

### Project Background

Confederation of Indian Industry (CII) in association with Cement Manufacturers' Association (CMA) is working on an initiative to facilitate use of urban & industrial waste as Alternate Fuel & Raw Materials (AFR) in Indian cement industry, thereby moving towards a low carbon economy.

The growing demand for fuel and raw material in cement industry can be satisfied with the help of using different AFR materials in the system. Many plants in India already started using AFR and few other plants are also in the process of utilizing AFR in the Cement manufacturing.

Government also came up with lot of initiatives through central and State pollution control boards for increasing the AFR usage in cement industries. To grow and meet the future demands of the market, Indian cement industries should definitely take a big step towards AFR utilization, especially on alternate fuels usage.

The main objective of the project is to accelerate AFR initiatives in the country, leveraging the Cement sector, through capacity building, data availability and facilitating exchange of waste by working closely with Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB). This initiative was partially supported by Shakti Sustainable Energy Foundation (SSEF).

As the part of initiative, CII envisaged various activities, which includes

1. Working group comprising of industry representatives and Pollution Control Board (PCB) officials were created to drive the whole project
2. Round table discussion among cement plants, Pollution control board, waste generators and stakeholders in eight different states to discuss the "Opportunities and Barriers on co-processing" (Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka,

Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu)

3. White paper on "Increasing Co-Processing in Indian cement Plants" submitted to Ministry of Environment, Forest and Climate Change (MOEF)
4. International mission - Team of PCB officials, Industry representatives and Industry association visited Countries like Switzerland, France and Germany Cement plants, where AFR is being used.
5. Technical sessions and panel discussion on increasing AFR usage in Indian Cement industries on premier National events like Green Cementech and Waste Management Summit
6. A unique website launched for AFR - [www.ciiwasteexchange.org](http://www.ciiwasteexchange.org)
7. Workshops and missions to best operating cement plants in India
8. Release of best practice manuals and technical bulletins
9. Step by step guide for getting co-processing approvals from PCB for cement plants and Hazardous waste transportation for transporters

In line with our efforts to promote AFR utilization, we are bringing out this "Status paper on AFR usage in Indian Cement Industry".

This status paper is an effort to understand the current level of AFR utilization in the Indian Cement industries, which will benefit all stakeholders of the industry to assess, understand and further strengthen AFR usage in Indian Cement industries.

We are confident that this status paper on AFR usage will help and support the Indian Cement plants to understand & further accelerate the AFR usage.



### Confederation of Indian Industry (CII)

The Confederation of Indian Industry (CII) is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process and works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes. Founded in 1895, India's premier business association has over 7200 members.

CII - Sohrabji Godrej Green Business Centre (CII - Godrej GBC), a division of Confederation of Indian Industry (CII) is India's premier developmental institution, offering advisory services to the industry on environmental aspects and works in the areas of Green Buildings, Energy Efficiency, Water Management, Renewable Energy, Green Business Incubation and Climate Change activities.

CII has been closely associated with the Indian cement industry at both technical & policy level. On the technical front, CII has been associated with detailed energy efficiency improvement studies with over 70 cement manufacturing facilities over the last 15 years. At the policy level, CII has a National Cement Council headed by Senior industry representative and members from all stakeholders organizations.

### Cement Manufacturers' Association (CMA)

Cement Manufacturers' Association (CMA), the apex representative body of large cement manufacturers in India was established in 1961. It is a unique body in as much as it has both the private and public sector cement companies as its members.

CMA acts as a bridge between Indian cement Industry and the Government. It creates a conducive environment to promote growth of cement industry, through advice and consultation. It closely works with government, various Regulators on policy issues, enhancing efficiency, competitiveness, growth and development opportunities for Indian cement industry.

As a representative organization of cement industry, CMA articulates the genuine, legitimate needs and interests of the cement industry. Its mission is to impact the policy and legislative environment so as to foster balanced economic, industrial and social development in the cement industry.

### Shakti Sustainable energy foundation (SSEF)

Shakti Sustainable Energy Foundation was established in 2009 to support India's developmental and energy security objectives. SSEF work towards facilitating India's transition to a sustainable energy future by promoting policies that encourage energy efficiency as well as the increased generation of renewable energy.

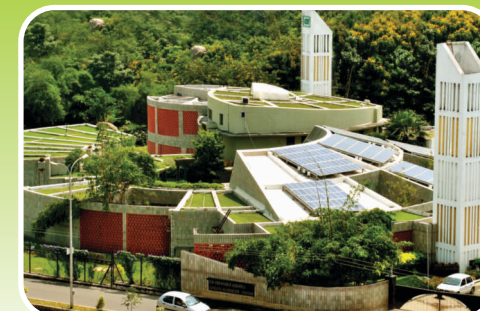
Shakti works collaboratively with national, state and local decision-makers to craft sound energy policies to build India's new energy economy. SSEF bring together experts from every sector - industry, academia, law, finance, civil society, think tanks, and more - to drive this change.



