

# Guidelines on Co- processing in Cement/Power/Steel Industry

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**Central Pollution Control Board**  
*(Ministry of Environment & Forests, Govt. of India)*  
Parivesh Bhawan  
East Arjun Nagar, Delhi – 110 032

## Foreword

In conjunction with the UN Commission on sustainable development under the programmes on sustainable consumption and production patterns, the strategy adopted for hazardous waste management in the country stipulates the hierarchy of Reduce, Reuse and Recycle ahead of ultimate disposal. In tandem with this approach, 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. The hazardous incinerable waste has vast potential to be used as a supplementary resource or for energy gradient recovery on co-processing. Their higher calorific value /constituents which are ingredients of cement evolve scope of its utilization as a supplementary resource material in the cement industry.

Central Pollution Control Board under the Hazardous wastes (Management and Handling & Transboundary movement) Rules, 2008 has been empowered to accord approval for utilization of hazardous wastes. About 6.2 Million tonnes of hazardous wastes including out of which 0.41 Million tonnes of Incinerable wastes is annually generated in India. The disposal of such waste in common and captive incinerators leads to the loss of vital resource besides having potential to cause severe environmental risks if not operated in an environmentally sound manner.

However, Co-processing of hazardous wastes in cement kiln, wherever, characteristics so suggests, will eradicate such risks and harness the encapsulated energy, hence a priority area. In order to streamline the procedure of co-processing so as to give a thrust to such activity, the present guidelines have been prepared.

Contributions of Shri B. P. Shukla, Additional Director & I/c HWMD, Dr. S. S. Bala, Additional Director & I/c PCI-II Div., Shri Suneel Dave, SEE, PCI-II Div, Shri P. K. Gupta, Environmental Engineer, PCI-II Div. and Shri Bharat K Sharma, Environmental Engineer, HWMD and Dr. D. D. Basu, Sr. Scientist, under the guidance of Shri J. S. Kamyotra, Member Secretary, CPCB, deserve acknowledgement for preparing the guidelines.

I believe that the document will be useful to all stake holders in joining hands to promote gainful utilization of hazardous waste and protect natural resources of the country. The success achieved on adoption shall also go a long way in attaining the national mission of reducing carbon emission.

(Prof. S. P. Gautam)

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**PART- I**  
**(Cement)**

## 1.0 Background:

About 6.2 Million tonnes of hazardous wastes is annually generated in India, out of which around 3.09 Million tonnes is recyclable, 0.41 Million tonnes is incinerable and 2.73 Million tonnes is land-fillable. This categorization of hazardous wastes into 3 classes is based on the hazard potential and its characteristics guiding its ultimate disposal, in accordance with the Hazardous wastes (Management and Handling & Transboundary Movement) Rules, 2008. Most of these wastes have characteristics suited to their utilization as resource material either for recovery of energy or materials like metals or their utility in construction, manufacture of low-grade articles or recovery of the product itself, which after processing can be utilized as a resource material. Hence a new mind- set treating the hazardous waste as a resource material rather than a difficult disposable material is the need of the hour.

The cost of providing incinerator would depend on its capacity ranging from Rs 10 crores to 30 crores. Assuming disposal cost of Incinerable hazardous waste is about Rs. 16,000/- per MT, it may roughly be estimated that additionally about Rs. 640 crore / annum would be incurred in incinerating hazardous waste in our country. Besides, incinerator if not operated optimally may contribute to emissions including toxic Dioxins and Furans. This coupled with resource conservation and reduced carbon emissions make a strong case for considering co-processing as a sound and better alternative for hazardous wastes disposal in general and Incinerable waste in particular.

Thus the co-processing of hazardous substances in cement industry is much beneficial option, whereby hazardous wastes are not only destroyed at a higher temperature of around 1400°C and longer residence time but its inorganic content gets fixed with the clinker apart from using the energy content of the wastes. Apart from this, no residues are left, which in case of incineration still requires to be land filled as incinerator ash. Further the acidic gases, if any generated during co-processing gets neutralized, since the raw material is alkaline in nature. Such phenomenon also reduces resource requirement such as coal and lime stone. Thus utilization of Hazardous wastes for co-processing makes a win –win situation.

