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## RESEARCH ARTICLE

### Alternate Fuel & Raw Material Facility.

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#### Abstract

Hazardous waste of various type of industries generate hazardous impact on environment the dispose of hazardous waste is very intricate Problem. Lack treatment and disposal facilities cause hazardous wastes (HWs) destruction of municipal landfills and open spaces, raising serious environmental threats. The dispose of hazardous waste through Alternate Fuel and Raw Material Facility gives substitute of fossil fuels as well as reduce the harmful impact on environment.

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#### Introduction

Various types of Industries play an important role in the economy of the country but every industries extract various type of hazardous waste. In the last decades industry, government and the general public have become increasingly aware about hazardous waste the disposal of hazardous waste is huge environmental problems .If it disposal done in proper way it will beneficial for environment. The AFRF is the ideal way of handling and disposal of hazardous waste by this way we can get an option such as reuse, recycle and recovery of energy. Through AFRF Concept hazardous waste can be use as a substitute for fossil fuels or raw material in the cement industries. Pre- Processing hazardous waste fed into the kiln or the pre- calciner. It needs to be noted that certain constituent of the pre-processing hazardous waste should be line with as per specification of “. Central Pollution Control Board (CPCB) in the year 2010, issued “Guidelines on Co processing in/Cement/Power/Steel Industry”

#### Specification of HW for use as alternative Raw material

| Sr.no | Parameter  | Limit        |
|-------|--|--------------|
| 1     | Volatile organic Hydrocarbon   | < 5000 PPM   |
| 2     | Total Organic Carbon (TOC)   | < 1000 PPM   |
| 3     | $\text{CaO} + \text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3 + \text{SO}_3$ ( In Ash ) | >80%         |
| 4     | Chloride   | < 1.5 %      |
| 5     | Sulphur  | < 1.5 %      |
| 6     | PCB/PCT  | < 5.0 PPM    |
| 7     | Hg   | < 10 PPM     |
| 8     | Cd + Tl + Hg   | < 100 PPM    |
| 9     | As + Co + Ni + Se + Te + Sb + Cr + Sn + Pb + V   | < 10,000 PPM |

**Specifications of hazardous waste for use Energy Recovery**

| Sr.no | Parameter                                 | Limit          |
|-------|---|----------------|
| 1     | Calorific Value As received basis         | >2500 k Cal/Kg |
| 2     | Ash                                       |                |
| 3     | -Liquid                                   | < 5%           |
|       | -Solid                                    | < 20%          |
| 4     | Chloride                                  | < 1.5 %        |
| 5     | Halogens (F+Br+I)                         | < 1.0 %        |
| 6     | Sulphur                                   | < 1.5 %        |
| 7     | PCB/PCT (ppm)                             | < 50           |
| 8     | Hg  | < 10 PPM       |
| 9     | Cd+Tl+Hg                                  | < 100          |
| 10    | As+Co+Ni+Se+Te+Sb+Cr+Sn+Pb+V              | < 25,00        |
| 11    | Ph  | 4 to 12        |
| 12    | Viscosity (cSt) for Liquid                | < 100          |
| 13    | Flash point (Deg Centigrade) (for Liquid) | > 60           |
| 14    | Moisture                                  | <25 %          |

The following hazardous waste which are prohibited for Co- Processing for the environment , health, Safety and operation issue

1. Biomedical waste
2. Electronics Scrape
3. Batteries
4. Explosives
5. Radioactive

**Operation Process of AFRF**

AFRF Process carried out by following way

**Finger Print Analysis:-**

Hazardous waste which are being generated by Occupier (Hazardous waste sources).

Does it come in CPCB Guideline Criteria?

Will it suitable for AFRF process?

Hazardous waste will be adjusted to desired levels as per the possibility and sent to cement industry as an alternative raw material?

It will check by Operator (Operator means a person who owns or operates a facility for collection, reception, treatment, storage or disposal of hazardous wastes) laboratory after laboratory Analysis is being decided whether waste have to accept or reject.