# Status Paper on AFR Usage in Indian Cement Industry



An Initiative by CII - CMA  
MAY 2015



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## Introduction

### Indian Cement Industry

Cement manufacturing Industry in India is one among the leaders in Energy efficiency across the world and one of the most technologically advanced industries in the country. The modern Indian cement units are state-of-the-art plants and are comparable to the best in the world.

The cement industry comprises of 185 large cement plants with an installed capacity of 350.00 MT and more than 350 mini cement plants with an estimated capacity of 11.10 MT per annum and fueled by growth in the infrastructure sector, the capacity is expected to increase to around 550 MT by FY20. The cement market in India is expected to grow at a compound annual growth rate (CAGR) of 8.96 percent during the period 2014-2019.

The Production and Despatch figures of Cement for the year 2013-14 are 256.04 Million Tonnes (MT) and 248.70 Million Tonnes (MT) respectively. The Production and Despatch figures for the year 2014-15 are 200.8 Million Tonne (upto December, 2014) and 192.46 Million Tonne (upto December 2014) respectively.

India has a lot of potential for development in the infrastructure and construction sector and the cement sector is expected to largely benefit from it. In the 12th five year Plan, the government plans to increase investment in infrastructure to the tune of US\$ 1 trillion and increase the industry's capacity by 150 MT.

The Government of India has decided to adopt cement instead of bitumen for the construction of all new road projects on the grounds that cement is more durable and cheaper to maintain than bitumen in the long run. Some of the other initiatives such as development of 100 smart cities are expected to provide a major boost to the sector.

All these factors will increase the demand for cement in the country, which will in turn raise the quantity of raw material and fuel used in the cement industries. Already many cement plants are importing fuels and few cement plants even importing limestone a basic raw material for cement production.

As per IBM data the total cement grade Limestone reserve available to meet the industry requirements is 89.86 Billion Tonnes.

Country	Specific Electrical energy consumption (KW/Ton of cement)	Specific Thermal energy consumption (Kcal/Kg clinker)
India	82	725
Spain	92	836
Germany	100	836
Japan	100	836
Brazil	110	884
Italy	112	908
China	118	956
Mexico	118	1003
Canada	140	1075
USA	141	1099
World Average.	100-110	850-860

Based on the expected growth and consumption pattern, the current reserves are expected to last only for another 35 - 41 years.

The coal consumption in Indian Cement Industry is about 5% of the total coal consumption in India. The range of coal requirement for the cement industry during the different years of 12th plan period is assessed to be in the range of 63-96 million tonnes (46-70 million tonnes for cement production and 18-27 million tonnes for captive power).

As a leader in energy efficiency now, Indian Cement industries trying to achieve excellence in other areas like safety, alternate fuel and raw material utilization and Environment management, which will make the cement production green and more economically attractive.

### Waste Generation

As per CPCB, it is estimated that there are about 41523 number of hazardous waste generating industries in India and their hazardous waste generation is about 7.90 million tonnes per annum. These wastes can be categorized into three components such as recyclable, land fillable and incinerable and their percentage constitutions are as below:

- Total generation - 7.90 million tonnes /Annum
- Landfillable - 3.32 million tonnes /Annum
- Recyclable - 3.98 million tonnes /Annum
- Incinerable - 0.60 million tonnes /Annum

In India the quantity of MSW generated is around 1,27,000 MT/day. The total waste quantity generated by the year 2047 is estimated to be about 260 million tons per year.

The quantum of waste generation is increasing day by day due to urbanization and industrialization in the country. It is estimated that if the waste is not disposed off in a more systematic manner, more than 1,400 km<sup>2</sup> of land, which is equivalent to the size of city of Delhi, would be required in the country by the year 2047 for its disposal.

As per UN report, India is the fifth biggest producer of e-waste in the world, discarding 1.7 million tonnes (Mt) of electronic and electrical equipment in 2014.