The production of cement in India is about 200 Million Tonnes per annum, for which estimated coal and lime stone requirement are 40 Million Tons per annum and 320 Million Tons per annum, respectively. The country, therefore, has potential to utilize entire hazardous waste generation, if found suitable otherwise, for co-processing. Apart from this many other substances having high calorific value viz.; tyres and plastic wastes, which are otherwise treated as “waste” but do not fall under the purview of “hazardous waste” as stipulated in the Hazardous wastes (Management and Handling & Transboundary movement) Rules, 2008, can also be co-processed in the Cement industry. Apart from Cement Industry, Thermal Power Plant, Iron and Steel Industry are other potential candidates for co-processing. The location of Cement, Thermal Power and Steel Industry along with existing location of Common Hazardous Waste Treatment & Disposal Facility (TSDF) have been depicted in the following map.

CPCB has already taken up trial run for co-processing of few categories of wastes and granted regular permission for the same. The list has been appended as Annexure-I. Based on satisfactory performance of trial run, 22 cement manufacturing units in various States already started co-processing of these few categories of wastes with the approval of CPCB. Further, trial run is also going on for various other categories of waste.



Locations showing Cement, Steel and Thermal Power Plant of India



Locations showing Common Hazardous Waste Treatment & Disposal Facility (TSDF)

## **2.0 Objective:**

Despite co-processing having inherent advantages, a careful approach is called for in view of hazardous nature of substances also being handled, many of which has potential to create havoc in terms of transportation, handling, storage and processing itself. Further the mechanism to be followed for co-processing hazardous wastes, has to conform to the Rules and regulations as provided for under Hazardous Wastes (Management and Handling & Transboundary Movement) Rules, 2008 apart from provisions in various other related Acts & Rules. Development of a standard methodology and application procedure to streamline the entire processing mechanism taking all essential safeguards along with the delivery of approvals in a reasonable time frame prompted CPCB to formulate the guidelines.

**3.0** The hazardous wastes 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 leading to environmental catastrophe. The requirements of handling, including labelling, packaging, transport and storage applicable to the hazardous wastes have been described in following sub-sections, however, these will not be applicable to other substances like tyre chips, plastic waste and other high volume low effect wastes such as phosphogypsum, red mud, slags from pyrometallurgical operations etc. not covered under the purview of the Hazardous wastes (Management and Handling & Transboundary movement) Rules, 2008:

### **3.1 Responsibilities for occupier for handling of hazardous wastes:**

“Occupier” in relation to any factory or premises, means a person who has, control over the affairs of the factory or the premises and includes in relation to any hazardous waste the person in possession of the hazardous waste.

- (i) The occupier shall take all adequate steps while handling hazardous wastes to:
  - (a) Contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and
  - (b) Provide persons working on the site with the training, equipment and information necessary to ensure their safety.

### **3.2 Authorization:**

- (i) Every person who is engaged in processing, treatment, package, storage, transportation, use, collection, conversion, offering for sale, transfer or the like of hazardous waste shall require to obtain an authorization from the State Pollution Control Board/ Pollution Control Committee. For obtaining such authorization or its renewal, the person shall make an application in Form 1 of the Rules to the State Pollution Control Board/ Pollution Control Committee. Accordingly, authorisation requirement is also applicable for cement co-processing.
- (ii) The hazardous waste shall be collected, stored or re-processed only in authorized facility / industry by the State Pollution Control Board/ Pollution Control Committee for the purpose.

### **3.3 Packaging:**

The containers must be able to withstand normal handling and retain integrity for a minimum period of six months. In general, packaging of hazardous substances must meet the following requirements:

- (i) All packaging materials including containers shall be of such strength, construction and type as not to break open or become defective during transportation.
- (ii) All packaging materials including containers shall be so packed and sealed that spillages of hazardous wastes / substances are prevented during transportation due to jerks and vibrations caused by uneven road surface.

- (iii) Re-packing materials including that used for fastening must not be affected by the contents or form a dangerous combination with them.
- (iv) Packaging material should be such that there will be no significant chemical or galvanic action among any of the material in the package.

