the life cycle is collected. This foreground data is compiled into Life Cycle Inventory (LCI) datasets, collections of all mass and energy flows for all processes involved, with the help of specific LCA software. For important upstream processes, such as country-specific electricity mixes or basic materials, background datasets of average production conditions can provide information that would otherwise have to be collected individually.

The LCA inventory includes the following:

- Definition of system and system boundaries
- List of raw materials, their sources, energy involved in extraction, wastes and effluents produced
- Steps of processing the raw materials, stages involving combination of raw materials and manufacturing process
- Possibilities for recycling materials during processing and manufacture
- Accounting of energy and effluents from each of these steps
- Distribution and transportation needed for the product to reach the consumer
- Energy used and material waste and effluents produced during use and maintenance
- Possibilities of reuse of whole product or parts
- Possibilities of recycling of materials and the energy expenditure and effluent production in the recycling process

The LCA software then enables the user to identify the cumulative mass and energy flows throughout the entire life cycle of the product. This data is grouped and characterized according to different environmental impact categories, such as climate change, ozone layer depletion, etc. using impact assessment methods available in the software. Some environmental impact assessment methods even weigh the various environmental categories against each other in order to calculate aggregated results in different impact areas,

d.g. human health, or even single-score results combining all different environmental impactFinally, during the interpretation, the results of the impact assessment are discussed and analyzed. The major sources of environmental impacts along the life cycle are identified and recommendations for improving the environmental performance of the product are given. The assumptions and the data quality are discussed.



Source: American Center for Life Cycle Assessment

The results of the four steps of LCA are described in a detailed report and sent for peer review. Even if a review of the study is not intended, a detailed report helps the audience understand the LCA results.

Credit 3 awards companies 10 points for conducting LCA - 5 points if it's an internal study and 10 points if the LCA study is reviewed by a third party.

Case Study 1- LCA by Detergent Manufacturer for Product Improvement

A leading FMCG company has been using LCA since late 1980s to analyze products, identify product innovation opportunities and guide decision making on laundry detergents. Studies have shown that energy consumption in the home is by far the most substantial use of energy across a washing machine's lifetime. With this knowledge, detergents have been developed by several companies for washing clothes at lower temperatures.

To quantify the benefit of using lower temperatures, the energy savings of the 'use phase' in the home were measured. LCA was conducted to compare low temperature products with normal variants. Further evaluations were carried out to determine whether the ingredients in certain low temperature detergents caused any negative impacts, for example, via emissions to water.

Findings showed that cold water detergents can lead to significant savings in energy consumption and improvements across a range of environmental indicators such as climate change, acidification and photochemical ozone creation. Developing these detergents reduced the environmental impact through lower energy consumption, brought financial benefit to the consumer through lower electricity bills, and provided leading industries in this sector with a substantial business opportunity.

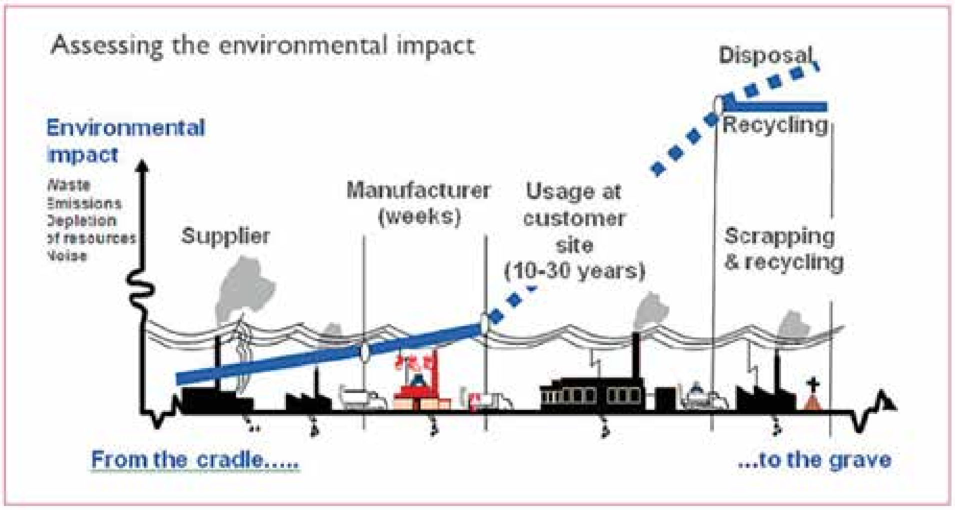
The table below shows results of the LCA study: per wash environmental savings of using Actif a froid (coolclean) versus base scenario.

Laundry detergent savings *vs 2001*	*Actif à froid % savings*	*Actif à froid savings per wash*	Unit
Primary Energy (total)	*27.37%*	*3.91*	*MJ*
Water consumption (total)	*0.96%*	*0.70*	*litres*
Solid Waste (total)	*18.71%*	*0.015*	*kg*
Climate change	*17.49%*	*48.18*	*g CO2-eq*
Depletion of the ozone layer	*14.40%*	*3.58E-06*	*g CFC11-eq*
Photochemical oxidant formation	*21.04%*	*0.00556*	*g C2H4-eq*
Human toxicity (USES 2.0)	*18.91%*	*3.89*	*g 1,4-dichlorobenzene eq*
Acidification (CML2000)	*14.44%*	*0.067*	*g SO2-eq*
Eutrophication (CML2000)	*15.56%*	*0.10*	*g PO4-eq*
Freshwater Toxicity (USES 2.0)	*14.33%*	*3649*	*g 1,4-dichlorobenzene eq*
Aquatic eco-toxicity (CML1992)	*-8.57%*	*-0.0023*	*m3 poll. Wat.*

Case Study 2- LCA of Large AC Motors

A leading power and automation technology company calculated the life cycle impacts of a large AC Motor1278 KW and 250 MVA Power Transformer. The results of the study revealed that major impacts (98%) are during the usage phase of the motor due to energy consumption. The company adopted internal calculation tools which are used to make accurate estimates of energy consumed, environmental impacts and overall efficiency of the product.

LCA helps to (a) check the viability of installing the product against other alternatives and (b) determine where the company's future initiatives should focus – usage phase or manufacturing phase.



There is a potential of about 80% of carbon savings which can be achieved by energy efficiency throughout lifecycle of the product. Results of the LCA study showing environmental impacts during the life-cycle are shown below:

a) Large AC motor 1278 kW

Environmental effect	Equivalent unit	Manufacturing phase	Usage phase	Total lifecycle
Global warming potential GWP	kg CO_2/kW	44.55	3060.70	3081.39
Acidification potential AP	kmol H+/kW	0.01	0.60	0.61
Eutrophication	kg O_2/kW	1.13	38.24	39.11
Ozone depletion potential ODP	kg CFC-11/kW	0.00	0.00	0.00

b) 250 MVA power transformer

Impact category	Equivalent Unit per MVA	Manufacturing	Use phase	Manufacturing + Use phase
Global warming (GWP)	kg CO_2	2600	219000	222000
Acidification (AP)	mol H^+	1450	41500	42900
Ozone depletion (ODP)	kg CFC-11	0.0003	0.0015	0.0018
Photochemical oxidant formation (POCP)	kg C_2H_4	0.99	43	43.9
Eutrophication (NP)	kg O_2	54.7	2500	2550

Environmental Impact Reduction

LCA Credit 4 **Points: 25**

Goal

To reduce the environmental effects of the product or process which arise during the various phases in a product's life cycle.

Compliance Options

Company should reduce the environmental impacts identified during the LCA study by significant amount over a specified timeline. The reduction can be in terms of carbon emissions, material consumption, water consumption or toxicity.

The allocation of points for the credit will be on the basis of the actual percentage reduction which has been achieved

Environmental Impact Reduction (Carbon/Material/Water/Toxicity)	**Points**
At least one project	5
> 5 % Reduction	10
> 10 % Reduction	15
> 15 % Reduction	20
> 20 % Reduction	25

Documentation Required

1. Detailed documentation indicating the percentage reduction in the environmental impact of the product or process.

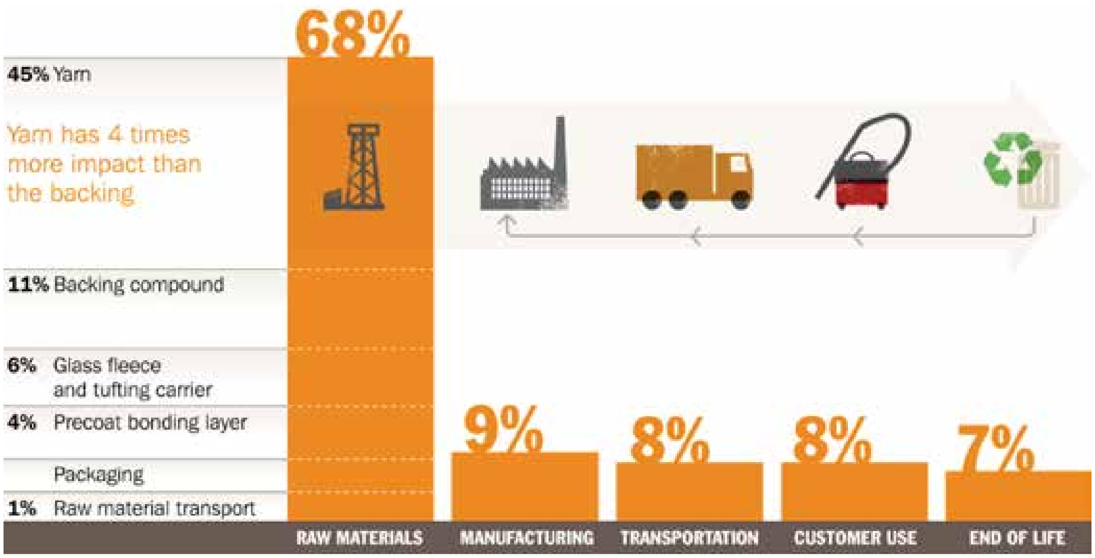
Approach

Every product has an impact on the environment during all stages of its life-cycle from extraction of resources to end-of-life treatment. The need to reduce the potential adverse impacts on the environment is well recognized around the world. However, the identification of these aspects and the prediction of their impacts is a complex process. It is important to ensure that an evaluation as to how products can affect the environment at different stages of their life-cycle is carried out in order to promote a reduction of potential adverse environmental impacts caused by those products.

The detailed explanation of the four stages of LCA, namely, goal and scope definition, life cycle inventory analysis, impact assessment and interpretation has been given in LCA credit 3. The final stage "interpretation" enables companies to identify areas of improvement throughout the life cycle of a product. Companies that are successful in identifying areas of improvement and achieving reduction in carbon emission, water consumption, material consumption or toxicity are awarded a maximum of 25 points under LCA credit 4.

