Sustainable Waste Management in Cement Kilns

Sharmistha Nandi | 27/06/2024

geoclean

Overview

- Waste Challenge
- Concepts and Benefits of Co-processing
- Cement Industry and Circular Economy
- Geoclean Operations and Solutions

Waste: A growing challenge

Waste handling can be time consuming and costly, exposing industries to environmental and reputational risk

Complex waste management operations compete for funding with other priorities such as clean water and general utilities

Municipalities struggle with lack of infrastructure and budgets to manage waste

Improper waste management puts a strain on the health of urban dwellers and the environment

Incineration & Landfill

Disposal based options for management of non-recyclable waste streams pose serious challenges

- Large waste footprint and liability
- May produce harmful gases & leachates
- Do not capture the inherent value of waste
- Contribute to high GHG emissions
- Require additional infrastructure
- Large opportunity costs

What is Co-processing?

Co-processing in cement kiln...

- Co-processing is a globally recognized technology through which waste is treated in energy-intensive industries such as cement
- The technology is referred to as co-processing as the safe destruction of waste occurs parallel to the cement manufacturing process, at high temperatures and long residence time existing in cement kilns

Completely decomposes waste through high temperatures and long residence time

Recovers energy and recycles mineral value of waste, if any

Leaves no residue

Leads to conservation of natural resources

Offers local waste management solution

Reduces greenhouse gas emission

Saves public funds

Promotes a circular economy

Co-processing: A proven technology for waste management

- **Safe elimination of harmful substances** that cannot be kept in the loop of a circular economy
- **Best use of residual waste** which reached its end-of-life status and can't be recycled anymore
- **Conservation of natural resources** by replacing them with secondary resources
- **Energy recovery** and **mineral recycling** from waste for which (closed-loop) recycling is not yet feasible
- **Use of existing cement plants** with moderate additional investments into pre-processing and co-processing facilities

