WHITE PAPER

ON

INCREASING CO-PROCESSING

IN

INDIAN CEMENT PLANTS

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1.0 ABSTRACT

Indian cement industry is the second largest in the world with total installed cement capacity of about 323.02 million tonnes per year (as of March 2011) with annual growth rate of 9% during the five year period 2006-2011[1]. Though the Indian cement industry has achieved excellence in energy efficiency & productivity through initiatives like adopting the latest technology, best practices, etc alternative fuel and raw material (AFR) usage still remains a major area of concern. Use of alternative fuel in Indian cement industries has a huge potential- thermal substitution of just 5% in cement industry can reduce India's emissions by about 0.1%[2].

The "Interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth" by Planning Commission of India also suggests fuel substitution and corresponding emission intensity reductions that can be achieved by 2020:

- Under Determined Effort Scenario, a fuel substitution of 5% is expected by 2020. Effective implementation of Determined Effort regime over the next decade with the clinker/cement ratio decreasing to 0.8 by 2020 and fuel substitution of 5% will lower emission intensity to 0.67 MT CO_2/MT cement by 2020.

- Under the Aggressive Effort Regime the clinker/cement ratio could come down to 0.75 by 2020, fuel substitution with the adoption of newer technologies could increase to 10 percent, and adoption of BAT by smaller units could lead to 1.8 percent per annum decrease in emissions intensities. This could see the emissions intensity of Indian cement industry coming down to 0.59 MT CO_2/MT cement in 2020.

- Use of wastes such as lime sludge as alternative raw material can also bring in reduction in carbon intensity.

But among many hurdles, one of the primary deterrents identified is lack of suitable & enabling policy framework. It is therefore essential to involve policy makers in this initiative. However, Central Pollution Control Board has taken the initiative and prepared guidelines on co-processing of wastes in cement kilns which is followed by the regulatory authorities while granting permission to cement plants for co-processing.

The objective of this paper is to facilitate development of enabling policies and framework by regulatory agencies (State and Central Pollution Control Board) to facilitate use of urban & industrial waste as raw material/ alternate fuel in the cement industry, thereby moving towards a low carbon economy.

2.0 PRESENT SCENARIO & CHALLENGES

India generates about 6.2 million tons of hazardous wastes annually, out of which around 3.09 million tonnes is recyclable, 0.41 million tonnes is incinerable and 2.73 million tonnes is land-fillable[3]. With increase in population and increase in per capita consumption, increasing quantum of hazardous waste is generated every year. The local administration, civic bodies and policy makers are posed with a serious concern of its effective & safe disposal.

[1] Cement Manufacturers' Association Annual Report 2010-2011

[2] Total cement production in 2007-08: 155.7 MTPA; specific emission intensity of 691 kg CO2 /MT Cement and emissions due to thermal energy consumption at 32%, the total emission reduction by replacing conventional fossil fuel with alternate fuel by 5% would reduce emissions by 1.721 MT CO2 /year, which is about 0.1% of India's emissions

[3] Central Pollution Control Board

All developed nations globally have utilized cement kilns in their countries as an effective option for industrial, municipal and hazardous waste disposal as this creates a WIN-WIN situation for both the local administration and the cement plants. Spiraling fuel costs, uncertainty in fuel availability and goal to reduce CO_2 emissions has led few cement plants in India to use alternative fuels. However, the current thermal substitution rate (TSR) in Indian cement industry is less than 2% as compared to some European countries that have a thermal substitution rate as high as 40%[4]. This is due to many challenges faced by the Indian cement industry as explained below.

2.1 Availability of information on waste

Detailed information on district and sector wise distribution of waste, type of waste generated is not readily available in the public domain. As the data available on the quantity and quality of waste is minimal or outdated, cement industries have to spend considerable amount of time and resources in exploring the availability of different types of alternative fuels.

As per the guidelines published by CPCB on co-processing, wastes that have already been approved by CPCB for co-processing based on the trial results can be used by cement plants across the country without repeating the trial run again. Information on updated list of these wastes needs to be readily made available in the public domain. In addition, to ensure availability of data on the quality and quantity of waste, MoEF and CPCB should insist on returns of Form V (annual environmental data sheet) from all waste generators as well as cement plants within a specified time period.

There are many types of wastes that are successfully co-processed in several cement plants across the world without any specific environmental concerns. The data on these types of wastes should be compiled by organizations like Cement Manufacturers' Association (CMA) and Confederation of Indian Industry (CII) for the benefit of waste generators and cement plants. Guidelines on co-processing waste materials in cement production by GTZ provides list of waste material suitable for co-processing.

2.2 Handling wastes with different chemical compositions

Wastes received by cement plants have varying chemical compositions such as ash content, chemical composition, heavy metals, chlorides, moisture levels, calorific value, etc. Co-processing of such non-homogenous wastes, especially at substitution rates higher than 5% poses considerable difficulty. Therefore non homogenous wastes require pre-processing using different technologies to generate uniform quality AFR. Getting a regular supply of such pre-processed waste of homogenous quality is a big challenge for cement plants at present.