### Type of waste generated and the approximate time it takes to disintegrate

Type of Waste	Time to disintegrate
Organic waste such as vegetable & fruit peels, leftover foodstuff, etc.	A week or two.
Paper	10-30 days
Cotton cloth	2-5 months
Woolen items	1 year
Wood	10-15 years
Tin, aluminium and cans	100-500 years
Plastic bags	One million years?
Glass bottles	Undetermined

Thermal Substitution rate in Indian Cement Industries by utilising Alternate Fuels *										
S.no	Installed Capacity Clinker MTPA	Cement MTPA	TSR %	Name of Alternate fuel	Specific heat Kcal/kgclinker	Energy Savings Mikcal/Annum	Coal savings Tons/ Annum	Estimated saving Rs Lakhs/Annum		
2	Plant 2	1.98	1.8	3.7	4.3	2.5	123180	22396	616	
3	Plant 3	4.3	3.7	2.5	6.92	6.60	241346	43881	1207	
4	Plant 4	1.5	2.5	0.66	6.92	6.60	72037	13098	360	
5	Plant 5	0.66	0.72	1.36	6.60	6.18	35806	6510	179	
6	Plant 6	0.5	1.36	2.48	6.18	4.41	33790	6144	169	
7	Plant 7	2.48	1.6	4.3	4.41	4.11	78361	14247	392	
8	Plant 8	2.87	4.3	0.99	4.11	4.03	-	-	-	
9	Plant 9	0.99	1.64	4.21	4.03	3.97	28442	5171	142	
10	Plant 10	3.1	4.4	2.73	3.97	3.74	85952	15628	430	
11	Plant 11	2	3	4.22	3.74	2.85	55818	10149	279	
12	Plant 12	4.22	5.5	4.62	2.85	2.84	-	-	-	
13	Plant 13	4.62	4.21	3.04	2.84	2.58	95592	17380	478	
14	Plant 14	3.04	2.73	5.75	2.58	2.56	62507	11365	313	
15	Plant 15	5.75	8.5	1.29	2.56	2.56	104425	18986	522	
16	Plant 16	1.29	3.5	0.83	2.56	2.19	-	-	-	
17	Plant 17	0.83	1.81	2.72	2.19	2.00	17402	3164	87	
18	Plant 18	2.72	4.5	2.67	2.00	2.00	43544	7917	218	
19	Plant 19	2.67	3.3				38448	6991	192	

### Reference

Annual report 2014-2015 of Department Of Industrial Policy & Promotion  
IMF world economic outlook  
Central Pollution Control Board  
CII Energy Award questionnaire 2014  
IBEF report on Cement Industry in India

Global E-Waste Monitor 2014, United Nations report  
Report of European Business and technology center  
Indian Cement review  
Office of the Economic Adviser (OEA) is an attached office of the Ministry of Commerce & Industry.

Thermal Substitution rate in Indian Cement Industries by utilising Alternate Fuels *										
S.no	Installed Capacity Clinker MTPA	Cement MTPA	TSR %	Name of Alternate fuel	Specific heat Kcal/kgclinker	Energy Savings Mikcal/Annum	Coal savings Tons/ Annum	Estimated saving Rs Lakhs/Annum		
21	Plant 21	2.48	2.18	3.40	2.18	2.00	17083	3106	85	
22	Plant 22	3.00	3.40	4.5	2.00	1.98	21904	3983	110	
23	Plant 23	2.48	4.5	2.3	1.98	1.85	-	-	-	
24	Plant 24	0.89	2.3	1.08	1.85	0.50	12563	2284	63	
25	Plant 25	0.76	1.08	1.01	0.50	0.40	-	-	-	
26	Plant 26	1.24	1.01	3.3	0.40	0.32	3978	723	20	
27	Plant 27	3.3	3.3	5.45	0.32	0.23	7223	1313	36	
28	Plant 28	5.83	5.45	3.05	0.23	0.16	-	-	-	
29	Plant 29	2.54	3.05	1.79	0.16	0.15	3052	555	15	
30	Plant 30	2.13	1.79	3.9	0.15	0.09	2437	443	12	
31	Plant 31	6.5	3.9	3.5	0.09	0.01	4183	761	21	
32	Plant 32	2.5	3.5	4	0.01	0.00	232	42	1	
33	Plant 33	2.9	4	2.84	0.00	0.00	56	10	0	
34	Plant 34	2.45	2.84	-	0.00	0.00	0	0	0	
35	Plant 35	2.31	-	19.00	0.00	0.00	329175	59850	1646	
36	Plant 36	3.3	5.5	14.00	0.00	0.00	332640	60480	1663	
<b>Total/Average</b>	<b>92.16</b>	<b>109.38</b>	<b>3.550</b>		<b>728</b>	<b>1931950</b>	<b>351264</b>	<b>9660</b>		

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The source of data for this status paper is based on the questionnaire submitted by cement plants, data from CII energy award questionnaire 2014 and case studies shared in events /conferences. While utmost care has been taken to bring out the AFR usage data, how ever there might have been plants operating better than indicated, that may have missed our notice.

CII - Godrej GBC will not accept any claim for compensation, if any entry is wrong, abbreviated, omitted or inserted incorrectly either as to the wording space or position in the paper. This paper is only an attempt to bring out the levels of AFR usage in Indian Cement industry.