Source: Concept of Circular Economy, European Commission 2014

Environmental, Social and Economic Benefits of Co-processing

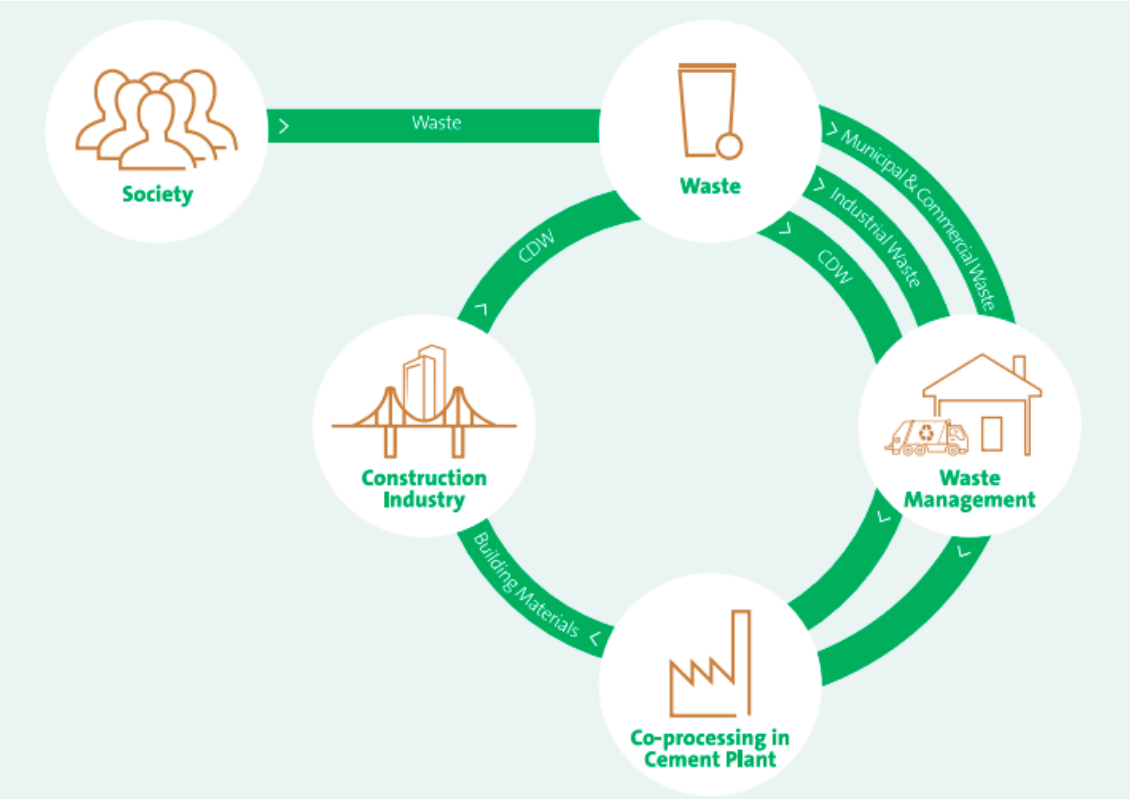
Climate Change Mitigation

Recycling and Resource Efficiency

No additional public expenditure

Local jobs

Cement Industry and Circular Economy

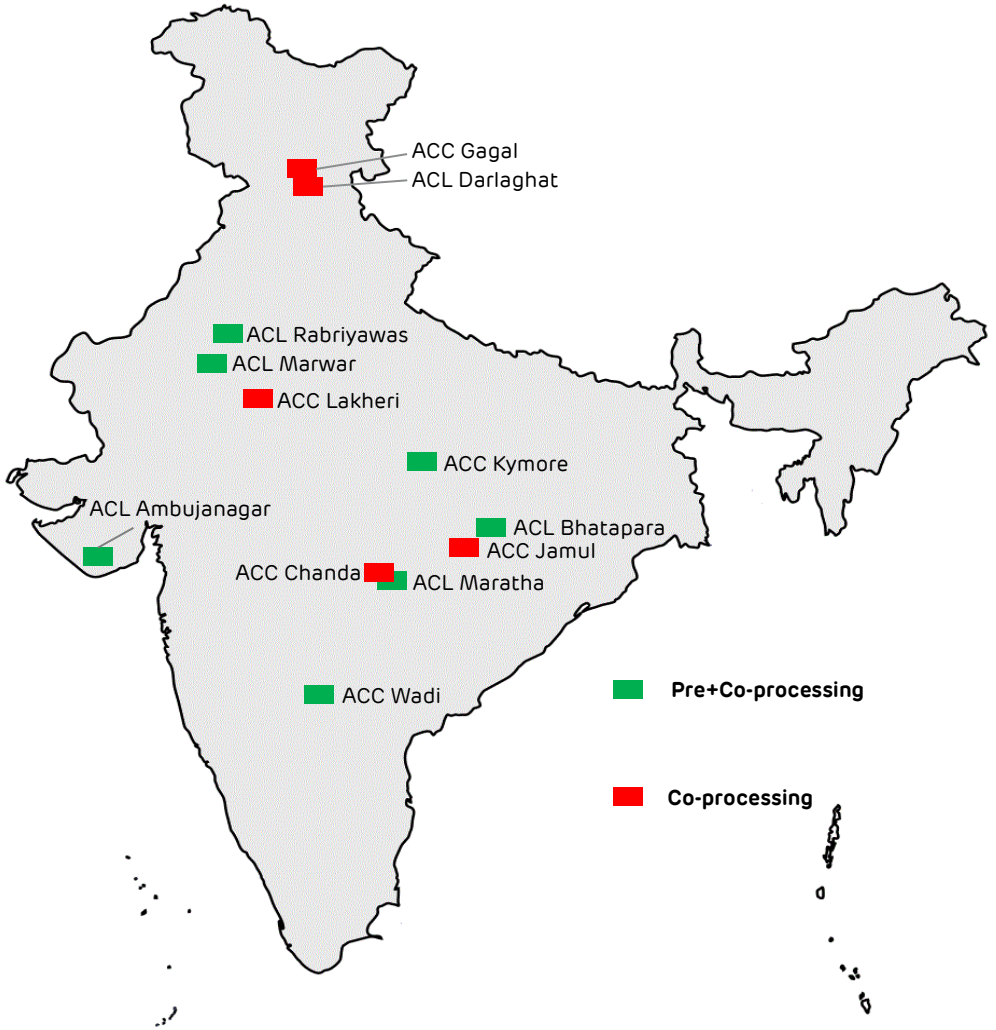


- Cement Industry is a key link in the circular economy through:
  - Co-processing of end-of-life waste in cement kilns
  - Utilizing cementitious industrial byproducts in cement
  - Using recycled/secondary aggregates in concrete
- With its growing capacities, Indian Cement Industry is working to provide sustainable solutions to the increasing volumes of waste in the country, thereby supporting the move towards a circular economy.