2.3 Permission process & trial runs for co-processing

In addition to exploring the availability of alternative fuels and handling heterogeneous wastes that arrive, cement plants also have to conduct trial runs in order to obtain clearances from local authorities, Central and State Pollution Control Boards, and the Ministry of Environment and Forests. Central Pollution Control Board released the guidelines on co-processing of hazardous waste in cement plants in February 2010. Annexure A provides details of the application procedure.

The time period for getting clearances for conducting trial runs and obtaining permission for regular co-processing takes about 8 to 12 months. The direct expenses (without considering conveying and handling systems) associated with conducting a trial run is upto Rs. 15 Lakhs[5]. The permission process is very time consuming and expensive and is one of the biggest difficulties in increasing the usage of AFR by cement

[4] Perspectives and limits for cement kilns as a destination for RDF, Elsvier
[5] Report of the working group on cement industry for XII five year plan

plants in the country. If AFR substitution rate is 1-2%, regulatory authorities should permit co-processing without any trial runs. Consultants should be identified sector wise that can carry out waste trials.

2.4 Transport

Collection, transportation, handling of hazardous waste is expensive as the distance between waste generator and cement plant is at least 150 km[6] and can go upto 1000 km. More over, the current guidelines focus on transportation of dangerous materials. There is a need to evolve and implement proper guidelines on safe transportation of hazardous materials. There is also a lack in availability of certified transporters who can safely transport hazardous materials from waste generators to cement plants.

2.5 Handling hazardous wastes

Handling and storage of different kinds of hazardous waste requires utmost care. Sometimes their odour is too strong and such wastes need to be suitably handled. Safety Personal Protective Equipment should be used during handling such waste. In addition, the permission process for co-processing of hazardous waste has extra clearances and procedures which causes a hindrance in usage of hazardous waste as AFR.

CPCB guidelines for co-processing should focus on non-hazardous waste just as much as hazardous waste. For example, in Europe, it is mandatory for commercial entities generating plastic as waste to send the plastic waste to either a recycler or for co-processing. Similar rules should be introduced in India where plastic and other non hazardous waste being generated in the country is diverted for co-processing.

2.6 Interstate transfer of waste

At present; the regulation on Hazardous Wastes (Management, Handling and Transboundary Movement) doesn't encourage transfer of hazardous waste from one State to another State for co-processing in cement kilns. In spite of having enough waste available in one State that can be used as AFR, due to stringent policies on interstate transfer of waste, this waste cannot be co-processed by cement plants in another State. On the other hand, Europe permits movement of waste across countries as it doesn't consider the "waste" being transported as a disposal problem but as a recovery option with significant advantages. A similar perception of waste as a recovery option should be established in India.

2.7 Costs for disposal of hazardous waste

Currently, industries pay a huge cost for disposal, transportation, treatment of hazardous waste before it is sent to the landfill or incinerator or TSDF facility. Annexure B provides details of the price paid by industries for disposing off their waste[7].

[6] Ultratech Cement Limited at Reddipalayam
[7] Udaipur Chamber of Commerce and Industry

2.8 Waste hierarchy

Its extremely important and urgent to decide on waste hierarchy so waste streams that can't be recycled or reused and those that are suitable for co-processing are not sent to incinerator, landfill or other processing industries. At present, there are no clear guidelines categorizing the kind of waste and what is the most suitable strategy for its disposal- landfill, incinerator or co-processing. Different State Pollution Control Boards across the country maintain an inventory of hazardous waste that is categorized into landfill waste, recyclable waste, and incinerable waste. A new category "Co-processing" waste could be added.

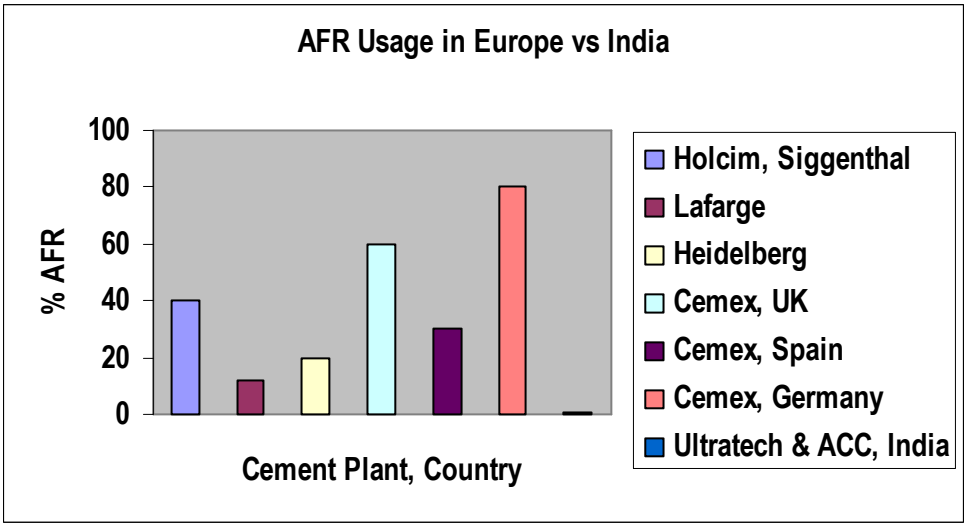
2.9 Technology to monitor emissions online