Case Study 1- LCA by Carpet Manufacturer

A leading carpet tile manufacturer in the United States conducted LCA to be able to communicate the benefits of their product to consumers and also be able to identify opportunities for improvement. Many companies claim to be organic, natural, carbon positive, bio-degradable, etc but there were no companies who were able to communicate the environmental impact of a carpet tile throughout its lifecycle.



LCA showed that 68% of the environmental impacts were caused in the raw material extraction stage. Manufacturing had just 9% impact while transportation had 8% impact on the environment with respect to the entire life cycle. Customer use and end of life also had a low 7-8% impact on the environment when compared to raw material extraction. In the raw material stage, about 45% of the environmental load was caused by yarn production. This therefore helped the company gain direction for future sustainability initiatives.

The above LCA results helped the company determine three ways of improving the environmental impact of a carpet tile:

- Reduce the amount of yarn
- Increase yarn recycled content
- Create a smarter yarn

Environmental Product Declaration for Products/Service

LCA Credit 5 **Points: 10**

Goal

Communicate the quantified environmental data for products or systems based on information from a LCA conducted according to the ISO-14025 standards

Compliance Options

Company should carry out environmental product declaration for products of high environmental impact from a third party certifying body.

The allocation of the points for the credit is based on the number of Environmental Product Declaration (EPD) conducted by the company

Environmental Product Declaration	Points
At least one product	5
> 25 % of the products or products contributing to 25% of turn over	10

Documentation Required

1. Copy of the Environmental Product Declaration (EPD) conducted by the company
2. Public disclosures through company website, press release, GRI report, annual corporate report

Approach

There is an increasing demand in the market for quantified environmental information. To make environmentally preferable choices in a life cycle perspective there is an obvious need for well documented information about the environmental load of the products/services from cradle to grave. The overall goal of an Environmental Product Declaration (EPD) is to provide relevant, verified and comparable information about the environmental impact from products/services. EPDs are based on ISO principles for Type III environmental declarations or ecolables (ISO 14025) giving them a wide-spread international acceptance.

It includes information about the environmental impacts associated with a product/service, such as raw material acquisition, energy use and efficiency, content of materials and chemical substances, emissions to air, soil and water and waste generation. It also includes product and company information and contact details of the verification/certification body.

Accordingto International EPDsystem, EPD has two benefits in the context of effective communication:

- ♦ A dynamic communication tool concurrent with product development as changes in product development can be updated at any time in the EPD.
- ♦ One declaration for all national and international markets- EPDs are based on common report format that is followed by all in the national and international markets.

It also has the advantage of simplifying information exchange for purchasing and procurement. According to International EPD system, advantages for producers, importers and suppliers providing information are:

- ♦ A common reporting format
- ♦ Wide range of communication possibilities
- ♦ International recognition

Advantages for purchasers/procurers, retailers and customers receiving information are:

- ♦ Easy-access to verified information
- ♦ Provision of other relevant information
- ♦ Possibilities to make fair judgments

Last but not the least; EDPs facilitate in-company product related environmental work. It facilitates effective implementation and maintenance of environment management system and provide input for design for environment.

EPDs are backed up with LCA studies based on Product Category Rules (PCRs). PCR ensures comparability, flexibility, modularity and transparency. The following are included in PCR:

- ♦ Goal and Scope definition for the product LCA
  - Functional unit
  - Declared unit
  - System boundary
  - Description of data
  - Units
  - Criteria for the inclusion of inputs and outputs
- ♦ Inventory Analysis – data collection & allocation
- ♦ Impact category selection and calculation rules
- ♦ Additional environmental information
- ♦ Materials and substances for declaration
- ♦ Period of validity

EPD must be certified by a third party and the declaration is valid for three years. EPD is only a declaration which says nothing about whether the product is environmentally preferable or not. In short, they are LCA results intended to be communicated in market situations to ensure comparability between products. Its upto the user to read and interpret the information provided in an EPD.

An EPD has three main parts-

1. Description of the product and the company

2. Environmental performance

3. Contact information about the company and the accredited certification body

LCA credit 5 awards a maximum of 10 points for conducting and publishing EPD.

References

1. International EPD System http://www.environdec.com

2. Dantes http://www.dantes.info/Publications/publ_topic_EPD.html

3. http://www.environmentalproductdeclarations.com/

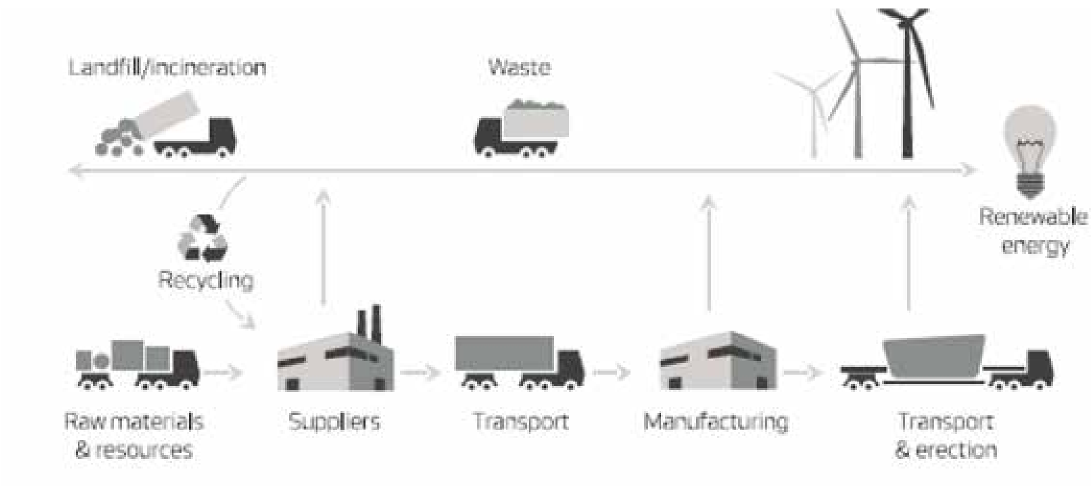
4. European Commission EPD schemes http://ec.europa.eu/environment/ipp/epds.htm

Case Study 1- EPD by Wind Turbine Manufacturer

A wind turbine manufacturing company published the results of the life cycle assessment study conducted on different wind turbines it manufactures through EPDs.

The LCA proves that wind power offers a strong environmental performance over the lifecycle of a wind turbine. The LCA analyses the entire lifecycle of a wind turbine like extraction, manufacturing of raw materials, production of wind turbines, transportation, erection, operation, maintenance, dismantling and disposal of wind turbines, their foundation and the transmission grid. The figure below illustrates the life cycle.

A wind turbine's energy balance reflects the time the turbine needs to be in operation before it has produced as much energy as it consumes throughout its lifecycle. It was found out after doing LCA that a 1.65 MW onshore wind turbine generates approximately 118,000 MWh during a 20 year period. The average energy balance of such a turbine is just 7.2 months. i.e. a 1.65 MW onshore wind turbine on an average location produces 33 times more renewable energy than it consumes during a 20 year period and is thus a more environment friendly option compared to conventional energy.



Case Study 2-EPD by Paper Company

A paper company in Indonesia conducted an EPD of an uncoated wood free fine paper. EPD explains the sustainability initiatives adopted by the company like obtaining fiber from certified forest management standards, environment management and monitoring plans, etc. The company's operations are certified under the Indonesian Eco Labeling Institute.

Some of the details of the EDP are shown below:

Details of the product and company

Manufacturer	ABC company
Product Description	Uncoated woodfree fine paper (EECF pulp)
Production Period	1st January 2007 to 31st January 2007
Production Unit	One Metric tonne
Contact Person name with email id	xyz@abc.om

Environmental Performance

Resource Usage	2007
Certified Forest Management Units (FMU)%	48.3
Pulpwood from certified forests (%)	80
Pulpwood from community tree farms (%)	0.18
3rd Party Certified	Yes
Energy Consumption (KWH/Product Unit)	800
Energy Efficiency (GJ/Product Unit)	2.88
Fibre Efficiency (Mt fibre/Product Unit)	3.81
Total Water Usage (m^3/Product unit)	9.87
Emissions to Air	2007
SO_2 from all sources (kg/product unit)	1.280
NO_x from Power generation (kg/product unit)	0.550
Total Suspended particulates (kg/product unit)	0.71
Emissions to Water	2007
COD (kg/unit)	1.63
BOD (kg/unit)	0.32
AOX (kg/unit)	0.03
Phosphorous (kg/unit)	0.007
Nitrogen (kg/unit)	0.053
Treated Liquid Effluent (m^3/product unit)	11.66
Emissions to Land	2007
Solid waste Land filled (m^3/product unit)	0.06
Solid waste land filled (OD/product unit)	46.04
Total Suspended particulates (kg/product unit)	0.71

Information on certification

ISO 14001:2004 and OHSAS 18001:2007 certifications by XYZ and is valid till November 2008 for the mill operations.

External Partnerships Contributing to LCI Database at Country Level

LCA Credit 6 **Points: 10**

Goal

Support programs which aim at making “Life Cycle Assessments” realistic, accurate and easily accessible

Compliance Options

Participation of the company in external initiatives aimed at creating the database for Life Cycle Inventory at the country level

The points for contributing data to National LCI database is 10

Documentation Required

1. Documents authenticating participation in the external initiatives

Approach

In developing countries, LCA capacity is low, and interest from industry and government is typically also low. LCA activity is usually only at an academic or research institute level. As many of these countries supply resources to developed countries, it is increasingly being recognised that LCI databases need to include the products and services from developing countries.

The present status of LCA in Indian industry is still at a nascent stage and the studies conducted so far are based on international background data, since India-specific background data for creating scientifically sound LCA is currently not available. The Indian LCI datasets can be developed based on statistical reports published by government or institutions as well as questionnaires sent to industries.

LCA credit 6 encourages industries to participate and contribute to life cycle inventory collection at the national level. It is aimed at making LCA a widely-accepted and applied tool for including environmental aspects in decision-making processes as well as for communication of quantified environmental data of products and services.

The ecoinvent Centre - a Competence Centre of Empa (the Swiss Federal Laboratories for Materials Science and Technology) is the world's leading supplier of consistent and transparent life cycle inventory (LCI). It contains international industrial life cycle inventory data on energy supply, resource extraction, material supply, chemicals, metals, agriculture, waste management services, and transport services. It is used by more than 2,500 users in more than 40 countries worldwide and is included in the leading LCA software tools. Confederation of Indian Industry (CII) - Sohrabji Godrej Green Business Centre is working with ecoinvent in collecting India specific life cycle inventory data for industrial processes. Companies that participate and contribute to such an inventory at a national level can get a maximum of 10 points. As a participant in such an initiative, companies would be required to share the following **information:**

- Raw materials
- Electricity and auxiliaries
- Fuel consumption
- Water consumption
- Transportation
- Waste generation
- Emissions to air
- Emissions to water

OTHERS

Green factory Building

A unit can either apply for Others credit 1- IGBC Green Factory Building Rating or credit 2 -Indoor Environment Quality, credit 3- Housing Facility and Employee Commute and 4- Landscaping and Biodiversity as shown in the table below.