The containers when used for packaging of the hazardous wastes shall meet the following requirements:

- Container shall be of mild steel with suitable corrosion-resistant coating and roll-on roll-off cover, which may either be handled by articulated crane or by a hook lift system comfortably for a large variety of wastes. Other modes of packaging, like collection in 22-liter plastic drums, cardboard cartons, PP and HDPE/LDPE containers etc., also work for variety of waste. However, all such container should be amenable to mechanical handling.
- It should be leak proof.
- In general, the containers for liquid hazardous waste should be completely closed / sealed. There should be no gas generation due to any chemical reaction within the container, and thud should be devoid of air vents.
- Container should be covered with a solid lid or a canvas to avoid emissions of any sort including spillage, dust etc. and to minimize odour generation both at the point of loading as well as during transportation.
- Container used for transportation of waste should be able to withstand the shock loads due to vibration effect/undulations of pavements etc.
- Container should be easy to handle during transportation and emptying.
- As far as possible, manual handling of containers should be minimized. Appropriate material handling equipment is to be used to load, transport and unload the containers. This equipment, lift gates and pallets. Drums should not be rolled on or off vehicles.
- Where a two-tier or three-tier storage is envisaged the frame should have adequate strength to hold the containers.
- One-way containers (especially 16-liter drums) are also allowed. The multi-use container should be re-useable provided it should be cleaned and free from deterioration or defects.
- Loads are to be properly placed on vehicles. Hazardous waste containers are not to overhang, perch lean or be placed in other unstable base. Load should be secured with straps, clamps, braces or other measures to prevent movement and loss. Design of the container should be such that it can be safely accommodated on the transport vehicle.
- Dissimilar wastes shall not be collected in the same container. Wastes shall be segregated and packed separately.

### **3.4 Labelling:**

There are two types of labelling requirements:

- (i) Labelling of individual transport containers (ranging from a pint-size to a tank); and
- (ii) Labelling of transport vehicles.

All hazardous waste containers must be clearly marked with the contents. The marking must be irremovable, waterproof and firmly attached. Previous content labels shall be obliterated when the contents are different. Proper marking of containers is essential.

Containers that contain hazardous waste shall be labelled with the words "HAZARDOUS WASTE" in Vernacular language, Hindi / English. The information on the label must include the code number of the waste, the waste type, the origin (name, address, telephone number of



generator), hazardous property (e.g. flammable), and the symbol for the hazardous property (e.g. the red square with flame symbol).

The label must withstand the effects of rain and sun. Labelling of containers is important for tracking the wastes from the point of generation up to the final point of disposal. The following are the requirements for labelling:

- The label should contain the name and address of the facility occupier<sup>^</sup>, where it is being sent for co-processing i.e. labelling of container shall be provided with a general label as per Form 12 of the Rules.
- Emergency contact phone numbers shall be prominently displayed viz; the phone number of concerned Regional Officer of the SPCB /PCC, Fire Station, Police Station and other agencies concerned.

Explanation: As a general rule, the label has to state the origin/ generator of the waste. He / she and only he / she – is responsible and shall know, in case of any accident / spillage etc. what kind of wastes it is, what hazard may occur and which measures should be taken. The second in the line is the collector / transporter / disposer, who has to know the risk and what to do to minimize risks and hazards.

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<sup>^</sup> Facility means any establishment wherein the processes incidental to the handling, collection, reception, treatment, storage, recycling, recovery, reuse and disposal of hazardous waste are carried out. Co-processing is an activity that may consist of recovery or reuse or disposal of hazardous waste or waste(s) combination.

### **3.5 Collection and transportation of Hazardous wastes:**

Safe transportation of hazardous waste to the site for utilization as a supplementary resource or for energy recovery, or after processing is a collective responsibility of the waste occupier/generator and operator\* of the facility. The detailed guidelines for collection and transport of hazardous waste have been provided at Annexure -2.

### **3.6 Storage of Hazardous wastes:**

The occupier, re-processor/re-user/co-processor of facility may store the hazardous wastes for a period not exceeding ninety days of the permitted quantity for reprocessing / reuse and shall maintain a record of sale, transfer, storage and reprocessing of such wastes and make these records available for inspection: Provided that the State Pollution Control Board may extend the said period for re-processors and facility operators up to six months of their annual capacity.

The detailed storage requirements for incinerable hazardous waste have been presented at Annexure 3.

### **4.0 Feeding of materials for co-processing:**

Different feed points can be used to insert the co-processing materials into the cement production process. The most common ones are:

- The main burner at the rotary kiln outlet end
- The rotary kiln inlet end
- The pre-calciner
- The mid kiln (for long dry and wet kilns)

Appropriate feed points have to be selected according to the physical, chemical and toxicological characteristics of the substances, if relevant, used. Wastes of high calorific value have to be always fed into the high temperature combustion zones of the kiln system. Such wastes containing stable toxic components should be fed to the main burner to ensure complete combustion in the high temperature and long retention time. Alternative raw materials containing components that can be volatilized at low temperatures (for example, hydrocarbons) have to be fed into the high temperature zones of the kiln system. Feeding of alternative raw materials containing volatile (organic and inorganic) components to the kiln via the normal raw meal supply should be avoided unless it has been demonstrated by trial runs in the kiln that there is no undesired emission from the stack.

