Waste Co-processing in Cement Kilns
Concepts and Benefits

Milind Murumkar.
Geocycle India
ACC Limited

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**Geocycle is brand of Holcim under which group companies offer waste management services to other industries**

Geo means “earth” in Greek, while Cycle calls to mind the cycle of life. “Geocycle” refers to our ability to convert waste into a safe, useable resource.
**Waste Management Hierarchy**

*GIZ Guidelines on Co-processing of waste materials in Cement Production*
Co-processing is...
...the disposal of waste materials in RII’s (Resources Intensives Industrial processes) such as cement, lime, steel, glasses, power generation etc.*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Temperature and time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature at main burner</td>
<td>&gt;1450°C: material</td>
</tr>
<tr>
<td></td>
<td>&gt;1800°C: flame temperature.</td>
</tr>
<tr>
<td>Residence time at main burner</td>
<td>&gt;12-15 sec and &gt;1200°C</td>
</tr>
<tr>
<td></td>
<td>&gt;5-6 sec and &gt;1800°C</td>
</tr>
<tr>
<td>Temperature at precalciner</td>
<td>&gt;850°C: material</td>
</tr>
<tr>
<td></td>
<td>&gt;1000°C: flame temperature</td>
</tr>
<tr>
<td>Residence time at precalciner</td>
<td>&gt;2 - 6 sec and &gt;800°C</td>
</tr>
</tbody>
</table>

*GIZ Guidelines on Co-processing of waste materials in Cement Production
Advantages of Co-processing in Cement Kiln

1. High temperatures and long residence time
   - In all cases more than 3” > 1100 °C

2. Self cleaning process
   - Lime represents > 60% in mass

3. Double valorization: organic and minerals
   - Organic totally destroyed
   - Ash incorporated in the final product

4. Reduction of global emissions
   - No additional emission if A.F.R. used - Global CO2 is reduced

5. Existing, local industry
Reduction of GHGs

Co-processing and Incineration
Reduction in GHG Emissions

Co-processing is THE alternative to save our environment and improve industry ecological footprint

Co-processing and Landfill
Prevention of Methane* Emissions

* Methane has 21 times more global warming potential than CO2
**Our Policy**

Holcim has defined a policy that will govern the Group companies’ behaviour and operations when co-processing wastes:

### The 9 principles of our co-processing policy

<table>
<thead>
<tr>
<th>Elements of sustainability</th>
<th>I. Act as a partner to society by offering waste management solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II. Keep our environment safe</td>
</tr>
<tr>
<td></td>
<td>III. Add value to our core business</td>
</tr>
<tr>
<td>What we will do</td>
<td>IV. Ensure occupational health &amp; safety</td>
</tr>
<tr>
<td></td>
<td>V. Refuse the listed “banned wastes”</td>
</tr>
<tr>
<td></td>
<td>VI. Guarantee the quality of our products</td>
</tr>
<tr>
<td>How we will do it</td>
<td>VII. Comply with the relevant regulations and promote best practices</td>
</tr>
<tr>
<td></td>
<td>VIII. Monitor and control the inputs, process, products and emissions</td>
</tr>
<tr>
<td></td>
<td>IX. Communicate transparently</td>
</tr>
</tbody>
</table>
But All Wastes Are Not Co-processable

List of “Banned Wastes”

- Asbestos containing waste
- Anatomical hospital waste
- Bio-hazardous waste
- Electronic scrap
- Entire batteries
- Explosives
- High concentration cyanide waste
- Mineral acids
- Radioactive waste
- Unsorted municipal solid waste
Co-processing Guidelines

- Holcim and GTZ through a Strategic alliance
- Proposed international guidelines for the co-processing of waste materials in the cement production
- Secured the public acceptance of these guidelines
- Finalized them in July 2006

Guidelines available in English, Spanish, Portuguese, Czech, Slovak, Hungarian, French, Chinese and Russian

- From those guidelines, specific legal frames on co-processing are under implementation in around 15 countries
  - More advanced: Mexico, Salvador, Colombia, Ecuador, Brazil, Chile, China, Philippines, ...
  - SA: new policy signed April 26 - 2009
CPCB Guidelines on Co-processing in India

Guidelines on Co-processing in Cement/Power/Steel Industry

February 2010

Central Pollution Control Board
(Ministry of Environment & Forests, Govt. of India)
Parivesh Bhawan
East Arjun Nagar, Delhi – 110 032

CPCB Guidelines on Co-Processing
February 2010
Special focus on cement
Co-processing: Moving to an **UN** Legal Frame

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**General Information**

- UK comments on proposal to amend Basel Convention. Technical guidelines on **specially engineered landfill (DS)** and **incineration on land (D10)**.
- **New Chemicals** on OSPAR List of Chemicals for Priority Action.
- **Comments from Taiwan** on the Implementation of Technical Guidelines.
- **Comments received from Parties and Others** in response to decision WP2 "Hazardous waste minimization”.