There is a dearth of technology and devices that can monitor different emission parameters online. Currently, devices are available to monitor just SOx, NOx and dust.

3.0 INTERNATIONAL BEST PRACTICES BY CEMENT INDUSTRIES

3.1 Usage of AFR by Cement Industries across the World

The graph below shows the percentage usage of AFR across cement plants in Europe and India. It is to be noted that the percentage usage of AFR is India is less than 1%.



Cement Company	% AFR
Holcim, Siggenthal	40
Lafarge (world average)	12
Heidelberg	20
Cemex, UK	60
Cemex, Spain	30
Cemex, Germany	80
Ultratech & ACC, India	1

HOLCIM

Holcim, founded in Switzerland in 1912, is one of the world's leading suppliers of cement and aggregates. It achieved 12.1% of thermal energy substitution in 2009 from 3.6% in 1990 by using alternative fuels[8].

Holcim, Siggenthal uses about 40% alternative fuels (TSR). Annual meetings are held with local communities, environmental board, environmental non profit organizations along with regular meetings regarding AFR directive, NOx emissions, etc. Some of the alternative fuels used are

- Dried sewage sludge (12'000t/y)
- Car tires (1'400t/y)
- Solvent (20'000t/y)

[8] http://www.coprocem.org/

- Animal meal (3‘00t/y)
- Plastic (14‘000t/y)
- Old activated coke from own coke filter (Polvitec) (1,400t/y)

Similarly, several other plants of Holcim have implemented AFR across various production sites in the World.

CEMEX

Cemex is a global leader in building material industry with a production capacity of 96 million tons of cement. The company achieved the following substitution rates for alternative fuels against fossil fuels:

- UK – 60% (SRF & Tyres)
- Spain – 30% (SRF & Tyres)
- Germany – 80% (SRF)
- Latvia – Targeting 60%

In December 2010 the company registered a new Clean Development Mechanism project at Zapotiltic, Mexico which aims to substitute alternative fuels for petcoke.

HEIDELBERG CEMENT

HeidelbergCement has a goal to replace fossil fuels with alternative fuels wherever possible. HeidelbergCement believes that the utilisation of waste materials and byproducts from other industrial sectors not only enables to contribute to natural resource conservation but also creates potential new solutions for sustainable waste management. The following wastes are used as alternative fuel:

- Sorted fractions of domestic and municipal waste with high calorific values
- Sewage sludge
- Hazardous waste.

The share of alternative fuels (incl. biomass) in the total fuel mix was 20.5% (TSR) in 2010[9]. Usage of RDF from municipal solid waste and commercial waste in 2010 resulted in the following savings:

- Recovery of 1 million ton of waste
- Saving 750,000 ton coal
- Saving 500,000 ton CO_2
- Avoiding 150,000 ton of ash when incinerated
- Saving 150,000 ton raw materials

The table below shows how a 70% increase in usage of waste fuels from the year 2000 resulted in decreasing various emissions such as Dust, NOx, SOx by 35%, 19% and 30% respectively.

[9] http://www.heidelbergcement.com/global/en/company/sustainability/environment/raw_materials_fuels.htm

	Emission (g/t clinker) 2008	Compared to 2000
Dust	284	Reduced by 35 %
NOx	1355	Reduced by 19 %
SOx	514	Reduced by 30 %
Waste fuels (%)	17 %	Increased by 70 %

Heidelberg Cement in China uses treated sewage sludge as alternative fuel with the following environment benefits:

- 100% thermal and mineral valorization of sewage sludge of circa 4 million inhabitants which lead to zero waste solution
- Saving of 25,000 ton/year coal
- Saving of 50,000 ton/year CO_2
- Saving of 20,000 ton/year virgin raw materials
- Zero increase of cement kiln emissions

It is to be noted that HeidelbergCement, Lengfurt, Germany has obtained consent from the government for 100% AFR usage.

LAFARGE

Lafarge, world leader in cement production has 168 plants in 50 countries. Lafarge has been using alternative fuels since 1990. According to Lafarge sustainability report 2010, alternative fuels accounted for 12% (TSR) of the Group's total fuel use. The company has a goal to increase TSR to 30% by 2015[10]. 84% of the plants use alternative fuels. Use of biomass fuels has increased by 40% over the last 3 years. Solid waste, tires, liquid waste, waste oil, energy from carbon or hydrocarbon in raw materials, biomass and animal meal are some fossil fuel alternatives used by the company.