## **5.0 Suitability of Substances for co-processing:**

1. The decision on what type of substances can be used is based on the clinker production processes, the raw material and fuel compositions, the feeding points, the air pollution control devices and the given waste management problems. The Accept - Refuse Chart in Annexure-4 could be used by plant operators to help them in considering, which type of substance is suitable for co processing.

Some of the substances, which have potential to be used in co-processing in cement kiln are given at Appendix A. The list at the Appendix is just an indicative and shall not be taken for co-processing directly but only after conducting trial run as per the procedures laid down in the para 10 of this document.

2. As a basic rule, waste accepted must give an added – value for the cement kiln:
  - Calorific value from the organic part
  - Material value from the mineral partMany substances, particularly those of low calorific value, contain a significant proportion of incombustible substance(s), while inorganic substances are used as a combination of high and low calorific value raw material.
3. In some cases kilns can be used for the safe disposal of hazardous waste such as obsolete pesticides, PCB or out-dated pharmaceutical products, which may not have appropriate material or energy value as per the Annexure 4 but can be disposed in cement kiln without impacting the product quality. However, for this type of treatment, regulatory authorities and cement plant operators must come to individual agreements and standards on a case - by - case basis in consultation with CPCB.
4. A wide range of hazardous waste materials may be co-processed such as; ETP sludge, paint sludge, refinery sludge and TDI tar. There are liquid hazardous wastes such as used oil, solvents or end - of - line products from the transport sector, which may also be used as Alternate Fuel and Raw Material (AFR). Some materials can be delivered as single batches directly to the cement plant, while other may be pre-processed to meet the required conditions. Regular quality control of the collected and delivered substances will help to ensure a smooth use of the AFR in kiln.
5. The quality of what goes in determines the quality of what comes out. Therefore, attention must be paid to the selection of raw materials and fuels. Material resources

6. Process requirement, product quality target or emission regulations all have a bearing on the choice of the physical and chemical parameters of the potential waste material considered for use. In selecting and using the substances, the aims are:
  - To ensure that the waste used undergoes its most compatible treatment compared to other possible technologies.
  - To restrain damaging effects to the products or the production process complying with the Hazardous Waste M, H & T M Rules, 2008.
  
7. The maximum concentration of various toxic parameters of waste, which may be considered for co-processing is termed as Acceptance criteria and appended as Annexure-5. This is evolved based on the following criteria.
  - Emission standards.
  - Pollutants in traditional raw materials.
  - Treatment alternatives for the available waste.
  - Trial run conducted in India.
  
8. The waste can be sourced either from TSDF or from the waste generator directly. In case of former, the waste for co-processing needs to be homogenized for smooth operation of cement kiln as it could be composed of different characteristics of wastes.
  
9. All the waste cannot be used for co-processing, keeping in view the environment, health, safety and operational concern. The wastes listed below are normally not recommended for co-processing till otherwise proved/evidenced for.
  - Biomedical waste
  - Asbestos containing waste.
  - Electronic scrap.
  - Entire batteries.
  - Explosives.
  - Corrosives.
  - Mineral acid wastes.
  - Radioactive Wastes.
  - Unsorted municipal garbage.

## **6.0 Operating Conditions:**

- a) Co-processing plants shall be designed, equipped, built and operated in such a way that the gas resulting from the co-processing is raised in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 950°C for two seconds. For hazardous wastes with a content of more than 1% halogenated organic substances (expressed as chlorine), the temperature has to be raised to 1100°C.

- b) Co-processing plants shall have and operate an automatic system to prevent waste feed:
  - I. at start up, until the temperature of 950°C or 1100°C as the case may be.
  - II. When ever the temperature of 950°C or 1100°C as the case may be is not maintained.
  - III. When ever emission monitoring show that any emission limits value is exceeded due to disturbances or failures of air pollution control devices.
- c) Co-processing plants shall be designed, equipped, built and operated in such a way as to prevent emission into the air giving rise to significant ground level air pollution; in particular; exhaust gases shall be discharged in a controlled fashion and in conformity with ambient air quality standards (Annexure- 6) by means of a stack, the height of which is calculated in such a way as to safeguard human health and the environment.
- d) The management of the co- processing plant shall be in the hands of a skilled person , competent to manage the hazardous waste in an environmentally sound manner.