**Hazardous Waste in Cement Kilns**

Please find the **Draft Technical Guidelines on Co-processing of Hazardous Waste in Cement Kilns** (Nov 3, 2009 version) submitted by Chile as lead country. Comments are invited from Parties and other stakeholders **by 31 January 2010** to SBC (iromhaim.shoffi@unep.ch) and copy to Mr. Julio Monreal at iromhaim@minsul.gov.cl.
Guidelines on Co-processing South Asia

- Co-processing is recognized by government authorities in:
  - India
  - Indonesia
  - Sri Lanka
  - Thailand
  - Vietnam
Frame Work Of Operation

Identify the Customer

Customer Interaction

Sample Evaluations

Co-processable?

Yes

Finalize Usage Plan

Clearances from Authorities

ACC and Waste Generator

No

Suggest Alternative Solution

Approval?

Yes

Initiate Regular Co-processing

No

Submit to Authorities

Undertake Trial Burn

Trial Burn Required?

Yes

Co-processing Agreement with Customer

No

Approval?

Yes

No
Holcim’s Global Waste Co-processing Network

- Co-processing activities in 39 countries with over 4500 customers
- 28 pre-processing facilities
- More than 7 mil. tons of AFR co-processed in 2009
- Treated about 20,000 waste streams
The Geocycle Asia Waste Management Network

- Employs 300 FTE dedicated to waste management activities
- More than 654,000 tons of AFR co-processed in 2007
- Treated about 20,000 waste streams
The Geocycle Asia approach
Geocycle India

Co-process Hz and Non Hz Solid, Liquid and Sludge waste

Handle with Safety
Waste Pre-processing Activities

Frame Work Of Operation

1. Identify the Customer
2. Customer Interaction
3. Sample Evaluations
   - Co-processable?
     - Yes
       - Finalize Usage Plan
       - Clearances from Authorities
         - ACC Limited
         - ACC and Waste Generator
       - Approval?
         - Yes
           - Co-processing Agreement with Customer
         - No
           - No
             - Approval?
               - Yes
                 - Submit to Authorities
                 - Undertake Trial Burn
                   - Yes
                     - Trial Burn Required?
                       - Yes
                         - Co-processing Agreement with Customer
                       - No
                         - No
               - Yes
                 - Initiate Regular Co-processing

Diffrent Waste Markets

Diffrent Kiln Systems

Flow-Sheet example
AFR Pre-Processing Project - Features

- Pre-processing is carried out in an enclosed area
- Material sampling station for fingerprint analysis
- Dedicated vehicle parking area
- Geo-membrane and concrete floor for complete leachate control
- State of the art Fire fighting facility
- De-odourizers (Limonene) for storage and pre-processing areas
- Modern facility with state of the art processing facilities
- No effluent or by product is generated
- Equipment for efficient dust control.
- Zero discharge and non-polluting
- Modular sewage treatment plant
- Compliant with national rules and guidelines
AFR Pre-Processing Project – What happens here?

- Saw Dust
- Municipal waste
- Paint Sludge & other acceptable Wastes
- Plastics
- Tyres
- Final Product
AFR Pre-Processing Project – Process description

- The waste material received at the factory is tested for quality.
- The size of the material is reduced in primary Shredder which can shred any waste material safely without emissions.
- After Primary shredding the waste material separated for coarse and fine materials in an air separator.
- The coarse material from air separator is further reduced in size in secondary shredder. The coarse and fine material are co-processed in rotary kiln.
- Wet and sludge type materials are impregnated with saw dust and other dry adsorbants for making them free flowing.
- The entire process is pollution free.
AFR Preprocessing Project – Regulatory Provision

- As per the “Basel Convention Technical Guidelines for co processing of wastes in cement kilns”, Pre-processing of wastes into AFRs and Co-processing in Cement Kiln is recognized as the most appropriate solution for environmentally sound management of wastes including Hazardous wastes. These are ratified by the different countries including India in Oct, 2011.

- MoEF has brought out a memorandum no. 23-5 / 2011 – HSMD dated 8th August 2011 permitting establishment of Preprocessing facilities for recycling of wastes by cement plants and TSDFs.

- As per this memorandum, cement plants and TSDF facilities are suggested to set up Preprocessing facilities for co processing wastes in Cement plants.

- Existing TSDFs have been suggested to set up the pre-processing facilities after obtaining NOC from SPCB.

