PROCESSING OF LIQUID HAZARDOUS WASTE IN CEMENT KILN

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My Home Industries Ltd.

MY HOME INDUSTRIES LTD., has initiated promoting the use of Alternative fuels as part of drive for sustainable development and resource conservation and the earlier practice of disposal of liquid waste was firing in incinerators. MHIL explored the possibility of installation of a fool proof system for safe handling and usage of these hazardous wastes. MHIL is a joint venture company with CRH plc an Irish company which is a leading building materials company in Europe and America. CRH has rich experience in usage of AF (liquid and solid) at its European plants and with this FLS was contacted for a suitable system.

1.0 Introduction

The conceptualization was frozen with the detailed study by in house experts from CRH, experts from pharmaceutical industry. Safety & environment aspects were taken care by Hazop study M/s Cholamandalam. FLS was inducted to provide world class design, engineering and supply of equipment. Selection of vendors and sub vendors was done with in house experts of MHIL & CRH. Co-processing facility designed by FLS was installed and commissioned successfully. MHIL got the HAZOP study and pre-commissioning safety audit through M/s. Cholamandalam MS Risk, for the liquid hazardous waste handling and firing system and further strengthened the safety system by in house experts of MHIL & CRH.

CPCB and APPCB has given the guidelines and directives regarding safety & environmental aspects for handling and firing liquid hazardous waste (organic waste residues/spent organic solvent) in to Kiln main burner, all aspects were taken care and the system was commissioned. The commissioning was successful with the study of emissions as per guidelines of CPCB in addition to operational stabilization. All the standards specified by CPCB and APPCB were met and all details of test results of emissions were submitted to them.

2.0 HANDLING SYSTEM

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<th>S. No</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Design, Engineering, Manufacturing and supply of Liquid Fuel Firing system using burners, N2 system</td>
<td>16.02.2011</td>
<td>M/s FL Smidth Private Limited</td>
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<tr>
<td>2</td>
<td>Hazard identification &amp; operability study</td>
<td>07.05.2011</td>
<td>M/s Cholamandalam MS Risk services Ltd</td>
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- System design for handling fire spent organic solvents along with coal in Kiln.
- System installed for two kilns.

**System Considering:**

- Storage Tanks - 2Nos (Cap:100KL, Double walled)
- Unloading Pumps - 2 Nos (Cap: 25 m3/hr, 1W+1S)
- Feed pumps - 3 Nos (Cap: 6 m3/hr, 2W+1S)
- Burner station - 2 Nos (Cap: 3000 kg/hr)
- MF Station - regulating the required flow
- System operated by PLC - regulating and monitoring carried out through MF Station

**Safety System:**

- N2 system - 30 Nm3/hr
- Fire Hydrant system - 270 m3/hr @ 7kg/cm² pressure
- Pressure relief vent Valve - above tank top (valve open @+250 mmwc)
- Dike Wall - not allow the spill out of 200 KL solvent

The liquid solvents are carried to site in lorry tankers and the liquid waste is transferred in to the properly designed double walled stainless steel storage tanks by Nitrogen replacement in to the tankers to avoid any vapours left over in the tankers. Nitrogen blanketing (controlled in auto mode) is always present in the storage tanks to avoid any vapours coming out of the storage tanks in to atmosphere. The solvents shall be pumped from storage tank to main burner by means of feed pump to specially designed air atomized oil burner gun via a burner MF Station. MF Station will measure, control and regulate the flow of solvents through a PLC based control cabinet which contains all the necessary control loops for burner set operation. This is a very unique system in its kind in cement plants in the country and is totally concealed one and nothing is exposed. During the trail run monitored the quality of clinker produced which was found to be unchanged and tested for heavy metals, minor constituents which were very well within limits. There is a separate fire fighting system installed for this liquid wastes handling system.

**Hazardous Waste Suppliers to MHIL & Properties:**

- MYLAN Laboratories Limited
- Aurobindo Pharma Limited
Pharmaceutical and bulk drug industries emanate waste solvents which consist of high organic content with COD. These waste solvents may be containing Methanol, Toluene, Acetates and other low boiling organic compound which is being used as Alternative Fuel.

3.0 TEETHING PROBLEMS DURING OPERATION

During operation of the system, experienced the problems like pump failures with high viscosity solvents and seals failures etc., also damage of burner lancers due to corrosion by solvents. Presently the system is operating smoothly and consistently. Since it is air assisted burner there is no effect on flame momentum and burning zone temperature. Before unloading the tanker, the solvents are tested for calorific value and compatibility and less than 2500 kcal/kg are rejected. As the solvents fired in kiln are consistent and in controlled manner, there is no hampering of the production and quality of clinker. Before and after usage of solvents there is no change in chemical composition in heavy metals and minor constituents in clinker.

4.0 SAFETY & ENVIRONMENT:

The liquid Alternative Fuels identified are to be classified as Hazardous in nature. The liquid AF have high volatile matter and low flash point (nearly 50deg C). Risk of fire and explosion are foreseen in unloading, storage and feeding systems. A high level of safety measures is called in for trouble and hazard free operation of the system. Nitrogen generators are considered for inertisation of explosive gas mixtures in tank and in the unloading lorry tankers. To ensure safety of the environment, suitable free protection system was installed by MHIL. The drives for unloading and fuel transfer pump used in the system are flameproof type. To ensure personnel safety at the unloading area suitable personnel protection equipment is provided.

MHIL got the HAZOP study and pre-commissioning safety audit done through M/S. Cholamandalam MS Risk Services Ltd., for the liquid hazardous waste handling and firing system. Further strengthened the safety system from in house expertise of MHIL & CRH.

Provided “Self-contained breathing apparatus to meet the emergency within the Alternative Fuel complex. Fire fighting points provided around the complex and two points with Foam injection provision. SOP designed and displayed for interlock provided for unloading pump skid with main storage tank pressure to avoid over pressurisation during tanker’s unloading.(if main storage tank pressure exceeds 400 mmw) then unloading pump will trip.

5.0 PRESENT THERMAL SUBSTITUTION & ACHIVEMENTS

Presently the liquid wastes are consumed at the rate of around 900 MT per month. The average CV has been around 4000Kcal/Kg. The consistency in quality is a big question since the receipts are from different pharmaceutical companies with wide range of solvents and products. Hence continuous monitoring (pre testing of liquid wastes) and data collection is of utmost importance for effective usage of these wastes without compromise on safety, operations, and quality of clinker.
The maximum thermal substitution was up to 4%. During the year 2012-13, we had consumed 4290 Tons of solvents at rate of 0.93% thermal substitution and it was equivalent to 3515 tons of coal. The net savings by replacing the coal is approximately 1.68 Cores during the year.

5.0 TARGETS

The system is operated in such ways that the quality of end product and taking care of occupational health & safety of the employees and all interested parties are ensured. For 2013-14 year we have the target of firing of 2000 tons/month.