3.2 Pre-processing of Waste

Non-homogeneous waste requires pre-processing to generate uniform quality of AFR. Various auxiliary industries in Europe and USA pre-process non-homogeneous waste using different technologies.

Geocycle, Holcim

Geocycle is a world leader in pre-processing of non-homogeneous waste. Geocycle, France prepares 40,000 tonnes/year of AFR. 27,000 tonnes of waste is mixed with 13,000 tonnes of saw dust to make the waste free flow as well as maintain steady calorific value. Industrial waste are of various types such as solid waste, ETP sludge, liquid waste, paints, solvents, waste oil, animal meal, etc. These are mixed with appropriate amounts of saw dust to make it homogenous. The obnoxious gas that is released during processing is removed by burning it at high temperatures (more than 850 degree centigrade).

[10] Lafarge Sustainability Report 2010

SITA, UK

Sita is a recycling and resource management company. The company engages in preparing Solid Recovered Fuel (SRF) from municipal and industrial solid waste. The calorific value of such SRF is normally in the range of 16,000-25,500 Kcal/Kg. SRF is indeed the best alternative to coal/pet coke in cement plants. Sita has already handled 8,394,636 tonnes of municipal and solid waste. Out of which 1,692,414 tonnes of materials are recycled and recovered and 100,650 tonnes of compost has been produced. Total amount of electricity generated from land fill waste is 531,456 MW and 279,939 MW of electricity has been generated from energy-from-wastes.

4.0 INTERNATIONAL BEST PRACTICES ON POLICY

BASEL CONVENTION

The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal entered into force in 1992. The Basel Convention places obligations on countries that are Parties to ensure the Environmentally Sound Management of hazardous and other wastes. "The guiding principle broadly accepted for securing a more sustainable waste management system is the waste hierarchy of management practices which places waste prevention and operations which may lead to resource recovery, recycling reclamation, direct re-use or alternative uses, in a preeminent position relative to operations which do not lead to such possibility. Thus, where waste avoidance is not possible, reuse, recycling and recovery becomes, in many cases, a preferable alternative to non recovery operations. To this end, co-processing in cement kilns provides an environmentally sound resource recovery option for the management of hazardous and other wastes, preferable to landfilling and incineration[11]."

EUROPE

The utilisation of alternative fuels in the cement industry is supported by the general principles of waste management at both European Union and national levels. The use of hazardous waste as an alternative fuel in cement kilns is regulated at EU level by Directive 94/67/EC. While the Directive sets out rules for the burning of hazardous wastes in dedicated plants for incineration of waste, it also recognizes and provides for the procedure of combustion or co-incineration, that is the burning of wastes in industrial furnaces (such as cement kilns) not exclusively designed for such purposes.

The EU Landfill Directive sets targets for the diversion of organic waste from landfill. In 2004, only 47 % of the total EU municipal waste generated was landfilled, and it is expected to decrease further to approximately 35 % by 2020 through increased recycling and thermal waste treatment initiatives[12].

Cement kilns co-processing hazardous wastes in the EU are not required to carry out a test burn but must comply with emission limit values for dusts, HCl, HF, NOx, SO_2, 12 heavy metals, total organic carbon (TOC) and dioxins and furans (PCDDs/PCDFs).

[11] Technical Guidelines on Environmentally Sound Co-processing of Hazardous Waste in Cement Kilns, Basel Convention website

[12] Environmental Science Associates on National Policy the Thermal Treatment of General and Hazardous Waste for the Republic of South Africa

European Commission's Best Available Technology reference documents (BREFs) present the results of an exchange of information, carried out under Council Directive 2008/1/EC (Integrated Pollution Prevention and Control Directive), between European Union (EU) Member States and industries concerned, and offer guidance to EU Member States on BAT and associated emission levels, as well as providing other useful sector specific information.

In Switzerland, the government conducted Life Cycle Assessment studies for different types of wastes that can be used as alternative fuels in cement plants. Based on the results of the studies, it declared the wastes that have the lowest impact on the environment that can be directly utilized for co-processing.

SOUTH AFRICA

National Policy on the Thermal Treatment of General and Hazardous Waste for the Republic of South Africa confirms the country's commitment towards implementation of waste management options that are consistent with the principles of the waste management hierarchy.

Existing regulatory framework consists of the following:

- The National Environmental Management: Waste Act (Act 59 of 2008) acknowledges the internationally recognised hierarchy of waste management, stating that sustainable development requires that waste generation is avoided, or if it cannot be avoided, that it is reduced, re-used, recycled or recovered (which includes co-processing), and as a last resort treated (which includes incineration) and/or safely disposed of. The Bill provides for setting national norms and standards, and specific waste management measures that include the licensing of waste management activities, identification of priority wastes, and prescribing measures for dealing with such wastes.

