Utilization of Industrial waste as raw material in Cement plant

Confederation of Indian Industry

CII – Godrej Green Business Centre, Hyderabad

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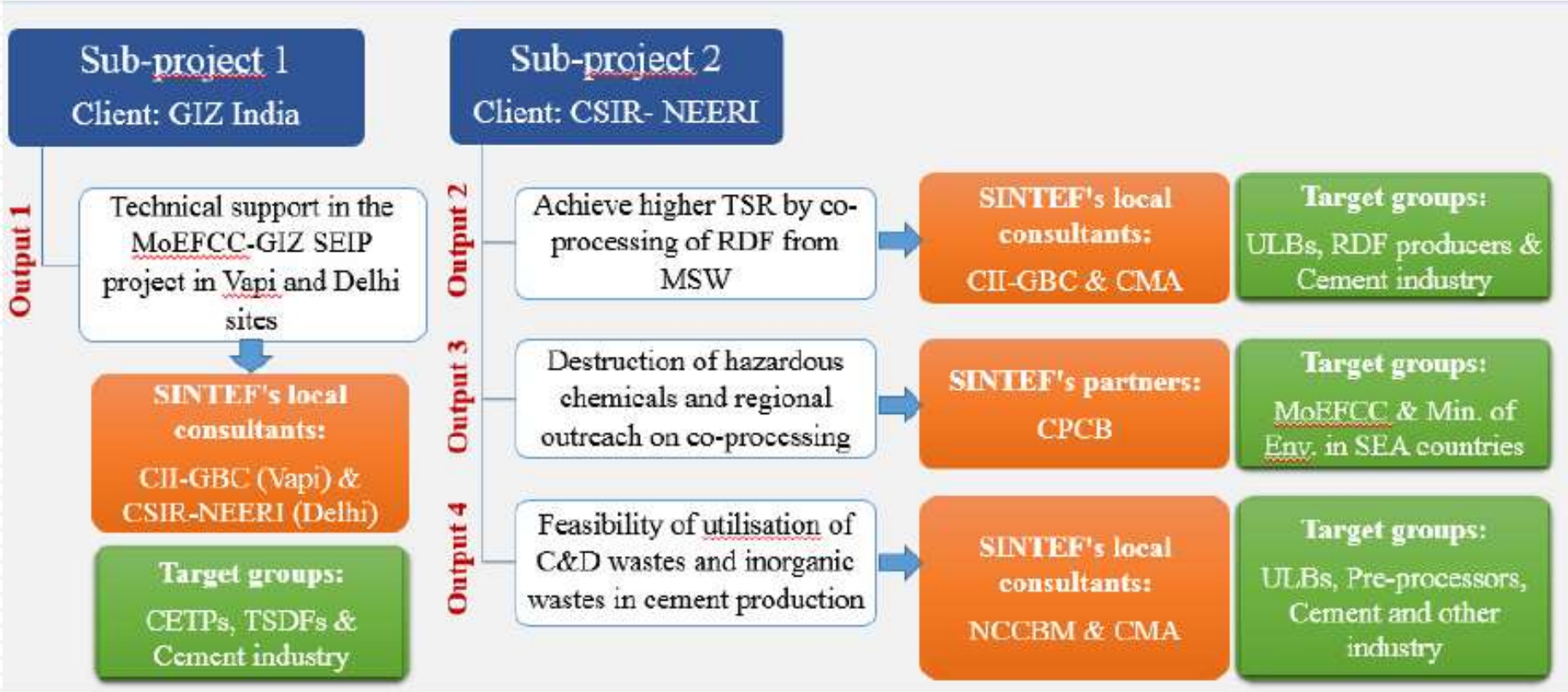
Co-processing of Alternate Fuel and Resources in the Cement Industry



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Cement Manufacturers' Association
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CII-GBC association with SINTEF

- Technical support in the GIZ-project on Sustainable and Environment friendly industrial production (Vapi)
- Demonstrate high thermal substitution rate by co-processing of refuse derived fuels from municipal solid wastes

About Vapi Industrial Area

- Vapi has more than 30 dyes and dyes intermediate industries
- Generating 600 to 700 tonnes/day of spent sulphuric acid
- Sludge Generation
  - 1 tonne of spent acid generates 0.5 tonne of sludge
  - Total generation of sludge is estimated as 300-350 tonnes/day

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About Vapi Industrial Area

- 15% of wastes received at the landfill is the sludge from dyes
- Landfill has a capacity of 1.4 million tonnes of hazardous waste
- More than 90% of landfill capacity is already filled
- At the present rate, Landfill will get exhausted in less than a year

Action Initiated

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MICAS

Votorantim Cimentos

Organised the meeting

Sample of the waste analysed

Laboratory test revealed positive

Procedure of the trial discussed

Lab Analysis Report

	Unit	Marine gypsum* (Conventional)	Sludge from neutralisation of spent sulphuric acid
SO_3 content	%	34.88	38.52
Purity ($CaSO_4.2H_2O$)	%	75	82.8
Moisture content	%	0.1	21.76
Chloride content	%	<2	<0.1

**Marine gypsum is recovered from salt pans during production of common salt in coastal region, particularly in Gujarat and Tamil Nadu.*