Credit	Title	Points
OS Credit 1	Green building rating as per IGBC Green Factory Rating or LEED	50
OR		
OS Credit 2	Indoor environment quality	20
OS Credit 3	Site location	10
OS Credit 4	Landscaping	20

OS Credit 1 **Points: 50**

Goal

Encourage adaptation of green building practices in the unit.

Compliance Options

The unit should be certified by IGBC Green Factory Building rating system or LEED Green Building rating system.

Description	Points
Green Factory Platinum / LEED Platinum	50
Green Factory Gold / LEED Gold	40
Green Factory Silver / LEED Silver	35
Green Factory Certified / LEED Certified	30

Documentation Required

1. Copy of the LEED or IGBC certificate.

Background

The world is witnessing tremendous growth in construction and infrastructure. As the sector is rapidly growing, preserving the environment poses a series of challenges. Various green building certification systems across the globe certify factory buildings that are constructed keeping ecological sustainability in mind.

One such certification system is the Indian Green Building Council's (IGBC) Green Factory Building Rating System. This is a voluntary and consensus based programme. The rating system has been developed based on materials and technologies that are currently available. The rating system facilitates the development of energy efficient, water efficient, healthy, more productive and environmentally friendly factories. The programme is fundamentally designed to address national priorities and quality of life for factory workmen. The rating programme uses well accepted national standards and wherever local or national standards are not available, appropriate international benchmarks have been considered.

Constructing factories that are certified as green has the following benefits:

- Reduction in power demand by factory buildings
- Reduction in GHG emissions
- Reduction in potable water consumption
- Increase of green cover in new factory premises, thereby reducing heat island effect
- Recharge of aquifers with storm water
- Enhanced indoor air quality leading to increase in worker productivity by as much as 16% (source: Greening the Building and the Bottom Line, Rocky Mountain Institute, 1994).

Approach

IGBC Green Factory Building rating addresses green features under the following categories:

- Site Selection and Planning
- Water Conservation
- Energy Conservation
- Material Conservation
- Indoor Environment Quality and Occupational Health
- Innovation & Design Process

The existing factory buildings need to address the following measures while applying for certification under IGBC Green Factory Rating System:

- Soil erosion control measures in future
- Changes in design to accommodate require- ments of differently abled people, like easy access to lifts, rest rooms etc.
- Change to low flow water fixtures
- Rainwater harvesting
- Limit turf areas
- Have policy for use of green materials in future
- Minimum fresh air ventilation
- Comfort conditions
- Use eco-friendly housekeeping materials

Different levels of green building certification are awarded based on the total points earned. However, every green factory building should meet certain mandatory requirements which are non- negotiable. The rating system is valid for 3 years. The various levels of rating awarded are:

- 'Certified' to recognize best practices
- 'Silver' to recognize outstanding performance
- 'Gold' to recognize national excellence
- 'Platinum' to recognize global leadership

Certification Level	Points
Certified	51-60
Silver	61-70
Gold	71-80
Platinum	81-100

In addition to IGBC, Green Factory rating, companies can also be certified by LEED. OS credit 1 awards 50, 40, 35 or 30 points for units certified as platinum, gold, silver or certified by IGBC or LEED respectively.

Resources

1. Indian Green Building Council http://www.igbc.in

Case Study 1- Green Factory Building

A FMCG facility in Bangalore, India is certified as "platinum" by Indian Green Building Council Green Factory Rating System. The factory has the following features that won the company platinum rating:

- 100% on-site treatment of waste water
- Rain water harvesting ponds with total capacity of 8,700 cu.m
- Low Flow Water Fixtures that lead to 35% reduction in potable water use
- Water efficient management techniques for irrigation that also won the company 'CII National Award for Excellence in Water Management 2010'
- 18.9 MW wind turbines that caters to all properties in Karnataka
- Excellent day lighting for all regularly occupied spaces
- Eco-friendly building materials
- Eco-friendly house keeping chemicals
- Break-out spaces for employees

Case Study 2- Green Factory Building

India's leading manufacturer of diesel and natural gas engines has been certified "gold" by Indian Green Building Council Green Factory Rating System. The factory building includes the following features:

- Ventilation through wind towers for the entire factory
- Excellent day lighting-100 % naturally lit building
- Sewage treatment plants capable of treating 100% of wastewater generated
- 41% reduction in energy consumption
- Energy efficient lighting systems, efficient fans and ventilation system using wind power
- Water conservation initiatives like use of low flow and flush water fixtures, efficient irrigation systems, rain water harvesting
- No night sky pollution- exterior lighting power density does not exceed 80% for exterior areas over Energy Conservation Building Code.

Indoor Environment Quality

OS Credit 2 **Points: 20**

Goal

Provide a healthy and safe indoor working environment for employees and increase productivity.

Compliance Options

OS 2.1 Fresh Air Ventilation

Install fresh air delivery systems in all the occupied spaces of the unit building to meet the criteria below:

Air conditioned

Provide ventilation rates higher than those mentioned below:

Location	Minimum Airflow
Unit area	20 cfm per person + 0.12 cfm per sq ft
Office area	5 cfm per person + 0.06 cfm per sq ft
Cafeteria	7.5 cfm per person + 0.18 cfm per sq ft
Day care	10 cfm per person + 0.18 cfm per sq ft
Classrooms	10 cfm per person + 0.12 cfm per sq ft
Wood / Metal shop	10 cfm per person + 0.18 cfm per sq ft
Conference / Meeting rooms	05 cfm per person + 0.06 cfm per sq ft
Computer lab	10 cfm per person + 0.18 cfm per sq ft
Storage rooms	0.06 cfm per sq ft
Warehouse / Stores	0.06 cfm per sq ft

Points for OS credit 2.1 are awarded as specified below:

Percentage improvement over minimum fresh air	Points
> 20 % improvement over minimum fresh air requirement	5
> 30 % improvement over minimum fresh air requirement	10

OR

Naturally conditioned

Provide openings such that the ratio of openings to carpet area is at least 2%.

Points for OS credit 2.1 are awarded as specified below:

Opening to Carpet Area Ratio	**Points**
Opening to Carpet Area Ratio ≥3 %	5
Opening to Carpet Area Ratio ≥4 %	10

OR

forced ventilation

Provide increased air changes per Hour (ACH) than those mentioned below:

Location	**Air Changes per Hour (ACH)***	**Location**	**Air Changes per Hour (ACH)***
Assembly Rooms	4	Engine rooms	15
Boiler Rooms	15	Factories and workshops	8
Canteens	8	Foundries	15
Compressor rooms	10	Gymnasium	6
Conference rooms	8	Offices	6
Dye works	20	Stores and Ware houses	3
Electro plating shops	10	Welding shops	15

* If areas are not addressed in the above table, provide at least 8 air changes per hour

Note: Volume measured at 4.25 meters height from the floor Points for OS credit 2.1 are awarded as specified below:

Percentage Improvement over minimum Air changes per hour	**Points**
> 20% improvement over minimum air changes per hour	5
> 30% improvement over minimum air changes per hour	10

Note: If a unit has a combination of any of the above three ventilation techniques (air conditioned, natural or forced), the distribution of points is based on the share of area under the particular ventilation technique with respect to the total area.

OS 2.2 Low VOC paints

Use paints with low or no VOC content to cover 100% of interior wall surface area. For other VOC emitting materials like adhesives and sealants used within the interiors, ensure that the VOC content does not exceed the limits as specified in the table below.

vOC Limits for materials like adhesives and sealants

Type of material	vOC Limit (g/L less water)
Paints and Coatings	
Anti-corrosive / Anti-rust paints	250
Flat (Mat) paints	50
Non flat (Glossy) paints	150
Varnish	350
Adhesives and Sealants	
Indoor carpet adhesives	50
Glazing adhesives	100
Tile adhesives	65
Wood	30
Wood flooring adhesives	100

Description	Points
Use of paint with low/ no VOC – 3 points Adhesive and sealants with VOC content within the limit- 2 points	5

OS 2.3 Eco friendly house keeping chemicals

Use products / chemicals for house keeping that meet Green Seal standard (GS-37) or other equivalent standards.

Description	Points
Use eco friendly house keeping chemicals that meet GS-37 or other equivalent standard	5

Documentation Required

1. Provide specific information regarding the fresh air intake volume for each occupied zone to demonstrate that the design exceeds minimum fresh air compliance options.

2. Provide (letter/brochure) from the manufacturer indicating the VOC limit of the paints, coatings, adhesives and sealants used. Provide purchase invoices and supporting photographs of paint containers specifying VOC content.

3. Provide MSDS cut-sheets / specifications for all cleaning products used.

Background

According to US Environmental Protection Agency, majority of human population spends an average of 90% of their time indoors, where levels of pollutants may be two to five times–and occasionally more than 100 times–higher than outdoor levels. In its 1999 Air Quality Guidelines, the World Health Organization states that most of a person's daily exposure to many air pollutants comes through inhalation of indoor air. This emphasizes the need for optimal indoor environmental quality (IEQ) strategies. Such strategies reduce potential liability for design team members (including building owners), increase the resale value of the building, and increase productivity of building occupants. IEQ strategies include issues related to indoor air quality (IAQ) such as increased ratios of filtered outside air, ventilation effectiveness, moisture management and control of contaminants. Prevention of air quality problems is generally much less expensive than cleaning up after these problems occur.

Approach

There are three approaches that are awarded points for improved indoor air quality under others parameter, namely,

- Fresh air ventilation
- Low VOC paints
- Eco friendly house keeping chemicals

fresh air ventilation

In a factory it is extremely vital to have fresh air ventilation since it has both process heat loads and normal loads. Having adequate fresh air will impact the indoor air condition and quality. Naturally conditioned facility buildings may consider having window openings to bring in the fresh air. Incase of forced ventilation systems, fresh air can be pumped into the spaces. In areas, where the fresh air temperatures are either too high or too low, consider treating such air using systems like geothermal, wind towers, earth tunnel cooling, direct/ indirect evaporative cooling, etc.

Evaluate the project site prior to acquisition to avoid choosing a site with potential IAQ problems. These potential problems might include heavy traffic areas, nearby polluting industrial sites, or neighboring waste management sites. In addition, identify possible future uses of nearby sites that may impact outdoor air quality. Obtain ambient air quality data and local wind patterns from the local sources to identify sources of pollution most likely to affect the site.

After the building site has been chosen, identify site activities that may have a negative impact on air quality such as construction activities, materials installed in the building, and chemical handling activities during occupancy. Establish air quality standards early in the design process, and clearly state these design criteria in plans and specifications. Specify, design, and install fresh air intakes away from possible sources of contamination (at least 25 feet is recommended and 40 feet is preferable). Possible sources of contamination include loading areas, building exhaust fans, cooling towers, street traffic, idling

cars, standing water, parking garages, sanitary vents, dumpsters, and outside smoking areas.