- The White Paper on the Renewable Energy Policy (2004) intends to promote renewable energy and integration of renewable energies into the mainstream energy economy. Apart from recognizing biomass the policy also recognizes organic components in municipal and industrial wastes. Energy from waste is accordingly one of the renewable energy resources included in the policy. The White Paper recognises that almost all of South Africa's waste with notable energy content is disposed of to landfill sites which should be avoided.

- South Africa also has a goal to contribute to meeting its international commitments in terms of the Stockholm and Basel Conventions.

- The Stockholm Convention on Persistent Organic Pollutants (2004) aims to eliminate the manufacture and use of particularly toxic POPs. The Convention also aims to clean-up existing stockpiles, dumps and equipment containing POPs, and includes several recommendations for the treatment of POPs containing waste through incineration or co-processing.

5.0 RECOMMENDATIONS

5.1 Data availability

Waste statistics are not updated and documentation systems for tracing waste are not known. It is important to know the origin of each type of waste and its composition in order to ensure easy and safe co-processing. The lack of waste statistics does not allow for a financially and ecologically optimized handling of waste streams.

Next Steps

It is extremely vital for the government to create a waste bank that helps cements plants in determining the type, quantity of waste available, name of waste generator and distance from the cement plant. There is a need to create waste banks that can combine, collate and share information on the different types (quantity, quality, etc) of waste available across the country. Waste banks should consist of the type of wastes available in the country, source of that waste, location of waste generator, quantity generated, calorific value of waste, category of waste (industrial, municipal, hazardous, non hazardous, bio-medical), properties of the waste, hierarchy of waste as recommended by Pollution Control Board (recycle, reuse, landfill, incinerator, co-processing, TSDF). This data should be available online in the public domain so cement plants as well as civil society can easily access the data. This matrix should also be updated regularly before June of every year by the Pollution Control Board. A software should be developed that can keep track of the waste being loaded, transported, used for co-processing, etc. Gujarat and Andhra Pradesh Pollution Control Board use XGN, software developed by NIC that tracks the different activities and waste being handled. Similar software can be used to keep track of waste available for co-processing.

In addition, CPCB should establish a separate website which provides the following information- trail runs conducted, permission accorded by the SPCB and CPCB, reports on the trials conducted, hazardous and non hazardous wastes likely to be available in the country for co processing, etc. The process of applying for permission and obtaining permission should also be made online for greater transparency and for quicker processing of applications.

5.2 Segregation of waste

Wastes of all types are currently mixed and sent to cement plants for co-processing. Waste segregation would help cement plants in determining the properties of waste and thus the type of technology required to process the waste for co-processing. Segregation of municipal solid waste is essential to ensure increase in availability of waste to cement plants for co-processing. Waste should be thus be segregated at the source before it is sent to cement plants for co-processing.

Next Steps

To ensure successful segregation of municipal solid waste, the government needs to create awareness among citizens on how to segregate their waste and the importance and benefits associated with the segregation. The government also needs to set up the infrastructure on collecting the segregated waste from different households and sending the waste to appropriate destinations depending on the characteristics of the waste. The government would need to establish a budget for segregation of both municipal solid waste and industrial waste as part of the national mission on co-processing.

5.3 Pricing for waste disposal

The price for the disposal of waste gets defined based on its specific characteristics, infrastructure required to handle & manage it, facilities and efforts required to pre-process it to make it suitable for co-processing in the kiln, volume handled and also on the liability associated with its handling, storage and disposal. There is need therefore to implement the polluter pays principle and allow the market forces to decide the price of disposal.

Industries that dispose their waste despite it being suitable for co-processing or other methods of recycling should be charged a higher disposal fee by SPCB. This will ensure diversion of such waste to co -processing units. Appropriate financial incentives need to be offered to both the waste producers which send their waste for co-processing as well as cement plants that accept such waste. SPCB can provide attractive discounts in consent fee for both the waste generator and cement plants co-processing the waste.