- Currently RSPL in Panoli, Gujarat and GEPIL in Ranipet have set up pre-processing facilities after taking NOC from GPCB and TNPCB.
AFR Pre-Processing Unit – Pictorial Operational Sequence

- Truck arrives at facility
- Security check
- PPE check
- Entry stamp
- Truck enters facility
- Documentation check
- Truck weighment
- Electronic data entry
AFR Pre-Processing Unit – Pictorial Operational Sequence

- **Waste inspection**
- **Arrival checklist**
- **Storage Area**
- **Waste unloading**
- **Supervision**
- **Waste Sampling**
**AFR Pre-Processing Unit – Pictorial Operational Sequence**

- **Lab Analysis (fingerprint)**
- **Final Storage**
- **Waste identification**
- **Storage Map**
- **Compatibility testing**
- **Shredding**
AFR Pre-Processing Unit – Pictorial Operational Sequence

Screening

Blending

Pre-processed Waste
Pre-processing Platform in Thailand
Examples of Waste Pre-Processed and Co-Processed

- Diaper trimmings
- Damaged beans
- Plastics/Packaging waste
- Expired FMCG products
- Expired food/health products
- Packaging materials
- Rubber wastes
- Textile waste
- Refinery wastes
- Lime sludge from water treatment
- Blasting grit
- Diatomaceous earth
- Aluminum production waste
- Spent Carbons

- Paint wastes
- Used oil & grease
- Scrap tires
- Wood chips
- Solvents
- Carbon fines
- Oil filter fluffs
- Coking wastes
- Shipping wastes
- RDF fluff & pellets
- Sorted municipal solid waste
- ETP Sludge
- Synthetic gypsum from sulfur scrubbers
- Refinery catalyst
- Foundry sand
Co-processing Deliverables

- Waste managed responsibly with no waste residue
- Zero Liability once the waste is accepted at Geocycle
- Safe, secure and environmentally sound way of waste disposal
- Full compliance with local environmental regulations and the setting of best practices
- Rigorously monitored environmental and safety standards
- Optimized asset utilization, eliminating unnecessary onsite waste storage
- Complete documentation of waste disposal activities
- Locally available solution

Co-processing is, therefore, a local & desired route to manage wastes with zero liability, environmental impact addressing all concerns of sustainable development.
**Brand Protection & Brand Enhancement**

- Helps to prevent brand reputation erosion
  - Protects against grey market sales
  - Prevents trademark abuse

- Boost for the green image of the company. Helps you be ‘a cut above the rest’
  - Co processing Certificate of disposal stating that the waste sent by waste generator has been co-processed and ‘does not exist anymore’
  - Helps to achieve **zero waste to landfill goals**
  - Performance enhancement for ISO and other International certification
  - Adds another feather in your cap of sustainability reporting

**THINK GREEN : CO-PROCESS**
Current Challenges in Data Collection

- Availability of waste generation details – Industrial & Municipal
  - Quantity
  - Quality
  - Disposal practices adopted
    - More so in MSMEs
  - Reliability of publicly available information

*Seek support of all PCBs in filling the gaps & provide valuable feedback*
# Data Variation in States – Hazardous waste

<table>
<thead>
<tr>
<th>State</th>
<th>Incineratable (MTPA)</th>
<th>Landfillable (MTPA)</th>
<th>Recyclable (MTPA)</th>
<th>Total Quantity (MTPA)</th>
<th>No. Haz. Waste generating Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh*</td>
<td>42,826</td>
<td>4,14,747</td>
<td>6,29,167</td>
<td>10,86,740</td>
<td>3,222</td>
</tr>
<tr>
<td>Karnataka*</td>
<td>43,009</td>
<td>47,377</td>
<td>96,108</td>
<td>1,86,495</td>
<td>3,078</td>
</tr>
<tr>
<td>Tamil Nadu**</td>
<td>11,145</td>
<td>1,57,909</td>
<td>89,593</td>
<td>2,58,647</td>
<td>2,532</td>
</tr>
<tr>
<td>Chhattisgarh*</td>
<td>7,435</td>
<td>83,055</td>
<td>1,96,069</td>
<td>2,86,560</td>
<td>189</td>
</tr>
</tbody>
</table>