**Waste transport from the Occupier (Hazardous waste Sources):-**

when hazardous waste shall be collected from the occupier that time waste should be in close and spillage proof containers with labeling (Corrosive, Reactive, Ignitable or Toxic) as per CPCB Guideline and also should be transported in vehicles as per CPCB Guideline along with 6- copy of manifest (as per CPCB Guideline)

| Copy number with colour code | Purpose   |
|------------------------------|---|
| Copy 1 (White)               | To be forwarded by the occupier to the State Pollution Control Board Committee.   |
| Copy 2 (Yellow)              | To be carried by the occupier after taking signature on it from the transporter and the rest of the four copies to be carried by the transporter. |
| Copy 3 (Yellow)              | To be retained by the operator.   |
| Copy 4 (orange)              | To be return to the transporter by the operator of the facility / recycler after accepting waste.   |
| Copy 5 (green)               | To be return by the operator of the facility to State Pollution Control board/Committee after treatment and disposal of the waste.                |
| Copy 6 (blue)                | To be return by the operator of the facility to the occupier after treatment disposal of hazardous materials/wastes.                              |

**Pre – processing of waste: -**

Before Proper handling and operation of hazardous waste their characteristics should be take into account

1. Ignitability: - ignitability is the characteristic used to the define the waste which may be cause of a fire during transport, storage or disposal
2. Corrosivity: - it characteristic indicated by pH. hazardous waste with high or low pH can react dangerously with other waste and result may be form in corrode, fire , or violent reaction
3. Reactivity:- Unstable waste can generates toxic gases, vapors, or fumes it may be harmful to human health as well as environment
4. Toxicity: - hazardous waste which shows leaching characteristics their improper management leachate percolate in ground water and eventually ground water becomes toxic.

**Three types of waste to be processed in AFRF Operation Process**

1. Solid waste
2. Liquid Waste
3. Semi solid / Tarry waste

**Solid waste:-**

Solid waste that can be useful for Co- Processing in cement plant their pre- process done through following way

1. Reduced the solid waste size through Hammer Mill or shredder mill
2. Solid materials which found in granular /powder and residues form taken into for mixing / blending. A solid Blend is prepared By use of Additives or binders such as Rice husk, Press mud, coconut fibers & shell, Coal dust, spent carbon, lime, for adjust all relevant parameters as per Co- Processing

