



REPORT ON TRIAL RUN STUDY OF CO-PROCESSING OF TANNERY ETP SLUDGE IN CEMENT KILN AT M/s DALMIA CEMENT (BHARAT) LTD., ARIYALUR, TAMILNADU

**South Zonal Office,
Bengaluru**

1. Background

The Hazardous Wastes (Management and Handling & Transboundary Movement) Rules, 2008, provided for a specific Section i.e. Rule 11 dedicated to utilization of Hazardous Wastes as a supplementary resource or energy recovery or after processing. In view of this CPCB has taken-up trial run for co-processing of few categories of wastes and granted regular permission for the same. The unit which is going for co-processing of wastes has to follow the guide lines on Co- processing in Cement / Power / Steel Industry.

M/s Dalmia Cement Bharat Ltd., Ariyalur Cement Plant, Ariyalur was commissioned in Feb 2010. It is having a single kiln with a five stage preheater and online Calciner, with an installed capacity of 2.0 MTPA of clinker and 3.0 MTPA of cement. The unit manufactures ordinary Portland cement (OPC - 43 Grade and OPC - 53 Grade) and Portland Pozzolona Cement. The Tamil Nadu State Pollution Control Board (TNPCB) has accorded permission vide letter no. T10/TNPCB/F-19120/HWM/ARI/2014 dated 09.05.2014 (**Annexure -1**) to conduct trail run for the co-processing of tannery ETP sludge in the cement kiln to utilise 3000 Tonne of tannery ETP sludge using various proportions 1 %, 1.5 % and 2 % respectively in the presence of TNPCB and CPCB officials as per CPCB protocol.

Accordingly, M/s Dalmia Cement Bharat Ltd., conducted trail run for co-processing of tannery ETP sludge during September 26-30, 2014 for 5 days. The following officials from CPCB & TNPCB have been present for assessment and monitoring:

1. Mrs. H.D.Varalaxmi, EE, CPCB
2. Mr. Er. R. Kannan,,DEE, Ariyalur Regional Office, TNPCB

The unit has engaged M/s CVR Labs Pvt., Ltd., Chennai for emission monitoring during monitoring programme (normal operation, trail run at different % of H.W and normal operation) for 5 days. CPCB inspection team witnessed the trail run during co-processing of ETP sludge (tannery).

2. Hazardous Wastes & Handling

Generation: The TNPCB accord permission / authorisation to the units (22 units) located in Erode to transport the ETP sludge generated from the tannery waste water treatment to M/s Dalmia Cements to conduct the trail run. The list of industries transported ETP sludge is as follows:

<i>S. No.</i>	<i>Name of the Unit</i>	<i>Quantity Received (MT)</i>
1.	M/s KSKK leather Processors Pvt., Ltd., Erode	554.39
2.	M/s KSKK tanning company Pvt., Ltd., Erode	546.60
3.	M/s K. Rangasamy gounder & son, Erode	59.51
4.	M/s Thangamuthu Gounder & Son, Erode	157.65
5.	M/s Mohamed Haneefa Sahib & Sons, Erode	86.25
6.	M/s Shakthi Exports, Erode	929.17
7.	M/s D. Mohamed Ismail, Erode	302.78
8.	M/s e.K.M. Hajee Abdul Jaleel Sahib & Sons, Erode	94.44
9.	M/s Sarvana Leather Processing centre, Erode	118.72
10.	M/s A.M. Sadik Tannery, Erode	207.61
11.	M/s N.K.G. Leather Erode.	151.86
12.	M/s Aiswarya Leathers, Erode	71.11
13.	M/s S.A. Abdul Azeez & Co, Erode	50.74
14.	M/s Kamashenu Tannery, Erode	17.51
15.	M/s Sri Ranga Tannery, Erode	124.61
16.	M/s Lead Leathers, Erode	8.79
17.	M/s Samy Leather Tannery Erode	34.26
18.	M/s Saromani Tannery, Erode	32.46
19.	M/s V. Rangasamy & Co. Erode	15.96
20.	M/s S.A. M Yousoofdeen Tannery, Erode	41.69
21.	M/s KKS Abdul Samad Sahib, Erode	240.95
22.	M/s Venkateshwaran & Bros, Erode	9.98
	Total	2989.73

Transportation: The hazardous waste for co-processing need to be handled in an environmentally safe manner avoiding the possibilities of contaminating the nearby environment and eliminate the chances of accidents. It was informed that the ETP sludge from the ETPs were transported by truck about 190 kms from Erode. The TNPCB granted authorisation to M/s Arunachala Enterprises, Aryalur to transport ETP sludge from Erode to M/s Dalmia Cement permission The sludge transported for co-processing with required Form - 13.