Locating fresh air intakes appropriately requires coordination between HVAC designers and the project architect. Ensure that the outside air capacity for the ventilation system can meet the requirements of the referenced standard in all modes of operation. For air conditioned facilities, in case of more than 20% improvement over minimum fresh air requirement, 5 points are awarded. In case of more than 30% improvement over minimum fresh air requirement, 10 points are awarded. For naturally conditioned facilities, if the ratio of openings to carpet area is greater than 3%, 5 points are awarded. If the ratio of openings to carpet area is greater than 4%, 10 points are awarded. In case of forced ventilation, if there is more than 20% improvement over minimum air changes per hour, 5 points are awarded. If more than 30% improvement over minimum air changes per hour is achieved, 10 points are awarded. Most manufacturing facilities have a combination of air conditioned facility, naturally conditioned unit and forced ventilation.

Use of low VOC paints:

Material Safety Data Sheets (MSDS) from product manufacturers may not include information on VOC content. It may be necessary to request emissions test data from product manufacturers and compare this test data with comparable products. VOC emissions data should exclude the colorants in paints. For other VOC emitting materials like adhesives and sealants used within the interiors, ensure that the VOC content does not exceed the limits as specified in the table above.

Material selection is important to creating interior spaces with low-VOC levels. Locally sourced materials and those materials created with recycled content, rapidly renewable materials, and certified wood may have high VOC content and, thus, may be inappropriate for the project. Use of low-VOC products improves indoor air quality during the construction process as well as over the lifetime of the building.

Use of paints and coatings with low or no VOC, adhesives and sealants having VOC content within the limit will award the company 5 points under Others credit 2.2.

Use of eco friendly house keeping chemicals:

Adopt eco -friendly house keeping practices during maintenance / housekeeping activities by using bio-degradable chemicals, which address health, hygiene and well-being of maintenance staff & building occupants. Eco-friendly housekeeping chemicals may be used for cleaning of floors, walls, glazing surfaces, restrooms, etc. Use of eco friendly house keeping chemicals that meet GS- 37 or other equivalent standards will award the company 5 points under Others credit 2.3.

Resources

1. American Society of Heating, Refrigerating and Air Conditioning Engineers www.ashrae.org

2. U.S. Environmental Protection Agency's Indoor Air Quality website www.epa.gov/iaq

3. Master Painters Institute's Environmental Issues webpage: www.paintinfo.com

4. Green Seal www.greenseal.org

5. Carpet and Rug Institute www.carpet-rug.com

6. Janitorial Products Pollution Prevention Project www.westp2net.org/janitorial/jp4.htm

7. EPA environmentally preferable product information http: www.epa.gov/epp

Site Location

OS Credit 3 **Points: 10**

Goal

To reduce air pollution from vehicular movement as well as land development impacts from personal automobile use.

Compliance Options

The unit should provide housing facility that caters to 40% of employees within a distance of 5 km from the unit.

The unit should be located within 1 km walking distance from the railway station or within 0.5 km walking distance from a bus stop. Alternatively, the unit can provide shuttle service that caters to 40% of the employees.

Credit	Description	Points
OS Credit 3.1	Housing facility for 40% of employees within 5 km radius	5
OS Credit 3.2	Access to public transport / shuttle services	5

Documentation Required

1. Site plan indicating the location of the plant, township and housing facility. Details of the number of employees using the housing facility.
2. Site plan indicating the location of plant, township, highlighting the railway station / bus stop and distance between the station and the plant.
3. Description of the shuttle service provided by the company and percentage of the employees utilizing the shuttle facility.

Approach

The exhaust from automobiles pollutes the air and contributes to acid rain. Environmental impacts occur during extraction, refining and transportation of crude oil for gasoline production. Reducing private automobile use saves energy and reduces associated environmental problems. Fortunately, alternatives to conventional transportation methods exist. A large number of people are willing to use alternative means of transportation such as bicycles, mass transit and carpools if they are convenient and facilities are provided to encourage them.

The initial cost to design and construct a project in proximity to mass transit varies widely. During the site selection process, project owners should compare the cost of building sites in different areas to determine if a reduction in automobile use is possible and economical. Many occupants view proximity to mass transit as a benefit and this can influence the value and marketability of the building. Parking infrastructure and transportation requirements, disturbance of existing habitats, resource consumption, and future fuel costs should also be assessed.

Commuting strategies like bicycle and walking has many health benefits. Bicycling and walking also help in getting closer to the community, encouraging interaction among neighbors and allows enjoyment of surroundings in ways unavailable to automobile passengers.

The following strategies can be adopted to reduce the impact on the environment caused by employee commute:

- Provide functional and direct sidewalks, paths and walkways to existing public transport stations that are close to the facility

- Provide incentives such as transit/train/bus passes to encourage occupants to use public transport

- Provide shuttle services for employees to commute from their residence

- Encourage carpooling / explore the possibility of sharing facilities with different working groups for parking, shuttle and bike parks

- Use electric vehicles. Electric vehicle engines do not contribute to noise pollution relative to internal combustion engines. Alternative fuel vehicles have low or no tailpipe emissions. Apart from health benefits, lower emissions can also help cities meet government regulations.

Others credit 3.1 awards companies 5 points for building housing facility for 40% of the employees within 5 km radius and 5 points for access to public transportation or shuttle services.

- Selection of sites near public transits and household services that are accessible by safe and convenient pedestrian pathways

- Initiate dialogue with local authority to set us public bus stop

- Survey and analyze the travel route of employees and determine if the available public transportation options meets their needs

Landscaping

OS Credit 4 **Points: 20**

Goal

Encourage green landscaping and biodiversity such that landscapes are transformed to greener, healthier, inspirational and recreational places.

Compliance Options

A green belt of adequate width and density should be developed within and around the plant premises as per the CPCB guidelines (approximately 33% of the total land area). Points for credit 4 will be awarded for maintaining additional green belt above the standard requirement.

Credit	Description	Points
OS Credit 4.1	Maintain additional green belt ≥ 10 % of standard requirement	5
OS Credit 4.2	Maintain additional green belt ≥ 20 % of standard requirement	10

If the CPCB guidelines are not applicable, the unit should develop green belt in unused site areas. Points for credit 4 will be awarded as mentioned below:

Credit	Description	Points
OS Credit 4.1	Develop green belt ≥50 % in the unused site area	5
OS Credit 4.2	Develop green belt ≥75 % in the unused site area	10

Points will be awarded to units for maintaining bio-diversity and creating recreational and inspirational spaces for the employees.

Credit	Description	Points
OS Credit 4.3	Efforts to create and maintain bio-diversity by preserving native & adoptive species	5
OS Credit 4.4	Recreational and inspirational spaces	5

Documentation Required

1. Provide drawings, calculations and photographs indicating site area with natural topography (and / or) landscaped area

2. Types of native and adoptive vegetative species planted.

3. A brief write up on the initiatives taken to perverse biodiversity within and around the campus.

Approach

According to the United Nations Development Programme (UNDP), poverty and biodiversity are intimately linked. The poor, especially in rural areas, depend on biodiversity for food, fuel, shelter, medicines and livelihoods. Biodiversity also provides critical 'ecosystem services' on which development depends, including air and water purification, soil conservation, disease control, and reduced vulnerability to natural disasters such as floods, droughts and landslides. It is therefore vital to preserve the ecosystem from anthropogenic activities like construction of factories, buildings, townships, etc.

The construction process is often damaging to site ecology, indigenous plants and regional animal populations. Construction process can not only destroy plant habitat and wildlife but also wildlife corridors that allow animal migration. As animals are pushed out of existing habitat, they become increasingly crowded into smaller spaces. Eventually, their population exceeds the carrying capacity of these spaces and they begin to invade surrounding developments or perish due to overpopulation. Overall biodiversity, as well as individual plant and animal species are threatened by reduction of habitat areas.

Ecologicalsitedamagecan be avoided orminimized by limiting the extent of construction activities to certain areas on the site and by restricting the development footprint to the greatest extent possible. Protection of open space and sensitive areas through the use of strict boundaries reduces damage to the site ecology, resulting in preservation of wildlife corridors and habitat. Retaining a high proportion of open space for vegetation reduces storm water runoff volumes and natural features are available for wastewater or storm water treatment. Preservation of certain trees may reduce passive solar gains. Additional vegetation can assist with cool breeze and noise reduction and enhance the air quality.

Survey the existing ecosystem in and around the facility. Document existing water bodies, soil conditions, wildlife corridors, trees and other

vegetation, and map all the potential natural hazards. Consider the impacts of the proposed development on existing ecosystem and propose strategies to mitigate negative impacts.

Design a facility that minimizes disturbance to the existing ecosystem. Encourage preservation, conservation and restoration of existing natural site amenities. Where appropriate, build on parts of the site that are already degraded so as not to degrade undisturbed areas. Native or indigenous species is defined as native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes with no human intervention. Restore the native landscape of the site by preserving and planting native species to reestablish predevelopment site conditions. Retain the natural landscape in the site to the best extent possible. Avoid destruction of fully grown trees.

CPCB guidelines require certain plants to have at least 33% of area under landscape. Others credit 4.1 and 4.2 awards companies 5 or 10 points for creating green belt area greater than 10% or 20% respectively above the standard requirement (by CPCB). Others credit 4.3 awards companies 5 points for maintaining the biodiversity within and around the campus. Others credit 4.4 awards companies 5 points for creating recreational facilities within the campus.

Resources

1. CII Green Landscapes http: www.greenlandscape.in
2. Flowers of India http: www.flowersofindia.net
3. Daves Garden http: davesgarden.com
4. Rohith Nursery http: www.treetransplantation.in
5. ZTCInternational http: www.ztclandscapesolutions.com
6. ELT India http: www.eltindia.com/home.html

Case Study 1- Sustaining Biodiversity

A leading fertilizer company in Rajasthan in its endeavour to make their campus and nearby area green, started plantations around the proposed site even before the manufacturing facility was constructed. Initiatives were taken to conserve wildlife and preserve habitat of some endangered species at Sorsan preserve in Baran district of Rajasthan. A fund was set up in collaboration with Hadoti Naturalist Society (a local body) and forest department, Government of Rajasthan to support wildlife conservation.

With the efforts put up in the last two decades and continuous monitoring of the area in and around the campus, the area has become an abode for many endangered and migratory species. An ecological green township has been developed with modern facilities in the area which was once a rocky and barren land. The ecological township has more then 500 acres of green cover, 100 species of flora, and several animal species including avian species (both local and migratory, including peacocks) monkeys, rabbits, reptiles and many non-predatory animals. The company has regular interactions with Bombay Natural History Society (BNHS) on environmental issues. Officials of BNHS visit the campus from time to time and give suggestions and advice on improving the flora in the campus.