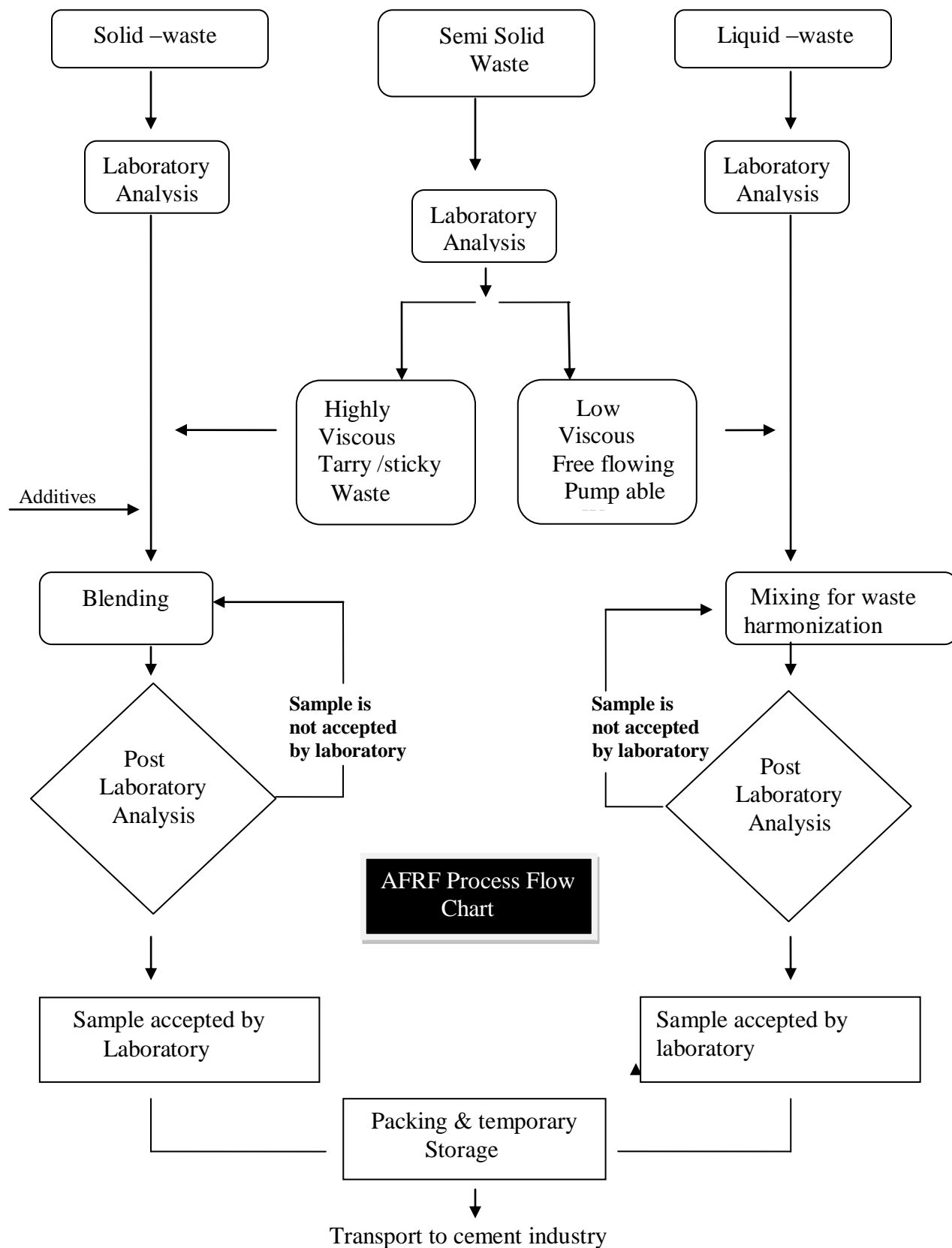
**Liquid waste:-**

AFRF Process received liquid waste through Tanker or Drums. After laboratory Analysis they will be stored in Raw Material storage tank, Raw Materials storage tank may be three to five nos as per waste compatibility. Suitable and compatible liquid waste taken into Mixing Tank. Mixing tank does equipped with Agitator for mixing and homogenization of various reagent and waste as per require for Co- Processing. After proper mixing homogenous liquid transfer into final product tank for loading tanker.

**Semi solid / tarry waste:-**

Hazardous waste which are neither liquids nor solid it type of waste found in semisolid state and certain waste are tarry or sticky in nature and some time it is difficult to remove from the drums. Semisolid and terry waste are operated by sigma mixer we use liquid waste with semisolid and tarry waste for mixing and kneading after proper homogenous mixing we convert the semisolid/ tarry waste into liquid form and transfer it to Production storage tank for tanker loading process.

**Note:** - whenever mixing and transfer is occurred operation process then compatibility process should be done at all stage of operation otherwise fire, explosion, highly exothermic reaction and Violent Reaction, can be occurs.



**Quality control**

Q/C Department play important role in all stage of co-processing. Waste blending and mixing are done by Laboratory Instruction.

**Instruments Required for Testing**

| Sr. no. | Parameters  | Instruments Required for Testing  |
|---------|---|---|
| 1       | Ph  | pH meter  |
| 2       | VOC   | PCB/PCT Gas Chromatograph   |
| 3       | TOC   | TOC Analyzer  |
| 4       | $\text{CaO} + \text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3 + \text{SO}_3$ ( in Ash ) & Heavy Metals | Inductive Couple Plasma Spectrophotometer / Atomic Absorption Spectrophotometer |
| 5       | Cl& S   | Titration method  |
| 6       | F   | UV Visible Spectrophotometer  |
| 7       | CV  | Bomb calorimeter  |
| 8       | Ash   | Muffle furnace, hot air oven  |
| 9       | Viscosity   | Viscometer  |
| 10      | Flash Point   | Flash Point Analyzer  |
| 11      | Moisture  | Karl fisher instrument / hot air oven   |

**Advantage of Co- Processing in cement Kilns:-**

1. High Kiln Temperature ( 1800 °C at Main Burner and 1000 °C at pre- Calciner) which ensures destruction of organic pollutant
2. Long residence time (5-6 sec. at 1800 °C and 2-6 sec at > 800°C ) yields complete combustion
3. Self cleaning process of acid gas by lime
4. Ash is incorporated into the clinker Matrix

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