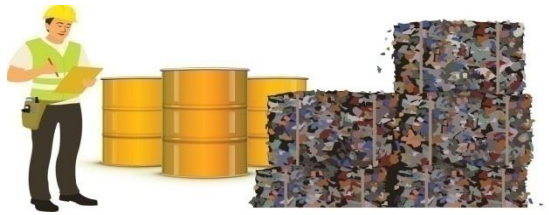
Geoclean – the dedicated waste management brand of ACC and Ambuja Cement

Our Footprint

- 7 pre-processing and 12 co-processing facilities
- More than 17 lakh tons of waste safely co-processed in 2023-24
- Partnered with 20+ municipalities and remediated 10+ dumpsites resulting in reclamation of 100+ acres of land
- More than 1.01 million tons of natural resources conserved, and 0.72 million tons of CO2 saved in 2023-24



Solutions we offer

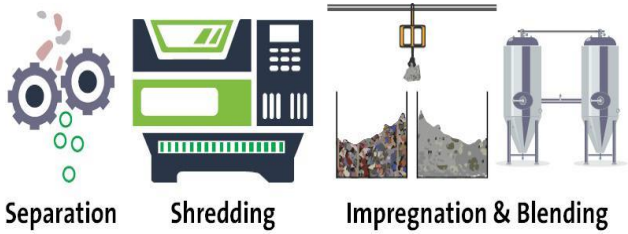


Assessment & Consultation.

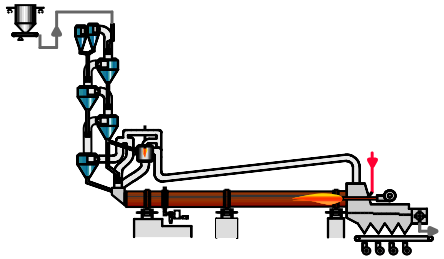
Laboratory Testing

Collection & Transportation

Other Services



Pre-processing



Co-processing

- Respect Waste Management Hierarchy and Circular Economy Principles
- Compliance with all relevant laws and regulations
- Selection of only appropriate waste streams (no banned wastes)
- Expert pre-processing to ensure quality control, proper handling and stable kiln operation during co-processing
- Appropriate risk controls to provide healthy and safe working condition
- Monitoring and auditing systems to track and enable successful implementation

Customers we serve

We work with our stakeholders to find the most sustainable solution for their waste, turning it into a circular resource and diverting it from landfills. Our approach ensures recycling and recovery of resource value inherent in waste.

Industrial & Service Companies

We offer dedicated solutions for industries and service companies.

We work with customers to ensure they receive the tailored solutions they need.

Agricultural Sector

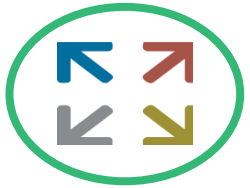
We work with farmers, plantations and agricultural processing units to safely and sustainably manage agricultural residue.

Our approach ensures that management of agricultural waste contributes to the prosperity and well being of local communities and is sustainable in terms of the environment & biodiversity.

Municipalities

Many municipalities face rising volumes of waste. At the same time, they also confront tighter budgets and increased expectations from stakeholders & regulators.

We offer them innovative solutions that eliminate the need for large public investments.



Waste Management Companies

Waste management companies require extensive capacity, flexibility and expertise in their waste management partners.

We create value for them and their customers by ensuring that waste is treated in a safe, compliant and responsible manner.

Examples of waste streams managed by Geoclean

- Biomass
- Calcium fluoride
- Carbon fines
- Contaminated soil
- ETP sludge
- Expired seeds / crop protection products
- Expired food/health products
- Expired consumer goods
- Filter cake
- Fly ash & bottom ash
- Foundry sand
- Mill scale
- Oily wastes
- Packaging materials
- Paint wastes
- Plastic waste
- Refuse Derived Fuel (RDF)
- Redmud
- Refinery wastes
- Rubber wastes
- Shipping wastes
- Segregated Combustible Fraction (SCF) of Municipal Solid Waste
- Solvents
- Spent carbon
- Spent pot liner
- Textile waste
- Tyres
- Used oil & grease

Geoclean's Solutions for Fresh & Legacy Municipal Waste

Management of fresh municipal waste

- Waste processing facilities are set up by the municipalities in various cities. These facilities segregate inert, recyclables and non-recyclables.
- The non-recyclable fraction containing waste such as plastics, textiles, paper, cardboard, wood and rubber lack sustainable solutions.
- This fraction of waste often referred to as SCF/RDF is safely co-processed in Geoclean's cement plants.
- Co-processing waste in cement kiln optimizes the utilization of the waste's inherent mineral and energy content, thanks to the unique, simultaneous, and efficient, recycling and recovery process, leaving zero residue.