Storage: The total quantities of sludge brought from ETPs are stored in existing storage shed along with other raw materials. During inspection the unit has stored

around 3000 tonnes of Tannery ETP sludge, moderate odour nuisance was observed in the storage yard.

Preparation: The unit has provided the separate belt conveyor with hopper to store raw material and to facilitate the blending of ETP sludge in different percentage viz 1%, 1.5% and 2 % respectively before feeding into raw mill. The blending of ETP sludge with other raw material was verified through central control room.

Characteristic of sludge: The characteristic of ETP sludge and the quality of clinker without blending and with blending of Tannery ETP sludge are given below:

Characteristics	Tannery ETP Sludge (Ranges between)	Clinker quality blending with ETP Sludge and without ETP sludge				
		Without blending sludge (pretrial)	Blending with 1 % sludge	Blending with 1.5 % sludge	Blending with 2.0 % sludge	Without blending sludge (post trial)
Total Moisture %	9.4 - 39.48	-	-	-	-	
SiO ₂ (%)	10.77– 41.44	20.55	20.7	20.42	20.57	20.58
Al ₂ O ₃ (%)	2.06 -6.72	5.57	5.62	5.53	5.65	5.70
Fe ₂ O ₃ (%)	1.3 -2.55	5.19	5.19	5.19	5.22	5.28
CaO (%)	20.79 -33.47	64.76	64.45	64.84	64.64	64.66
MgO(%)	0.99 -2.77	0.8	0.81	0.80	0.81	0.81
SO ₃ (%)	0.32 -0.57	1.42	1.52	1.59	1.49	1.34
Na ₂ O (%)	1.33- 7.89	0.27	0.26	0.25	0.24	0.26
K ₂ O (%)	0.16 -0.89	0.81	0.79	0.77	0.75	0.77
F.CaO (%)	-	1.89	1.94	2.06	1.84	1.914
Cl (%)	-	0.0239	0.0261	0.0287	0.0286	0.0281

The individual waste analysis results of the ETP sludge has shown a wide variation in its characteristics.

3. Trail Process

The hazardous waste sludge (Tannery ETP Sludge) blended with lime stone as per the granted percentages viz 1 %, 1.5 % and 2 % and fed to Raw mill kiln. The stages of raw mill kiln comprises of evaporation and preheating, calcining, clinkering, and cooling. Evaporation and preheating remove moisture and raise the temperature of the raw mix preparatory to calcining. Calcining takes place at 800-900°C and breaks the calcium carbonate down into calcium oxide and carbon dioxide which is evolved in the process. Clinkering completes the calcination stage and fuses the calcined raw mix

into hard nodules resembling small grey pebbles. Kiln temperatures in the burning zone range from 1350-1450°C, and retention times in this zone are four to six seconds. Relevant photos are given at **Annexure A**.

4. Raw material & Cost Saving

As like other wastes, the Tannery ETP sludge is not having required calorific value to consider as energy substitute in the co-processing. The ETP sludge contains CaO in the range 20.79 - 33.47%, which is consider to be good substitute for limestone. The substituting with sludge the unit has saved 1-2 % of the limestone by weight.

Quantity of hazardous waste utilization : maximum of 2 % i.e 182 TPD(at full capacity)
 Direct saving of Lime stone : 182 TPD
 Cost of Lime stone per tone : Rs. 180/tone
 Total cost saving : 182 * 180 = Rs. 32760 per day*

Note: * - excluding the packaging, transportation, preparation and handling costs.

The Raw material consumption and clinker production are as follows:

S.No.	Raw material	Pre trial	Trial run with different % of blending (Ave)			Post-trial
			1 %	1.5%	2.0 %	
1.	Lime Stone (TPD)	7189	5687	4320	6071	6699
2.	Feldspar (TPD)	64	72	31	14	85
3.	Fire clay (TPD)	142	44	18	13	25
4.	Tannery ETP sludge (TPD)	0	57.73	66.32	124.14	0.0
	Total	7395	5860.7	4435.3	6222.1	6809
5.	Fuel consumption (TPD)	238.3	238.0	239.8	240.2	226.8
	Pet coke					
	Lignite	307.5	305.8	305.6	325.6	324.2
	Total fuel consumption.	545.8	543.8	545.4	565.8	551.0
6.	Clinker Production (TPD)	4804	4752	4646	4780	4629