Case Study 2- Biodiversity Management Program

A leading consulting company views biodiversity management as an integral part of environmental policy. They have established biodiversity status for 9 campuses by conducting extensive site specific biodiversity surveys and based on this, implemented an action plan for conservation and enhancement.

Taxonomically, the flora present in campuses consists of 221 plant species belonging to 135 genera and 106 families. The diversified flora supports a variety of fauna. There are 123 animal species identified, including birds, butterflies, mammals and amphibians. The distribution of the various species in different locations is listed below

Facilty	Location	Flora	Fauna
Yantra Park	Thane	158	86
Banyan Park	Mumbai	146	91
Deccan Park	Hyderabad	103	55
Synergy Park	Hyderabad	140	48
Sholliganullur	Chennai	105	54
Seruseri	Chennai	77	40
Noida –II	Delhi	47	34
Mangaldas	Pune	115	76
Peepul Park	Trivandrum	83	39

Different flora conservation programs consisting of protection of traditional native plant species, transplantation of trees, greening-the-office program, environmental conservation (protection of rare and unique species like Baobob tree), establishment of medicinal garden, provision of nursery for propagation of plants, use of biotechnology for waste management (biodigester & vermicomposting) have been implemented in various campuses. Fauna conservation program consisted of creation of butterfly zones, bird habitat improvement program, snake conservation program and care for nature program to protect injured bird and other animals are implemented. Biodiversity awareness program consists of provision of tree/bird boards, class room/floor walk biodiversity awareness sessions for employee, nature track for employees for understanding & watching nature, etc.

Innovation

OS Credit 5 **Points: 40**

Goal

Award the unit for the exceptional and innovative performance above the requirements set by GreenCo rating system.

Compliance Options

Unit should showcase exemplary performance in any of the 9 parameters under GreenCo rating- energy efficiency, water conservation, renewable energy, waste management, greenhouse gas emissions, material conservation, green supply chain, product stewardship and life cycle assessment.

Credit	Description	Points
OS Credit 5.1 to 5.8	8 innovations (5 points per innovation)	40

Documentation Required

1. Details of the innovative project implemented including benefits achieved.

Approach

There are two types of innovation strategies and achievements that can qualify under this credit.

- ♦ The first type includes those initiatives that greatly exceed the requirements of existing GreenCo parameters. For instance, a project that incorporates use of recycled materials that exceeds the requirement of the parameter material conservation, recycling and recyclability or water efficiency measures that greatly exceed the requirements mentioned in the parameter water conservation.

- ♦ The second type of innovation strategies are those that are not addressed by any existing GreenCo parameter and that has a direct impact on the environment. Only those strategies that demonstrate a comprehensive approach and have significant and measurable environmental benefits are applicable. Following are the basic criteria for achieving points for a category not addressed by GreenCo:

    - The project must demonstrate quantitative environmental benefits (establish a baseline of standard performance for comparison to the final results).
    - The project concept developed must be applicable to other units or be replicable elsewhere.

Points awarded for one project at a specific point in time does not automatically constitute approval for similar strategies in a future project. Others credit 5 awards maximum of 40 points for 8 projects (5 points for each project).

GreenCo Accredited Professional (AP)

OS Credit 6 **Points: 10**

Goal

To support and encourage the involvement of Green Accredited Professionals in implementation and management of GreenCo rating system in the unit.

Compliance Options

The unit should have at least one GreenCo AP / IGBC AP / LEED AP in the project team

Description	Points
At least one Green Professional	5
≥ 3 Green Professionals	10

Note: The unit can apply for additional points under Others credit 5 Innovation until the GreenCo AP exam is launched.

Documentation Required

1. List of qualified green professionals
2. Copy of the certificates
3. Targets and strategies adopted to increase the number of green professionals

Approach

This credit focuses on the need to have staff that has been trained under various green certification programs like GreenCo, IGBC, LEED, etc. Participation in training programs like GreenCo will help in capacity building of the staff on specific skills required for GreenCo certification. For example, understanding the concept and process of conducting life cycle assessment, greenhouse gas inventorization, green supply chain, extended producer responsibility, energy conservation, water conservation, etc. This will help in coordinating the GreenCo implementation and documentation process in a much quicker fashion. The GreenCo / IGBC / LEED Accredited Professionals (AP) will understand the importance of each parameter of GreenCo and the correlations between the mandatory requirements and credits and their respective criteria. The GreenCo / IGBC

/ LEED AP should be an integral member of the GreenCo implementation team in the organization. CII-Godrej Green Business Centre organizes GreenCo / IGBC / LEED training programs that help and provide guidance in writing GreenCo / IGBC / LEED accreditation exams.

Resources

1. www.greenco.in

2. www.igbc.in

ANNEXURE

Annexure - A

Sector wise weightage

Green Rating System for Companies - Sectorwise Weightage

Sectors	Energy Efficiency	Water Conservation	Renewable Energy	GHG Reduction	Material Conservation, Recycling & Recyclables	Waste Management	Green Supply Chain	Product Stewardship	Life Cycle Assessment	Others (Ventilation, Site Selection & Innovation)	Total
Base Points	**150**	**100**	**100**	**100**	**100**	**100**	**100**	**75**	**75**	**100**	**1000**
Automobile	150	100	100	100	100	100	100	75	75	100	**1000**
Chemicals	150	100	100	100	100	100	100	75	75	100	**1000**
Engineering	150	100	100	100	100	100	100	75	75	100	**1000**
FMCG	150	100	100	100	100	100	100	75	75	100	**1000**
Glass	150	100	100	100	100	100	100	75	75	100	**1000**
Iron & Steel	150	100	100	100	100	100	100	75	75	100	**1000**
IT Hardware / Electronics	150	100	100	100	100	100	100	75	75	100	**1000**
Non Ferrous	150	100	100	100	100	100	100	75	75	100	**1000**
Petrochemicals	150	100	100	100	100	100	100	75	75	100	**1000**
Pharma	150	100	100	100	100	100	100	75	75	100	**1000**
Pulp & Paper	150	100	100	100	100	100	100	75	75	100	**1000**
Refineries	150	100	100	100	100	100	100	75	75	100	**1000**
Textile (Processing)	150	100	100	100	100	100	100	75	75	100	**1000**
Cement	200	100	100	125	100	100	50	50	75	100	**1000**
IT Services / Services	150	100	100	100	75	100	75	0	0	100	**800**
Hotel	150	150	100	100	100	150	150	0	0	100	**1000**

**** Hotel Sector - The assessment of the rating system will be for 8 criteria. The weightage for respective criteria is proportionally assessed from the main checklist***

Energy Efficiency (Max: 200 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
EE Mandatory Requirement - 1	**Energy Policy**		
EE Mandatory Requirement - 2	**Energy Management Cell & Energy Manager (certified by BEE)**		
EE-Mandatory Requirement - 3	**For all Designated Consumers, Mandatory Energy Audit & Monitoring & Verification should have been conducted**		
EE Credit 1	**Leadership and Strategy**	**20**	
EE Credit 1.1	Target Setting		
	>Internal benchmarking / exceed PAT Target (DC)		5
	> National/World class benchmarks		10
EE Credit 1.2	Financial Resource Allocation at the beginning of the year		5
EE Credit 1.3	Monthly reviews pertaining to Energy Efficiency		5
EE Credit 2	**Employee Involvement & Capacity Building**	**20**	
EE Credit 2.1	Strategies adopted for awareness creation & employee involvment		5
EE Credit 2.2	Training program, at least once in a year		5
EE Credit 2.3	Energy scorecard		**10**
EE credit 2.3.1	Energy Scorecard: Individual Performance Appraisal	**5**	
EE credit 2.3.2	Energy Scorecard: Energy performance of major equipment.	**5**	
Credit 3	**Energy Monitoring System**	**20**	
Credit 3.1	Energy monitoring for equipment (Electrical & thermal) having > 10% of total energy consumption		5
	Energy monitoring for equipment (Electrical & thermal) having > 5% of total energy consumption		10
Credit 3.2	Daily Variance Analysis and Correction		10
Credit 4	**Plant with Specific Energy Consumption (SEC)**	**140**	
Credit 4	Reduction in SEC in the last 3 years: Cement: 80% Weightage [Thermal : 40%, Electrical : 40%] CPP :20% Weightage		**75**

Credit 5	**Energy Efficiency Improvement in Equipment**		**35**
Credit 6	**Benchmarking with World Class Performance**		**30**
	Among top 10 Units / Top 10% of the units at national level		10
	Among top 5 units / Top 5% of the units at national level		15
	Among top 20 Units / Top 20% of the units at international level		20
	Among top 10 units / Top 10% of the units at international level		25
	Among top 5 units / Top 5% of the units at international level		30
	Sub total	**200**	

Note: Equipment to be monitored for credit 5:

Cement Plant: (1) Preheater fan, (2) RABH Fan, (3) Cooler vent fan, (4) cement mill separator fan, (5) raw mill fan, (6) Coal mill fan

CPP: (1) BFP pump, (2) FD Fan, (3) ID fan, (4) CEP pump

Renewable Energy (Max: 100 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
Mandatory Requirement - 1	**Renewable Energy Policy**		
RE Credit 1	**Leadership and Strategy - Setting targets with specific time lines for increasing share of Renewable Energy**	**10**	
RE Credit 1.1	Target Setting -Short term & Long term action plan and monitoring mechanism		5
RE Credit 1.2	Approved budget allocation for current & ensuing year		5
RE Credit 2	**On-site Renewable Energy Generation (Both Electrical & Thermal Energy)**	**25**	
	>1% substitution		5
	>2% substitution		10
	>3% substitution		15
	>4% substitution		20
	>5% substitution		25
Credit 3	**Offsetting both Electrical & Thermal energy through Renewable Energy Sources (65-80)**	**65**	
	≥2.5 substitution		5
	≥5 substitution		10
	≥10 substitution		20

	≥15 substitution		30
	≥20 substitution		35
	≥25 substitution		40
	≥30 substitution		45
	≥35 substitution		50
	≥40 substitution		55 -60
	≥45 substitution		60 -70
	≥50 substitution		65 - 80
	Sub-Total	**100**	

Notes

1. In case the unit earns maximum points in RE Credit 1 & 2, then the maximum number of points than can be earned in RE Credit 3 is only 65

2. In case the organisation is unable to implement any onsite generation, it may choose to offset 100 % though offsite RE generation, in which case the max points awarded will be 80 under RE Credit 3

3. If the company meets > 80% of its energy requirement through RE additional 5 points will be considered under innovation category

4. In case the onsite substitution exceeds 5 % the balance will be accounted in RE Credit 3

Note: For a company that has invested in Renewable Energy at the corporate level, credit for RE can be shared on the basis of (1) contribution of that facility w.r.t. total production volume or (2) contribution of that facility in that State or (3) complete credit but in this case, other facilities will not be able to achieve points under GreenCo RE.