**Note:**

* Data from SPCB

** Data from CPCB, 2009
### Data from CPCB Report 2009

<table>
<thead>
<tr>
<th>State</th>
<th>Incinerable (MTPA)*</th>
<th>Landfillable (MTPA)*</th>
<th>Recyclable (MTPA)*</th>
<th>Total (MTPA)*</th>
<th>Haz. Waste Generating Units (MTPA)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>31,660</td>
<td>2,11,442</td>
<td>3,13,217</td>
<td>5,56,319</td>
<td>1,739</td>
</tr>
<tr>
<td>Gujarat</td>
<td>1,08,622</td>
<td>11,07,128</td>
<td>5,77,037</td>
<td>17,92,787</td>
<td>7,751</td>
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<tr>
<td>Karnataka</td>
<td>3,713</td>
<td>18,366</td>
<td>54,490</td>
<td>76,569</td>
<td>2,076</td>
</tr>
<tr>
<td>Tamil Nadu</td>
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<td>2,532</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>6,897</td>
<td>5,277</td>
<td>2,83,213</td>
<td>2,95,387</td>
<td>174</td>
</tr>
</tbody>
</table>

*Source: National Inventory of Hazardous Wastes Generating Industries & Hazardous Waste Management in India, 2009, CPCB*
Tamil Nadu State Profile
State Overview

- Population: 7.21 Crore
- Area: 1,30,058 Km$^2$
- No. of Districts: 32
- GSDP: 4,91,048.5 Crore Rs.
- GDP Growth Rate: 12.309%
- Per Capita Income: 72,993 Rs.
- Industrial Units: 26,122$^1$
  - Large Scale: DNA
  - Mega Scale: DNA
  - SEZ: 16 (Manufacturing)
- Index of Industrial Production: 145.8

Source:
Waste Generation

- **Industrial waste**
  - **Hazardous waste Generation:**
    - 2,58,647 MTPA
    - 2532 Units
  - **Non Hazardous waste:** DNA

- **MSW**
  - **MSW Generation:**
    - 45,63,960 MTPA (12,504 TPD)
  - **ULBs: 719**
    - 10 Corporations,
    - 148 Municipalities
    - 561 Nagarapanchayaths

<table>
<thead>
<tr>
<th>Disposal Mechanism</th>
<th>Quantity (MTPA)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incinerable</td>
<td>11,145</td>
</tr>
<tr>
<td>Landfillable</td>
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<tr>
<td>Recyclable</td>
<td>89,593</td>
</tr>
</tbody>
</table>

Source:
1 National Inventory of Hazardous Wastes Generating Industries & Hazardous Waste Management in India February 2009
Current disposal practices

- No. of TSDFs: 1
  - M/s. Tamilnadu Waste Management Ltd, Gummidipundi
    - 1,00,000 MTA

- CETPs: 39

Source:
1 http://www.cpcb.nic.in/upload/NewItems/NewItem_149_Protocol.pdf
2 OVERVIEW OF CETPs IN INDIA - Status, issues and challenges, By N K Verma, Former Additional Director, CPCB (CII-GBC Workshop, 23 Nov 2012)
## Industry Profile in State

<table>
<thead>
<tr>
<th>Industry</th>
<th>Major Players &amp; Capacity / Turnover</th>
<th>Waste Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>Ford Motor Company, Hyundai Motor India Limited, Mitsubishi Motors, Ashok Leyland, Nissan, Bharath Benz</td>
<td>Paint Sludge, ETP Sludge, Oil Soaked cotton</td>
</tr>
<tr>
<td>Auto-components</td>
<td>Sundram Fasteners, RaneTRW, Visteon, Premier Instruments &amp; Controls Ltd.,</td>
<td>Paint Sludge, Oil soaked cotton, ETP sludge</td>
</tr>
<tr>
<td>Pulp &amp; Paper</td>
<td>ITC, TNPL, SPB</td>
<td>Sludge, Plastic waste, Oil soaked cotton</td>
</tr>
<tr>
<td>Engineering</td>
<td>Amalgamations Group, Bharat Heavy Electricals Ltd., Caterpillar India Pvt. Ltd., Murugappa Group, LakshmiMachine Works, Sanmar Group, TVS Group</td>
<td>Slag, Foundry sand</td>
</tr>
<tr>
<td>Tyres</td>
<td>Apollo, Michelin India, JK Tyres</td>
<td>Scrap Tyres, Off Spec rubber, scrap rubber</td>
</tr>
<tr>
<td>Chemicals</td>
<td>Orchid Chemicals and Pharmaceuticals, Shasun Chemicals and Drugs,</td>
<td>Expired drugs, Solvents</td>
</tr>
<tr>
<td>Petrochemical</td>
<td>Manali Refinery -Chennai Petroleum Corporation Ltd., Cauvery Basin Refinery-CPCL</td>
<td>ETP Sludge, Tank Bottoms</td>
</tr>
</tbody>
</table>
Our Strength - The W E T Management Theory

W - the most important one?

E - Equipment

T - Technology

WILL or Passion
Thank You

Namaste
Shukriya

Contact details:
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