5.4 Extended Producer Responsibility

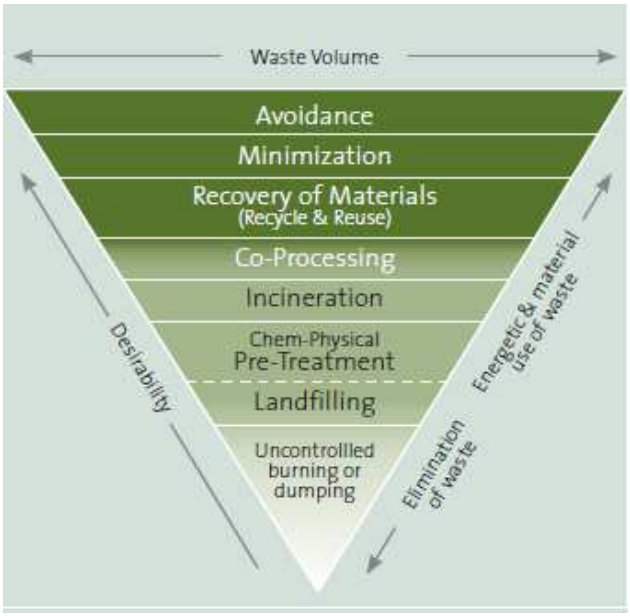
The rapid increase in production and consumption of products has led to an increase in the volume of products for disposal. This has resulted in large volumes of waste showing up at municipal landfills, leading to global collaboration to promote producer responsibility for proper disposal and recycling of products. Globally responsible producers of products should provide end-of-life programs that reduce the overall impact on the environment. Product stewardship is based on the principle that manufacturers have the greatest ability, and responsibility, to reduce product impacts. Extended producer responsibility programs would foster better collection of waste and thus enable collaboration between cement plants and waste generators. This would in turn lead to increase in usage of AFR.

5.5 Municipal Solid Waste

Co-processing should be regarded as an integrated part of modern waste management as it provides an environmentally sound resource recovery option for the management of wastes.

Co-processing should respect the waste hierarchy as shown in the diagram below. The diagram explains that waste shall not be used in cement kilns if ecologically and economically better ways of recovery are available.

Source: Guidelines on co-processing waste materials in cement production, GTZ-Holcim PPP



Next Steps

Municipal authorities should understand and incorporate the concept of waste hierarchy into waste management systems. Municipal solid waste should be collected, segregated and sent to waste processing industries or cement industries directly. Public private partnerships can be established between state governments and cement industries to collect, segregate and process municipal solid waste and send processed waste to cement plants for co-processing.

The Pollution Control Board officials could provide tremendous amount of guidance to waste generators, especially small to medium enterprises on the most ecologically sound and viable solution to be adopted in handling their waste based on the waste hierarchy.

5.6 Mission on co-processing

Co-processing provides an environmentally sound resource recovery option and does not hamper waste reduction efforts. Co-processing is also in line with relevant international environmental agreements, namely the Basel and Stockholm Conventions. Establishing national level mission on co-processing will recognize co-processing as a recovery option to be preferred over land filling and incineration. It will contribute towards achieving the goals set in National Action Plan on Climate Change, National Mission on Sustainable Habitats and Nationally Appropriate Mitigation Actions.

The handling, transportation and storage of hazardous waste also has a direct impact on the community. In case of any accidents, communities could be faced with irreversible damage. Current legislation and insurance policies are silent on the liability issue associated with handling and storage of hazardous waste. The question- "Who is held liable for handling waste- waste generators or cement plants using the waste as AFR?" remains unanswered. The mission on co-processing should address this gap.

Next Steps

The government should establish a national level mission on co-processing that will focus on establishing a legal and institutional framework to facilitate increased usage of alternative fuels and raw materials. There is a provision for introducing new rules under the Environment Protection Act. Just like there are rules for noise, plastic waste, hazardous waste; a rule on co-processing should be introduced. This will provide the legal framework required for increasing and promoting co-processing.

The mission will set minimum prequalification criteria to be met by cement plants that intend to implement co-processing. The mission would provide milestones to be achieved in the coming years with a goal of 10% thermal substitution rate by 2020. It would help in establishing guidelines on an effective system for waste sourcing, deliveries, AFR shipments, pricing of waste, etc. The government would be required to undertake capacity building and awareness generation programs towards acceptance of co-processing which will help in promotion and encouragement of co-processing in the country.

Various private public partnerships could be explored for effective implementation of municipal waste segregation. Waste tax could be incorporated as a component of property tax. This will help create funds for building the infrastructure required for segregation of waste. The government could also introduce guidelines that make segregation of municipal waste mandatory at the source for new communities being established in the tier 1, 2 and 3 cities. Wastes that currently don't fall under any category should be categorized to avoid wastes that could potentially be used for co-processing from being sent to the landfill or incinerator.

The Pollution Control Board should also work towards creating a web portal like CII's Waste Material Exchange (http://www.ciiwasteexchange.org/) website that provides access to the waste matrix, lists the

wastes that have been tested by CPCB for co-processing, various fact sheets and guidelines on co-processing, availability of wastes across the country, research and development efforts being undertaken, etc.