Greenhouse Gas Emissions Mitigation (Max: 125 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
Mandatory Requirement - 1	**GHG Emission inventorisation**		
GHG Credit 1	**GHG emission intensity reduction targets - Short term & Long term**	**15**	
GHG Credit 1.1	Setting short term & Long term GHG targets		5
GHG Credit 1.2	Developing detailed action plan for achieving the targets		10
GHG Credit 2	**Employee Involvement & Capacity Building**	**15**	
GHG Credit 2.1	Awareness Creation & Employee Involvement		5
GHG Credit 2.2	Organising capacity building programmes to relevant employees once in a year to involve them in GHG emission activities		10

GHG Credit 3	**GHG Management Systems**	**10**	
GHG Credit 3.1	Quality Management - GHG Emission Inventorisation		5
GHG Credit 3.2	Monitoring system for mitigation efforts		5
Credit 4	**GHG Emission Intensity Reduction -**	**30**	
Option-1	**Internal Performance Approach**		**30**
	> 5% in last 3 years		5
	> 10% in last 3 years		10
	> 15% in last 3 years		15
	> 20% in last 3 years		20
	> 25% in last 3 years		25
	> 30% in last 3 years		30
Option-2	**Benchmarking with National & International Performances**		**30**
	Company is among the top 15% of lowest GHG emission intensity companies in the country		5
	Company is among the top 10 % of lowest GHG emission intensity companies in the country		10
	Company is among the top 5 % of lowest GHG emission intensity companies in the country		15
	Company is among the top 15% of lowest GHG emission intensity at global level		20
	Company is among the top 10% of lowest GHG emission intensity at global level		25
	Company is among the top 5 % of lowest GHG emission intensity at global level		30
Credit 5	**Carbon Neutral Approach**	**35**	
Option-1	**GHG Intensive**		**35**
	Offset / sequestration ≥5% of total GHG emission		5
	Offset / sequestration ≥10% of total GHG emission		10
	Offset / sequestration ≥15% of total GHG emission		15
	Offset / sequestration ≥20% of total GHG emission		20
	Offset / sequestration ≥25% of total GHG emission		25
	Offset / sequestration ≥30% of total GHG emission		30
	Offset / sequestration ≥35% of total GHG emission		35

Credit 6	**Scope 3 emission inventorization**	**20**	
GHG Credit 6.1	Scope 3 emission inventorization		5
GHG Credit 6.2	>5 % Reduction in scope 3 emission intensity		5
	>10 % Reduction in scope 3 emission intensity		10
	>15 % Reduction in scope 3 emission intensity		15
	Sub total	**125**	

Water Conservation (Max: 100 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
WC Mandatory Requirement - 1	**Water Policy**		
WC Mandatory Requirement - 2	**Water Manager & Accountability**		
WC Mandatory Requirement - 3	**Norm for Specific Water Consumption in CPP**		
WC Credit 1	**Leadership and Strategy**	**10**	
WC Credit 1.1	Target setting & action plan		5
WC Credit 1.2	Monthly Reviews on Water conservation & management		5
WC Credit 2	**Employee Involvement & Capacity Building**	**10**	
WC Credit 2.1	Awareness creation & employee involvement		5
WC Credit 2.2	Training & Capacity building		5
WC Credit 3	**Metering & Overall Monitoring**	**10**	
WC Credit 3	Water Metering at critical locations, accounting 80% total water consumption		10
WC Credit 4	**Reduction in Fresh Water Consumption in the last 3 years - Cement plant: 50% weightage & CPP (only coal based power plants) : 50% weightage**	**30**	
Option -1	**Reduction in specific fresh water consumption**		30
	≥ 5% reduction		5
	≥ 10 % reduction		10
	≥ 15% reduction		15
	≥ 20% reduction		20
	≥ 25% reduction		25
	≥ 30% reduction		30

Option -2	**Reduction in Total fresh water consumption**		30
	≥ 5% reduction		5
	≥ 10 % reduction		10
	≥ 15% reduction		15
	≥ 20% reduction		20
WC Credit 5	**Rain water Harvesting in roof and non-roof areas**	**20**	
WC credit 5.1	Separate storm water drains for rainwater		**5**
WC Credit 5.2	50% of potential captured		5
	100% of potential captured		10
WC Credit 5.3	Freshwater substitution		5
WC Credit 6	**Augmentation of ground water beyond fence**	**20**	
	1: 1 recharging/collection		5
	1: 2 recharging/collection		10
	1 : 3 recharging/collection		15
	1: 4 recharging/collection		20
	Sub total	**100**	

Waste Management (Max:100 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
WM Mandatory Requirement - 1	**Waste management policy**		
WM Mandatory Requirement - 2	**Emission reports w.r.t revised standards for SPM, Sox, Nox, Heavy metals**		
WM Credit 1	**Leadership & Strategy**	**10**	
WM Credit 1.1	Short term & long term targets		5
WM Credit 1.2	Action plan and resource allocation		5
WM Credit 2	**Employee Involvement & Capacity Building**	**10**	
WM Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
WM Credit 2.2	Training programs and capacity building		5
WM Credit 3	**Waste Management Systems & Inventorization**	**10**	
WM Credit 3.1	Inventorisation of hazardous & non hazardous waste		5
WM Credit 3.2	Maintenance of waste management yard		5

WM Credit 4	**Utilization of waste as alternate fuel**	**30**	
	TSR >= 5%		5
	TSR >= 10%		10
	TSR >= 15%		15
	TSR >= 20%		20
	TSR >= 25%		25
	TSR >= 30%		30
WM Credit 5	**Liquid Waste Management**	**15**	
	Percentage fresh water substitution by recycle/reuse of treated water		15
WM Credit 6	**Gaseous Waste Management**	**25**	
WM Credit 6.1	Ambient Air Quality		5
WM Credit 6.2	≥ 5% reduction over and above the current norms		5
	≥ 10% reduction over and above the current norms		10
	≥ 15% reduction over and above the current norms		15
	≥ 20% reduction over and above the current norms		20
	Sub total	**100**	

Note: Gaseous Waste Management

Cememt: 75% Weightage & CPP: 25% Weightage Stack emissions should be monitored at the kiln, cooler vent, cement mill and CPP

Material Conservation, Recycling & Recyclability (Max: 100 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
MCR Credit - 1	**Leadership & Strategy**	**10**	
	Short & long term targets and allocation of resources for use of Alternative Raw material (ARW) & Clinker Factor Improvement		10
MCR Credit - 2	**Employee Involvement & Capacity Building**	**10**	
MCR Credit 2.1	Strategies adopted for awareness creation and employee involvement		
MCR Credit 2.2	Training programs and capacity building		
MCR Credit 3	**Systems to monitor clinker factor, fly ash utilisation, packaging material on daily basis**	**10**	

MCR Credit 4	**Raw Material Conservation**	**40**	
MCR Credit 4.1	Percentage increase in blended cement		**20**
MCR Credit 4.2	Clinker Factor Improvement		**15**
MCR Credit 4.3	Reduction in consumption of consumables like lube oil, bearings, bricks, general stores, water treatment chemicals		**5**
MCR Credit 5	**Management of Packaging Material**	**10**	
MCR Credit 5.1	Reduction in Packaging Material		**5**
MCR Credit 5.2	Bulk Transport		**5**
MCR Credit 6	**Use of alternative raw material (Ex- bed ash from boiler, ETP sludge, zinc slag, etc.)**	**10**	
	>2 % substitution		5
	>5 % substitution		10
MCR Credit 7	**Mines Management**	**10**	
	Sub total	**100**	

Note: MCR Credit 4.1: Minimum points are awarded for at least 60% blended cement and maximum points are awarded for 80% blended cement

MCR Credit 4.2:

- In case of OPC, usage of 3% filler will be awarded 10 points
- In case of PPC, usage of 33% flyash will be awarded 15 points
- In case of PSC, usage of 65% slag will be awarded 15 points

Green Supply Chain (Max.50 points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
GSC Credit 1	**Leadership and Strategy**	**5**	
GSC Credit 1.1	Strategy and Targets (Short and Long term)		5
GSC Credit 2	**Education and Awareness Creation**	**5**	
	List the suppliers, transporters, dealers and contractors		2
	50% of suppliers are covered		3
GSC Credit 3	**Common Banking System for Supplies like electrode, refractory, bearing and lube oil**	**5**	
GSC Credit 4	**Green Purchasing Guidelines & Implementation**	**5**	
GSC Credit 5	**Greening suppliers and dealers facilities**	**10**	

GSC Credit 6	**Resource intensity reduction in the supply chain and logistics (Energy, Material, Operational efficiency improvement)**	**20**	
	Logistics (cement)		10
	Supply chain (raw material)		10
	Sub-Total	**50**	

Note: GSC Credit 3 is not applicable for cement plants that do not have other cement plants within 50 kms.

Product Stewardship(Max: 50 Points)

Credit Number	Parameters	Maximum Credit Points Allocated	
PS Credit 1	**Leadership & Strategy**	**10**	
PS Credit 2	**Education, awareness creation & communication programs for all stake holders**	**10**	
PS Credit 3	**Improving product and process efficiency through research and development**	**15**	
PS Credit 4	**Extended Producer Responsibility**	**10**	
PS Credit 4.1	Initiatives by the plant to promote use of blended cement		5
PS Credit 4.2	Initiatives on recycling of construction & demolition waste		5
PS Credit 5	**Engagements to Voluntary codes (CSI, GreenPro, GRI, etc.)**	**5**	
	Sub-Total	**50**	

Life Cycle Assessment (Max: 75 Points)

Credit Number	Parameters	Maximum Credit Points Allocated	
LCA Credit 1	**Leadership and Strategy**	**10**	
LCA Credit 1.1	Goals & Targets (Short term & long term)		5
LCA Credit 1.2	Action plan for Life Cycle Analysis or Management		5
LCA Credit 2	**LCM reviews-new products and existing products**	**10**	
LCA Credit 3	**LCA for any of the products/service occupying the highest share in the productline**	**20**	
LCA Credit 3.1	Internal Study		5
LCA Credit 3.2	LCA with peer review		5

LCA Credit 4	**Environmental impact reduction**	**10**	
LCA Credit 5	**Detailed Environmental Product Declaration for Products**	**15**	
LCA Credit 6	**External Partnerships contribute to LCI Database at National Level**	**10**	
	Sub-Total	**75**	