5. Emission Control & Monitoring

The unit has provided Reverse Air Bag house (Fibre glass with PTFE Membrane of 2880 nos of bags) to control the particulate matter followed with a stack. The stack height is 124 M and 3.2 Meter dia. The CPCB team witnessed the co-processing of sludge in the kiln. The unit has engaged M/s CVR Labs Pvt., Ltd., Chennai carried out as per Guideline for normal operation; trail run at different percentage viz., 1%, 1.5 % and 2 % of H.W blending with lime stone and normal operation for 5 days. **The summary of the emissions monitoring results as per protocol of monitoring for source and ambient is enclosed at Annexure-2. From source emission monitoring report it is observed that all parameters were found within the prescribed limit during trail run of Tannery ETP sludge with different percentages viz 1%, 1.5 % and 2 % of H.W blending with lime stone.**

6. Conclusion

- M/s Dalmia Cements (Bharat) Ltd., has conducted trail run for utilisation of Tannery ETP sludge as a supplementary resource during September 26-30, 2014 in the cement kiln of 6060 TPD clinker production.
- As per the permission of TNPCB, the unit has carried out trail run of co-processing of Tannery ETP sludge with different percentages viz 1 %, 1.5% and 2.0 % by weight in Kiln along with lime stone, feldspar and fire clay.
- The unit could able to save 182 TPD of lime stone by ETP sludge. The cost of saving of lime stone @ Rs. 180 /T is around Rs. 32760 per day, which is excluding the cost of handling etc.
- The unit has stored Tannery ETP sludge in the existing raw material storage shed along with other raw materials. The tannery ETP sludge being taken from storage shed to hopper through belt conveyor and blended through automatic feeding mechanism to ensure the different percentages by weight.
- The unit shall develop and maintain the sprinkler system to arrest fugitive emission at lime stone & ETP sludge loading area to arrest fugitive emission. Also to construct wind barrier around material handling area to arrest the carryover dusts.
- The unit has installed Continuous Source Emission and 2 Continuous Ambient Air Quality Monitoring Station. The observed values during trail run was found within the prescribed standards, the results are follows;

Continuous Source Emission results:

	Raw mill	Coal mill	Clinker cooler	Cement mill	Power plant
Particulate matter in mg/m ³	13.02	27.83	16.28	Not in operation	27.45

Continuous Ambient Air Quality results:

U/S wind direction	
PM ₁₀ in µg/m ³	57.46
PM _{2.5} µg/m ³	17.45
D/S wind direction	
PM ₁₀ in µg/m ³	53.92
PM _{2.5} µg/m ³	7.34

- From source emission monitoring report it is observed that all parameters were found within the prescribed limit during trail run of Tannery ETP sludge with different percentages viz 1%, 1.5 % and 2 % of H.W blending with lime stone.

(H.D.Varalaxmi)
SEE

Annexure 1

Photographs showing arrangements made during Trail Run of Tannery ETP Sludge at M/s Dalmia Cements Ltd.,



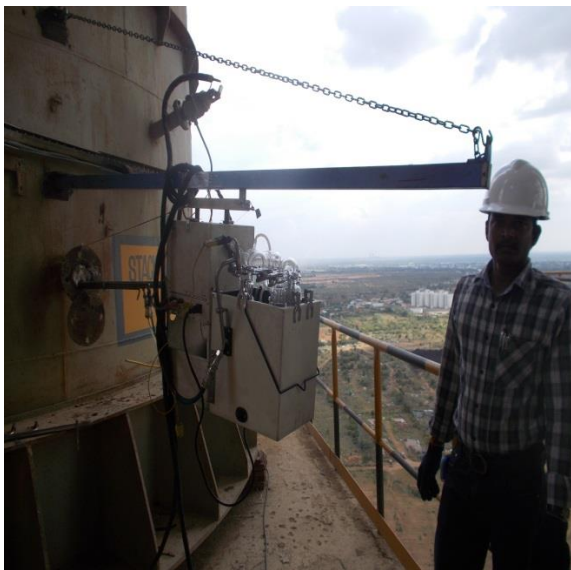
ETP sludge stored under shed along with other raw material



4 belt conveyor with hopper for feeding raw material to kiln in which one is dedicated for feeding ETP sludge



Arrangement made for composite sample collection of ETP sludge, Lime stone, clinker and fuel



Arrangement made for monitoring source emission during pre trail, trail and post trail run of co-processing



Ambient air quality monitoring (station no 1) carried out at upwind direction



Ambient air quality monitoring (station no 2) carried out at down wind direction



Ambient air quality monitoring (station no 3) carried out at down wind direction



Measures taken to store samples taken during source emission monitoring and Ambient Air quality monitoring while conducting co-process trial run of Tannery ETP sludge at M/s Dalmia Cements.