6.0 ROADMAP OF CO-PROCESSING IN CEMENT INDUSTRY FOR 2020

	2012	2016	2020
Action	(1) CPCB conducts trial runs for more type of waste materials (both hazardous and non hazardous materials) (2) Collect data on- quantity, quality, source of waste generated, cement plants willing to accept such waste, distance travelled from waste generator to cement plant, etc (3) Waste is segregated at the source before it is sent to cement plants for co-processing (4) Waste processing industries to collect waste from waste generators and give processed waste to cement plants. Pricing model to be regulated by the government on how much the polluter pays and how much cement plants should pay (5) Pre qualification criteria set for cement plants that want to do co-processing (6) Encourage interstate movement of hazardous waste as long as all precautions are implemented (7) Monitor technical and regulatory issues associated with the utilization of materials (8) Promote the advancement of technology and the development of skills through international transfer of technology and experience on co-processing	(1) Continuous online monitoring of stack emissions by cement plants whose AFR usage is greater than 10% and these emissions are accessible to CPCB/SPCB at any given time (2) Develop waste hierarchy for hazardous and non hazardous waste that gives clear guidelines on whether a particular type of waste should be sent to landfill, incinerator or sent for co-processing (3) Regulate and create uniform guidelines for co-processing of hazardous as well as non hazardous waste for all States in the country (4) Promote regular interaction between various stakeholders- cement plants, government officials, State pollution control board officials, community, waste generators, waste processing industries, etc. (5) Establish strong relationships with regulatory agencies so any kind of waste that can be prevented from being sent to landfill/incinerator is diverted to cement kilns (6) Conduct life cycle assessment studies to understand the overall impact of various disposal methods (landfill, incinerator, co-processing) and different types of wastes that can be used as alternative fuels	(1) A cement plant which fulfills the co-processing prequalification criteria should be issued a permit to co-process all types of waste, as long as it remains within maximum permissible emission norms (2) Continuous online monitoring of stack emissions by all cement plants using AFR and these emissions are accessible to CPCB/SPCB at any given time (3) Establish synergies and partnerships between cement sector and sectors like automobile, oil and gas, metal casting, etc that supply their waste to cement plants for co-processing (4) Study past and anticipated trends in the supply of materials and the plant's utilization of materials for co-processing

Benefits	(1) Lowers landfill demand (2) Co-processing reduces waste sent to landfill and incinerator and thus also reduces various gas emissions (3) Reduces dependence on coal, fossil fuels and other natural resources (4) Use of CO_2 neutral alternative fuels like scrap paper, wood, wastewater treatment sludge, etc reduces greenhouse gas emissions from cement production (5) Helps in reducing the overall environmental impacts throughout the life cycle of cement manufactured (6) Reduces health and environmental concerns associated with certain wastes like from piled scrap tyres (7) Many waste materials have raw material value thus substitute demand for mined material (8) Cost savings as no investments are required in purpose built incinerators or landfill facilities (9) Contributes towards achieving the goals set in National Action Plan on Climate Change and National Mission on Sustainable Habitats (10) Helps in creating a safer, healthier and ecologically sustainable environment for citizens		
Result	(1) 35 cement plants granted permission for co-processing (2) 3 kg of waste per tonne of clinker manufactured or thermal substitution rate is less than 2%	(1) GHG emissions reduced by 0.1% (2) 70 cement plants granted permission for co-processing (3) 7.5 kg of waste per tonne of clinker manufactured or thermal substitution rate is 5%	(1) 'GHG emissions reduced by 0.2% (2) 200 cement plants granted permission for co-processing (3) 15 kg of waste per tonne of clinker manufactured or thermal substitution rate is 10%

7.0 SUMMARY

Fossil fuels and raw materials have been successfully substituted by different types of wastes in cement kilns in Europe, Japan, United States, Canada and Australia since the beginning of the 1970s. There is a potential to reach 10% thermal substitution in India in the next 10 years through use of alternative fuels in cement plants. In order to achieve this goal, various policy interventions are required:

- Regulations should be framed such that co-processing is recognized as a preferred technology for waste disposal. Separate emission standards for co-processing should be formulated by the concerned authority.

- Minimum prequalification criteria should be set for cement plants utilizing waste considering environment, safety and cement quality parameters.

- A cement plant which fulfills the co-processing prequalification criteria including emission norms should be issued a permit to co-process all types of waste, as long as it remains within maximum permissible emission norms.

- Interstate movement of hazardous waste should be encouraged, as it is a recovery option where the use of waste reduces natural resource consumption of the State.

- A consistent methodology should be developed for the permitting process across all States in the country.