Others (Max: 100 Points)			
Credit Number	**Parameters**	**Maximum Credit Points Allocated**	
Green Factory Building	**To achieve IGBC Green Factory Building Rating, the unit / facility has to either follow Credit 1 Or Credit 2, 3 and 4**	**50**	
OS Credit 1	**Achieve Green Buidling as per IGBC Green Factory Rating**		50
OS Credit 2	**Indoor Environment Quality**	**20**	
OS Credit 2.1	Fresh Air Ventilation		10
Air conditioned	> 20 % improvement over min fresh air requirement -5 Points		
	> 30 % improvement over min fresh air requirement -10 Points		
Naturally Conditioned	Opening to carpet Area Ratio >= 3 % - 5 Points		
	Opening to carpet Area Ratio >= 4 % - 10 Points		
Forced ventilation	> 20 % improvement over min Air changes / hour-5 Points		
	> 30 % improvement over min Air changes / hour-10 Points		
OS Credit 2.2	Low VOC Paints		
	Use of paint with low / No VOC - 3 points		3
	Adhesive & Sealant with VOC content within limits - 2 points		2
OS Credit 2.3	Eco friendly house keeping chemicals		5
OS Credit 3	**Site Selection Planning**	**10**	
OS Credit 3.1	Housing facility for 40% of Employees within 5 kM radius		5
OS Credit 3.2	Access to Public Transport / Shuttle Services		5

OS Credit 4	**Landscaping**	**20**	
OS Credit 4.1 (under CPCB)	Maintain Additional Green belt >= 10 % of Standard requirement		5
	Maintain Additional Green belt >= 20 % of Standard requirement		10
OS Credit 4.2 (CPCB guidelines not applicable)	Develop green belt >= 50% in the unused site area		5
	Develop green belt >= 75% in the unused site area		10
OS Credit 4.2	Efforts to create and maintain biodiversity by preserving native & adoptive species		5
OS Credit 4.3	Recreational and inspirational spaces		5
OS Credit 5	**Innovation (exemplary performances in any of 9 parameters or other innovations)**	**40**	
OS Credit 6	**Accredited Green Professionals**	**10**	
	At least one Green professional		5
	>= 3 Green professionals		10
	Sub total	**100**	

Annexure C - CheckList for Service Sector			
Energy Efficiency (Max: 150 Points)			
	Parameters	**Points**	
EE Mandatory Requirement - 1	**Energy Policy**		
EE Mandatory Requirement - 2	**Energy Management Cell & Energy Manager**		
EE Credit 1	**Leadership and Strategy**	**20**	
EE Credit 1.1	Monthly reviews pertaining to Energy Efficiency		5
EE Credit 1.2	Target Setting		10
	Internal benchmarking- 5 marks		
	National/World class benchmarks- 5 marks		
EE Credit 1.3	Financial Resource Allocation at the beginning of the year		5
EE Credit 2	**Employee Involvement & Capacity Building**	**15**	
EE Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
EE Credit 2.2	Training programs and capacity building		5
EE Credit 2.3	Energy scorecard		5
EE Credit 3	**Energy Monitoring & Management System**	**15**	
EE Credit 3.1	Energy monitoring for equipment (Electrical & thermal) having ≥ 10% of total energy consumption - 5points Energy monitoring for equipment (Electrical & thermal) having ≥ 5% of total energy consumption - 10 points		10
EE Credit 3.2	Daily variance analysis and correction		5
Option -1 Plant with SEC	**Reduction in SEC in the last 3 years**	**100**	
EE Credit 4	**Reduction in SEC in last 3 years**		**50**
EE Credit 5	**Energy Efficiency improvement in Equipment**		**25**
EE Credit 6	**Benchmarking with World Class Performance**		**25**
	Among top 10 Units / Top 10% of the units at national level		5
	Among top 5 units / Top 5% of the units at national level		10
	Among top 20 Units / Top 20% of the units at international level		15
	Among top 10 units / Top 10% of the units at international level		20
	Among top 5 units / Top 5% of the units at international level		25
Option -2 Plant without SEC	**Reduction in SEC in the last 3 years**	**75**	
EE Credit 4	**Projects implemented (Last 3 Years)**		**50**
EE Credit 5	**Equipment wise efficiency improvement**		**25**
	Sub total	**150**	
Water Conservation (Max: 100 Points)			
WC Mandatory Requirement-1	**Water Policy**		
WC Mandatory Requirement-2	**Water Manager & Accountability**		
WC Credit 1	**Leadership and Strategy**	**10**	
WC Credit 1.1	Monthly Reviews		5
WC Credit 1.2	Target setting & action plan		5
WC Credit 2	**Employee Involvement & Capacity Building**	**10**	
WC Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
WC Credit 2.2	Training programs and capacity building		5

WC Credit 3	**Metering & Overall Monitoring**	**5**	
WC Credit 3.1	Water Metering at critical locations, accounting 80% total waterconsumption		5
WC Credit 4	**Reduction in Specific Fresh Water Consumption in Last 3years**	**30**	
Option-1	**Reduction in specific fresh water consumption**		
	≥ 5% reduction		5
	≥ 10 % reduction		10
	≥ 15% reduction		15
	≥ 20% reduction		20
	≥ 25% reduction		25
	≥ 30% reduction		30
Option-2	**Reduction in total fresh water consumption on the water projects implemented in the past 3 years**		
	≥5% reduction		5
	≥ 10 % reduction		10
	≥15% reduction		15
	≥ 20 % reduction		20
Option-3	**International Benchmarking**		
	Among top 10 units / Top 10% of the units at international level		25
	Among top 5 units / Top 5% of the units at international level		30
WC Credit 5	**Rain water Harvesting in roof and non-roof areas**	**20**	
	≥ 10% potential captured		5
	≥ 25% potential captured		10
	≥ 50% potential captured		15
	≥ 75% and above potential captured		20
WC Credit 6	**Augmentation of ground water beyond fence**	**25**	
	At least 1 project implemented on augmentation of ground water		5
	1: 1 recharging/collection		10
	1: 2 recharging/collection		15
	1 : 3 recharging/collection		20
	1: 4 recharging/collection		25
	Sub total	**100**	

Renewable Energy (Max: 100 Points)			
RE Mandatory Requirement 1	**Renewable Energy Policy**		
RE Credit 1	**Leadership and Strategy - Setting targets with specific timelines for increasing share of Renewable Energy**	**10**	
RE Credit 1.1	Target Setting -Short term & Long term and action plan		5
RE Credit 1.2	Approved budget allocation for current & ensuing year and monitoring mechanism		5
RE Credit 2	**On-site Renewable Energy Generation (Both Electrical & Thermal Energy)**	**25**	
	≥1% substitution		5
	≥2% substitution		10
	≥3% substitution		15
	≥4% substitution		20
	≥5% substitution		25

RE Credit 3	**Offsetting both Electrical & Thermal energy through Renewable Energy Sources**	**65**	
	≥5% substitution		10
	≥10% substitution		20
	≥20% substitution		30
	≥30% substitution		35
	≥40% substitution		40
	≥50% substitution		45
	≥60% substitution		50
	≥70% substitution		55
	≥80% substitution		60
	≥90% substitution		65
	Sub-Total	**100**	
Green House Gases (Max: 100 Points)			
GHG Mandatory Requirement - 1	**GHG Emission inventorisation**		
GHG Credit 1	**GHG emission intensity reduction targets - Short term & Longterm**	**10**	
GHG Credit1.1	Setting short term & Long term GHG targets		5
GHG Credit1.2	Developing detailed action plan for achieving the targets		5
GHG Credit 2	**Employee Involvement & Capacity Building**	**10**	
GHG Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
GHG Credit 2.2	Training programs and capacity building		5
GHG Credit 3	**GHG Management Systems**	**10**	
GHG Credit 3.1	Quality Management - GHG Emission Inventorisation		5
GHG Credit 3.2	Monitoring system for mitigation efforts		5
GHG Credit 4	**GHG Emission Intensity Reduction**	**20**	
Option-1	**Internal Performance Approach**		
	≥ 5% in last 3 years		5
	≥ 10% in last 3 years		10
	≥ 20% in last 3 years		15
	≥ 30% in last 3 years		20
Option-2	**National & International Benchmarking GHG emission intensity in the samesector**		
	Company is among the top 10% of lowest GHG emission intensity companies in the country		5
	Company is among the top 5% of lowest GHG emission intensity companies in the country		10
	Company is among the top 10% of lowest GHG emission intensity at global level		15
	Company is among the top 5% of lowest GHG emission intensity at global level		20
GHG Credit 5	**Carbon Neutral Approach**	**30**	
Option 1	**GHG Intensive Industries - Offset/Sequestration as apercentage of total GHG emissions**		**30**
	≥ 5% of total GHG emission		5
	≥ 10% of total GHG emission		10
	≥ 15% of total GHG emission		15
	≥ 20% of total GHG emission		20
	≥ 25% of total GHG emission		25
	≥ 30% of total GHG emission		30

Option 2	Non - GHG Intensive		30
	≥ 15% of total GHG emission		5
	≥ 25% of total GHG emission		10
	≥ 40% of total GHG emission		15
	≥ 60% of total GHG emission		20
	≥ 80% of total GHG emission		25
	≥ 100% of total GHG emission		30
GHG Credit 6	Reduction in Scope-3 emission (Employee Commute & Business travel)	20	
	≥ 1 % reduction		5
	≥ 2% reduction		10
	≥ 3% reduction		15
	≥ 4% reduction		20
	Sub total	100	

Waste Management (Max:100 Points)			
WM Mandatory Requirement-1	Waste Management Policy		
WM Credit 1	Leadership & Strategy	10	
WM Credit 1.1	Waste Management Policy		5
WM Credit 1.2	Short term & long term target and next row delete and include : Action Plan & resource allocation		5
WM Credit 2	Employee Involvement & Capacity Building	10	
WM Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
WM Credit 2.2	Training programs and capacity building		5
WM Credit 3	Waste Management Systems & Inventorization	10	
WM Credit 3.1	Waste Collection, Segregation, Internal Transport & Handling, Storage and Disposal Mechanism		5
WM Credit 3.2	Inventorisation of hazardous & non hazardous waste		5
WM Credit 4	Solid Waste Management	45	
WM Credit 4.1	E waste Management		30
	Reduction in specific waste disposal (This includes both the usable and non usable parts)		
	> 75 % Recycling		5
	> 80% Recycling		10
	> 85% Recycling		15
	>90% Recycling		20
	>95% Recycling		25
	100% Recycling		30
WM Credit 4.2	Organic Waste Management		15
	≥ 10 % reduction in specific waste disposal		5
	≥ 20 % reduction in specific waste disposal		10
	≥ 30 % reduction in specific waste disposal		15

WM Credit 5	**Liquid Waste Management**	**25**	
	Sewage Management - Reduction in disposal		
	>10% in sewage disposal		5
	>20% in sewage disposal		10
	>30% in sewage disposal		15
	>40% in sewage disposal		20
	>50% in sewage disposal/ Zero Effluent Discharge		25
	Sub total	**100**	

Material Conservation, Recycling & Recyclability (Max:75 Points)