Management of legacy municipal waste

- India has over 3,000 landfill sites, covering more than 10,000 acres of land. These sites pose serious hazards for the environment and public health.
- Geoclean has established partnerships with many large and small municipalities to help contribute to Swachh Bharat Mission.
- It supports MSW dump remediation projects across various states to clean up legacy waste sites.
- The remediation of dumps is achieved through sustainably co-processing the non-recyclable solid combustible fraction excavated from the site at its cement plants.

Geoclean co-processes waste from multiple municipalities across the states of Himachal Pradesh, Haryana, Rajasthan, Uttar Pradesh, Gujarat, Madhya Pradesh, West Bengal, Maharashtra, Chhattisgarh, Telangana, Goa, Karnataka, Tamil Nadu and Kerala.

Geoclean's EPR Solutions for Plastic Waste Management

- **Collection and Sorting:** We work with industries, municipalities and waste management agencies to collect both pre- and post-consumer plastic waste and Refuse Derived Fuel (RDF) from municipal waste containing plastics. Our partner agencies also collect and sort plastic waste for recycling across the country.
- **Transportation:** We take care to conform to all relevant local and national regulations during transportation.
- **Recycling and End-of-life Disposal:** Our partners recycle all plastics collected by them in CPCB registered recycling facilities. End-of-life disposal is carried out through co-processing at our 12 state-of-the-art facilities spread across the country. All our facilities are registered as plastic waste processors (PWP) with CPCB.
- **Ensuring complete transparency:** We ensure a complete record and audit trail, a cradle to grave approach ensuring transparency and traceability.
- **EPR Credits:** We work with our customers throughout the year for managing pre- and post-consumer plastic waste as well as RDF containing plastics. At the end of the year, we provide customers with EPR certificates emanating from the volumes for which they partnered with us via the CPCB portal.

geoclean

Geoclean's Solutions for Waste from Aluminum Industry

Spent Pot Liner (SPL)

- SPL is a solid waste generated during the production of primary aluminum.
- Aluminum is produced via an electrolytic process which occurs within carbon-lined steel pots.
- The lining of the pot is typically made of two layers - an insulating refractory lining and an interior carbon lining.
- Over time, the cell lining wears and can form cracks.
- When the lining of the pot comes to the end of its life, it is classified as SPL.

Challenge in Management

- SPL generated as waste material has two forms – a carbon rich portion called "1st Cut" and a refractory rich portion called "2nd Cut".
- SPL is classified as hazardous waste (Category 11.2 of Schedule I of HOWM Rules 2016), mainly due to the presence of toxic fluoride and cyanide that are leachable in water.
- It has high pH due to presence of alkali metals and oxides and thus, is corrosive in nature.

Co-processing of SPL

- Various trials conducted in India and abroad have shown that SPL can be safely co-processed in cement kilns provided appropriate infrastructure is in place.
- Controlled feeding of SPL in the cement production process can provide a sustainable long-term solution for both fresh and old stocks of SPL lying with aluminum smelters.
- **ACC and Ambuja co-processed more than 17,000 tons of SPL last year.**

Geoclean's Solutions for Waste from Aluminum Industry

Red Mud

- Red mud is an industrial waste generated during processing of bauxite into alumina using the Bayer process.
- It is composed of various oxide compounds, including iron oxides which gives it the red colour.
- For every ton of alumina produced, approximately 1 to 1.5 ton of red mud is also produced.

Challenge in Management

- Due to high level of production and the material's high alkalinity, if not stored properly, it can pose a significant environmental hazard.
- Several toxic and heavy metals such as arsenic, lead, cadmium, chromium, vanadium or mercury occur in bauxite and thus also in red mud.

Co-processing of Red Mud

- Co-processing of red mud offers substantial business and sustainability opportunities, as red mud contains many valuable resources.
- **ACC and Ambuja co-processed more than 2,50,000 tons of red mud last year.**

adani Cement

udAAAn Hum Karke Dikhate Hain

geoclean

Ambuja Cement | ACC