Process of trial

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Votorantim Cimentos

Sludge sent from Micas to Cement plant

20 tonnes of sludge

Mixed with 100 tons of marine gypsum

Charged into cement mill

Process parameters monitored during trial

	Unit	Before Trial	During Trial
Feed rate			
Pregrinder inlet	tonnes/hr	170	172
Gypsum	tonnes/hr (% of cement)	11.39 (6.7%)	11.18 (6.5%)
Pond fly ash	tonnes/hr (% of cement)	15.3 (9%)	15.48 (9%)
Dry fly ash	tonnes/hr (% of cement)	40.8 (24%)	41.28 (24%)
Clinker feed	tonnes/hr (% of cement)	102.51 (60.3%)	103.2 (60%)
Cement mill inlet	tonnes/hr	230	230

- **Utilization of Gypsum % and feed rate before trail and during trail was almost same**

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Process parameters monitored during trial

	Unit	Before Trial	During Trial
Pregrinder			
Pre-grinder load	kW	980	989
Pre-grinder discharge elevator load	kW	64	69
Pregrinder bag house fan speed	rpm	280	290
Baghouse differential pressure	mmwc	70	70
Pregrinder working pressure	MPa	6.5	6.5
Cement mill			
Separator speed	rpm	630	625
Bag house fan speed	rpm	650	655
Cement mill load	kW	2820	2850

- **No major changes in Pre-grinder and Cement mill parameters before trail and during trail**

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Analysis of the Pozzolana Portland Cement (PPC)

	Unit	Before Trial	During Trial
Chemical properties			
Al_2O_3	%	11.99	12.22
CaO	%	45.48	44.29
Fe_2O_3	%	7.71	7.63
MgO	%	2.13	2.25
SO_3	%	2.52	2.40
SiO_2	%	27.28	28.25
Physical properties			
Specific surface	m2/kg	375	342
Soundness- Le Chatelier	mm	1	1
Setting time- initial	minutes	130	135
Setting time- final	minutes	175	185
Compressive strength - 1 day	Mpa	21.8	21.1
Compressive strength - 3 day	Mpa	33.2	33.0
Compressive strength - 7 day	Mpa	45.1	44.4

- **No significant variations are observed in the <u>cement output</u>**

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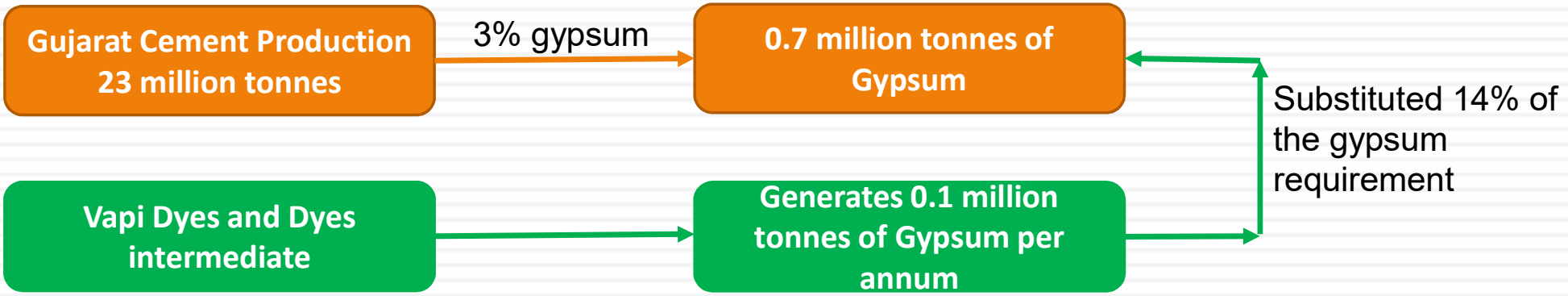
The success

>15% of the gypsum can be substituted by sludge generated from dyes industries



Gypsum requirement in India

- Indian cement will require more than 15 million tons of gypsum per annum (280 million tonns of gypsum for 15 year period)
- India has total natural gypsum reserves of just 39 million tons
- India imports 4.35 million tons of natural gypsum annually
  - Largest importer in the world

Source - http://www.globalgypsum.com

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Way forward

- India accounts for approximately 16 per cent of the world dyes production (IBEF)
  - High potential for substituting natural gypsum with alternatives

- Mapping of Dyes and Dyes Intermediate industries with cement plant
  - Acid Bank Initiatives (Vatva Acid Bank)

- Techno-commercial feasibility study for utilizing chemical gypsum in cement plant

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CII Past Activities – Under guidance of Expert group

Policy Advocacy

- Recommendations for inclusion of Co-processing in HWM rules
- Guidelines for HW co-processing
- Submissions to MoEFCC & CPCB on promoting co-processing

Technical Research

- Waste forecasting for Indian Cement Industry
- Status paper on AFR usage in Indian Cement industry
- Submissions to MoEFCC & CPCB on promoting co-processing

Capacity Building

- National & International missions
- Conferences & workshops
- Website on Co-processing
- Inventory of waste generation

Current status - Alternate Fuel and Raw material (AFR)

No of cement plant utilising AFR	12 (2010) – 60+ (2017)
Thermal Substitution Rate	0.6% (2010) – 3% (2017)
Quantity of AF Utilised	1.6 million Tons
Cost Savings	3420 million INR
Top 3 Thermal Substitution Rate (TSR) in India	26%, 22% & 21%

Source :

AFR services of CII-Godrej GBC

- **Facilitate Cement Industries for Utilisation of Alternative fuel & Raw material**

  - Training Program on AFR utilization, policy changes, technologies, experience & implementation
  - Feasibility study detailing waste mapping & forecasting
  - Technological evaluation for waste utilization in cement kiln
  - Engagement with relevant stakeholders (Municipality, Waste generator, Policymaker, technology suppliers) for sustainable waste utilisation

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Thank you

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