Annexure A- Co-processing Permission Procedure as per CPCB Guidelines

Central Pollution Control Board released the guidelines on co-processing of hazardous waste in cement plants in February 2010. According to the guidelines, a cement plant interested in co-processing needs to submit an application for trial run to SPCB with a copy endorsed to CPCB. SPCB grants permission for trial run within 60 days from date of receipt of application. Once SPCB grants permission, it takes 2-3 weeks for the cement plant to make all the arrangements for the trial run. The cement plant needs to inform CPCB about the trial run at least 15 days in advance so CPCB can monitor the trial run. The trial run lasts for 5 days. After successful completion of the trial run, cement plants needs to submit an application for regular co-processing along with the trial run report. The trial run report needs to be submitted to CPCB through SPCB. The report needs to contain data on emissions monitoring during the trial and before and after the trail. Cement plants need to send their emissions data to consultants abroad as certain emissions like dioxins can't be measured in the country. It thus takes a month to finish the trial run report. Once SPCB receives the report, it may grant or refuse permission within 30 days. The trial runs are conducted with CPCB, SPCB and a third party consultant. The authorization by SPCB takes 2-3 months. It therefore, takes 8-12 months from when a cement plants decides to implement co-processing to actual permission granted by CPCB/SPCB. If a new waste stream that hasn't been tested before by CPCB is to be introduced for co-processing, the same procedure is to be followed again.

Annexure B- Costs for Disposal of Hazardous Waste

The charges vary from State to State as the price depends on various factors such as fuel costs, distance travelled, State norms, etc.

Transportation: The following transportation charges are paid for transporting hazardous waste from waste generator to TSDF facility.

Transportation (distance from premises to member industry to TSDF)	Rs./km/MT
0 to 10 km	**Rs. 750/- (if vehicle loaded with waste is released within 4 hours from the premises of waste generating units) irrespective of quantity of waste loaded.**
	Rs. 1500/- (if vehicle is retained for more than 4 hours in one trip (Max. 8 hours) within the premises of waste generating unit) irrespective of the quantity of waste loaded.
11 to 100 km **101 to 250 km** **251 and above**	**Rs. 2.92** **Rs. 2.23** **Rs. 2.14**

A security deposit (apart from membership registration fee of Rs. 25,000/-) is to be paid depending on the waste generated:

Waste Generation	Security Deposit
i) Upto 5 MT per annum	Rs. 10,000/-
ii) 6 MT to 25 MT	Rs. 25,000/-
iii) 26 MT & above	Rs. 50,000/-

User charges:

(1) For direct landfill of waste:

Quantity of waste per annum	Charges per MT
Upto 250 MT	Rs.746
251 to 500 MT	Rs.737
501 to 1000 MT	Rs.727
Above 1000 MT	Rs.707

(2) For stabilization of waste:

Quantity of waste per annum	Charges per MT
Upto 250 MT	Rs.969
251 to 500 MT	Rs.959
501 to 1000 MT	Rs.950
Above 1000 MT	Rs.940

(3) For incineration of waste:

Quantity of waste per annum	Charges per MT
Upto 3000 KCL/Kg	Rs.7172
3001 to 5000 KCL/Kg	Rs.7753
5001 & above KCL/Kg	Rs.8238

Annexure C- Project Background

Objective:
Facilitate development of enabling policies and framework by regulatory agencies (State and Central pollution control board) to facilitate use of urban & industrial waste as raw material/ alternate fuel in the cement industry, thereby moving towards a low carbon economy.

Funding:

Project partially supported by Shakti Sustainable Energy Foundation (SSEF), part of Climate Works Foundation.

Partners:

Cement Manufacturers' Association (CMA) & CII – Godrej Green Business Centre

Participants:

The activities of this project were led by Mr. Ulhas Parlikar, Director – AFR, Holcim. Dr S K Handoo, Advisor (Technical), Cement Manufacturers' Association represented CMA. The project had 8 representatives from CPCB & SPCB:

No	Name	Designation	Organization
1	Mr Venkata Bhaskara Rao	Senior Environmental Engineer	Andhra Pradesh Pollution Control Board
2	Dr Sib Sankar Bala	Additional Director	Central Pollution Control Board
3	Mr Jayantbharti Goswami	Deputy Environment Engineer	Gujarat Pollution Control Board
4	Mr Ramesh Kumar	Senior Environmental Officer	Karnataka State Pollution Control Board
5	Mr Pushpendra Singh	Regional Officer	Madhya Pradesh Pollution Control Board
6	Mr Vidyanand Motghare	Joint Director – Air Pollution Control	Maharashtra Pollution Control Board
7	Mr Vijai Kumar Singhal	Senior Environmental Engineer	Rajasthan Pollution Control Board
8	Mr Mohan Naidu	Joint Chief Environmental Engineer	Tamil Nadu Pollution Control Board

Activities:

There were various activities conducted as part of this project:

1. Stakeholders consultation meetings
2. Release of best practice manual on AFR in May, 2011.
3. National mission to Ultratech Cement Limited, Reddipalayam and ACC Limited, Coimbatore in October, 2011.
4. AFR workshop in Jaipur in November, 2011.
5. International mission to Holcim (Switzerland), Holcim (France), Holcim (Germany) and Heidelberg (Germany) in December, 2011.
6. White paper on increasing co-processing in Indian cement plants in 2012.

Annexure D- Contact Details

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