MCR Credit1	**Leadership & Strategy**	**10**	
MCR Credit 1.1	Material Conservation & Recycling Policy		5
MCR Credit 1.2	Short & long term targets and allocation of resources		5
MCR Credit 2	**Employee Involvement & Capacity Building**	**10**	
MCR Credit 2.1	Strategies adopted for awareness creation and employee involvement		5
MCR Credit 2.2	Training programs and capacity building		5
MCR Credit 3	**Systems**	**10**	
MCR Credit 3.1	Framework for Material Conservation		5
MCR Credit 3.2	Systematic Monitoring Plans		5
MCR Credit 4	**Raw Material Conservation**	**45**	
Option 1	**Replacement of paper by recycled paper**	**20**	
	≥ 5% recycled		5
	≥ 10% recycled		10
	≥ 15% recycled		15
	≥ 20% recycled		20
Option 2	**Paper Use**	**25**	
	≥ 5% reduction		5
	≥ 10% reduction		10
	≥ 15% reduction		15
	≥ 20% reduction		20
	≥ 25% reduction		25
	Sub total	**75**	

Green Supply Chain (Max: 75 Points)

GSC Credit 1	**Leadership and Strategy**	**10**	
GSC Credit 1.1	Strategy and Targets(Short and Long term)		5
GSC Credit 1.2	Approved budget allocation for current year & ensuing year		5
GSC Credit 2	**Education and Awareness creation for suppliers & vendors**	**10**	
	≥ 50 % Suppliers		5
	≥80 % Suppliers		10
GSC Credit 3	**Resource Conservation through Supply Chain Management Systems (SCM)**	**10**	
GSC Credit 3.1	Management System		5
GSC Credit3.2	Monitoring System		5

GSC Credit 4	**Green Purchasing Guidelines and Implementation**	**15**	
GSC Credit 4.1	Green Purchasing Guidelines		5
GSC Credit 4.2	Implementation of Green Purchasing Guidelines		10
GSC Credit 5	**Recognition programs for suppliers**	**5**	
GSC Credit 6	**Resource intensity reduction in the Supply Chain (Carbon, Material, Water and Toxicity)**	**25**	
GSC Credit 6.1	Baselines and targets		5
GSC Credit 6.2	% Reduction in Supplier resources (Carbon/Material/Water/Toxicity)		20
	At least one project		5
	≧1.0% reduction		10
	≧1.5 % reduction		15
	≧2.0% reduction		20
	Sub-Total	**75**	
Others (Max: 100 Points)			
Green Factory Building	**To achieve IGBC Green Factory Building Rating, the unit /facility has to either follow Credit 1 Or Credit 2, 3 and 4**		
OS Credit 1	**Achieve Green Buidling as per IGBC Green Facory Rating /LEED**	**50**	
OS Credit 2	**Indoor Environment Quality**	**20**	
OS Credit 2.1	Fresh Air Ventilation 20%, 30%		10
OS Credit 2.2	Low VOC Paints		5
OS Credit 2.3	Eco friendly house keeping chemicals		5
OS Credit 3	**Site Location**	**10**	
OS Credit 3.1	Housing 40% of Employees within 5 kM radius		5
OS Credit 3.2	Access to Public Transport / Shuttle Services		5
OS Credit 4	**Landscaping**	**20**	
OS Credit 5	**Innovation (exemplary performances in any of 9 parameters or other innovations)**	**40**	
	8 Innovations @ 5 Points / Innovation		40
OS Credit 6	**Accredited Green Professionals**	**10**	
	Sub total	**100**	
Total		**800**	

ANNEXURE-D

EE Credit 5: Equipment wise Energy Efficiency Improvement Evaluation Sheets for Major Equipment

1. Centrifugal fans					
Sno	Fan name / number	Power consumption as per design kW	Power consumption kW (A)	Reference efficiency* % (B)	actual efficiency % - C
Total					
	Weighted average of reference efficiency			$\sum$ A x B / $\sum$ A	
	Weighted average of actual efficiency			$\sum$ A x C / $\sum$ A	
	* Reference efficiency - Design efficiency of fan / reference efficiency given by CII-Godrej GBC which ever is higher will be considered				
	Points allocation				
	1. Weighted average of actual efficiency < 3% of weighted average of reference efficiency				100%
	2. Weighted average of actual efficiency between 5 % to 3% weighted average of reference efficiency				50%
	3. Weighted average of actual efficiency > 5% of weighted average of reference efficiency				0%

2. Centrifugal Pumps					
Sno	Fan name / number	Power consumption as per design kW	Power consumption kW (A)	Reference efficiency* % (B)	Actual efficiency % -(C)
Total					

	Weighted average of reference efficiency			∑ A x B / ∑ A	
	Weighted average of actual efficiency			∑ A x C / ∑ A	
	* Reference efficiency - Design efficiency of pumps / reference efficiency given by CII-Godrej GBC which ever is higher will be considered				
	Points allocation				
	1. Weighted average of actual efficiency < 3% of weighted average of reference efficiency				100%
	2. Weighted average of actual efficiency between 5 % to 3% weighted average of reference efficiency				50%
	3. Weighted average of actual efficiency > 5% of weighted average of reference efficiency				0%

3. Positive displacement Blowers					
Sno	Blower name / number	Power consumption as per design kW	Power consumption kW (A)	Reference efficiency* % (B)	Actual efficiency % -(C)
Total					
	Weighted average of reference efficiency			∑ A x B / ∑ A	
	Weighted average of actual efficiency			∑ A x C / ∑ A	
	* Reference efficiency - Design efficiency of pumps / reference efficiency given by CII-Godrej GBC which ever is higher will be considered				
	Points allocation				
	1. Weighted average of actual efficiency < 3% of weighted average of reference efficiency				100%
	2. Weighted average of actual efficiency between 5 % to 3% weighted average of reference efficiency				50%
	3. Weighted average of actual efficiency > 5% of weighted average of reference efficiency				0%

4.Compressors					
Sno	Compressor no	FAD	actual quantity of air delivered	Actual power consumption kW	Specific power consumption kW/cfm
Total					
		Average specific power consumption		∑ A / n A	
	Note: Carryout capacity test by orifice method to estimate the actual quantity of air delivered by the compressor				
	Reference specific power consumption at operating pressure of 6.0 kg/cm2				
	1. Reciprocating compressor - 15 kW/cfm				
	2. Screw compressor - 16 kW/cfm				
	3. Centrifugal compressor - 12 kW/cfm				
	Points allocation				
	1. Average specific power consumption max 10% more compared to reference specific power consumption				100%
	2. Average specific power consumption 10-15 % more compared to reference specific power consumption				50%
	3. Average specific power consumption more than 15% compared to reference specific power consumption				0%

Refrigeration and Air Conditioning							
Sno	Chiller name / number	Capacity TR	Conderser type (air cooled / water cooled)	Power consumption kW	Reference COP (or kW/TR)	Refrigeration load in TR	Actual COP (or kW/TR)
Total							
	% deviation from design COP = (Design COP - Actual COP)*100/ Actual COP						
	* Reference COP is the COP of a good chiller available in the market will be considered - for that conderser type and operating temperature						

Guidelines for Rating

Sno	Criteria	Points (% of allocated points)
1	Actual COP is 95% of above of reference COP / actual kW/TR upto 5% more compared to reference kW/TR	100%
2	actual COP is 90 - 95 % of reference COP / actual kW/TR 5-10% more compared to reference kW/TR	75%
3	actual COP is 85 - 90 % of reference COP / actual kW/TR 10-15% more compared to reference kW/TR	50%
4	Actual COP is less than 85% of reference COP / actual kW/TR more than 15% of reference kW/TR	0%

Annexure E - Case Study References

The case studies presented under each credit have been taken from various awards organized by CII-Godrej Green Business Centre like energy awards, water awards and environment awards. The case studies have also been taken from company websites and sustainability reports. The case studies presented are from the following companies:

- 3M Ltd.
- ABB Ltd
- ACC Limited
- Aditya Birla Group
- Ashok Layland
- Asia Pacific Resources International Holdings Ltd.
- Asian Paints
- Asian Paints
- Bangalore International Airport Limited
- Catterpillar Inc.
- Chambal Fertilizers and Chemicals Limited
- CISCO Systems, Inc.
- Coca-Cola Beverage Pvt. Ltd.
- Covidien
- Chennai Petroleum Corporation Limited
- Cummins Generator Technologies India Ltd.
- Daimler
- Emami Paper Mills
- Ford
- Glaxo Smithkline
- Godrej
- HeidelbergCement
- International Paper
- ITC Ltd.
- Kirloskar Pneumatic Co. Ltd

- Kirloskar Oil Engines Ltd.
- Komatsu Ltd.
- Mahindra & Mahindra
- Nestle x Nike x Nokia
- Novartis
- Procter & Gamble
- Reliance Industries Ltd.
- Taiheiyo Cement Corporation
- Tata Motors Ltd.
- Tata Consultancy Services
- Toyota
- Turbo Energy Ltd.
- Vedanta Aluminium Ltdd
- Vestas
- Walmart
- Warner Bros Entertainment, Inc.
- Wipro Ltd.

ABBREVIATIONS

ACH	–	Air Changes per Hour
AP	–	Accredited Professional
BCM	–	Billion Cubic Meters
CDP	–	Carbon Disclosure Project
CEO	–	Chief Executive Officer
CFM	–	cubic feet per minute
CGWB	–	Central Ground Water Board
COP	–	Coefficient of Performance
CPCB	–	Central Pollution Control Board
EN26	–	Environmental (GRI Indicator)
EPD	–	Environmental Product Declaration
ETP	–	Effluent Treatment Plant
E-Waste	–	Electronic waste
FAD	–	Free Air Delivery
FMCG	–	Fast Moving Consumer Goods
FSC	–	Forest Stewardship Council
GHG	–	Green House Gas emission
GRI	–	Global Reporting Initiative
IGBC	–	Indian Green Building Council
ISO	–	International Standard Organization
IT	–	Information Technology
ITES	–	Information Technology Enabled Services
kCal	–	Kilocalories
KW	–	Kilowatts
KWh	–	Kilowatt hours
LCA	–	Life Cycle Assessment

LCC	–	Life Cycle Costing
LCI	–	Life Cycle Inventory
LEED	–	Leadership in Energy & Environmental Design
MCR	–	Material Conservation Recycling & Recyclability
MoEF	–	Ministry of Environment and Forest
MSDS	–	Material Safety Data Sheet
MSG	–	Mission on Sustainable Growth
NOx	–	Oxides of Nitrogen
PEFC	–	Program for the endorsement of forest certification
PR 1	–	Product Responsibility (GRI Indicator)
RE	–	Renewable Energy
SEC	–	Specific Energy Consumption
SOx	–	Oxides of Sulphur
SPCB	–	State Pollution Control Board
SPM	–	Suspended Particulate Matter
TCO	–	Total Cost Ownership
TPM	–	Total Particulate Matter
TR	–	Ton of Refrigeration
USEPA	–	United States Environmental Protection Agency
VOC	–	Volatile Organic Compounds
WBCSD	–	World Business Council for Sustainable Development
WRI	–	World Resource Institute
MEA	–	Mandatory Energy Audit

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