#### **7.0 Air Pollution Control requirements:**

The dust emission is the main pollutant as far as pollution from cement industry is concerned. The dust emission is unlikely to change when cement plant is processing hazardous and other substances. Generally cement kilns are equipped with Electro Static Precipitator or Bag House to control the particulate matter emission. Any acid gases formed during co-processing are likely to be scrubbed by the raw material being of an alkaline nature and are incorporated into the cement clinker. However, cement industry has to ensure that they meet the particulate matter emission standards during co-processing as prescribed under the consent order issued by SPCB/PCC. For other pollutants i.e. HCl, SO<sub>2</sub>, CO, TOC, HF, NO<sub>x</sub>, total dioxins and furans, Cd + TI + their compounds, Hg and its compounds, Sb + As + Pb + Co + Cr + Cu + Mn + Ni + V + their compounds, the emission during co-processing should not exceed the base line emissions i.e.; during pre co-processing phase of trial run.

#### **8.0 Emission standards:**

The emission standards for particulate matter prescribed for cement kiln by the concerned State Pollution Control Board shall be applicable during co-processing in cement kiln also. For other pollutants i.e. HCl, SO<sub>2</sub>, CO, TOC, HF, NO<sub>x</sub>, total dioxins and furans, Cd + TI + their compounds, Hg and its compounds, Sb + As + Pb + Co + Cr + Cu + Mn + Ni + V + their compounds, the emission during co-processing should not exceed the base line emissions i.e.; during pre co-processing phase of trial run.

#### **9.0 Monitoring requirements:**

The continuous measurement of particulate matter emission shall be carried out at co processing plant and the emission data shall be submitted to CPCB and the concerned SPCB/PCC. As per direction of CPCB monitoring of dioxins and furans including other parameters will be done by the cement plant.

## **10.0 Application Procedure:**

As per Rule 11 of Hazardous wastes (M,H & TM) rules,2008 Central pollution Control Board has been empowered to grant approval for utilization of hazardous wastes as a supplementary resource or for energy recovery, or after processing and obtaining such approval before hand is mandatory. The procedure formulated for the same has been sequentially described in following subsections:

- 10.1 The application duly filled in as per prescribed format for trial run (appended as Annexure 7) and enclosing all relevant enclosures has to be submitted to concerned State Pollution Control Board/PCC., where the waste is proposed to be utilized/ co-processed., with a copy of complete application endorsed to CPCB by the proponent. As such the CPCB has been empowered to accord approval for utilisation of hazardous wastes,. however in order to curtail the constraints on time/ inconvenience, and to encourage the co-processing, the approval for trial run shall be given by concerned SPCB/PCC., where the waste is proposed to be utilized/ co-processed. In case CPCB has objections, if any, shall communicate the same to the proponent with a copy to concerned SPCB within 30 days from the date of receipt of the application. The SPCB shall grant the permission for trial run within 60 days from the date of receipt of application. The permission, so accorded will be considered as deemed approval of CPCB.
- 10.2 SPCB/PCC shall ensure that Cement industry planning to conduct trial run to co-process hazardous waste meets the emission standards prescribed by SPCB in consent order / environmental clearance.
- 10.3 The protocol to be followed for trial run for co-processing has been detailed at Annexure 8. SPCB/PCC will grant permission for trial run in the format appended as Annexure 9.  
  
The proponent shall inform CPCB about the date of the trial run 15 days in advance so that CPCB can monitor the trial run.
- 10.4 After successful completion of trial run, for regular permission, the proponent shall apply to CPCB through concerned SPCB/PCC in the prescribed proforma provided as Annexure 7 along with all details related to the trial run. CPCB on receipt of the proposal will process and put up to the committee for making its specific recommendations. The proponent, if needed may be called for making a presentation before the committee.
- 10.5 On recommendation of the committee, competent authority in CPCB may grant or refuse the permission for regular co-processing within 30 days in format appended as Annexure 10. The percentage of hazardous waste to be co-processed along with the characteristics shall be prescribed in the permission.
- 10.6 Once regular permission for co-processing is granted for any waste, the other cement plants may not require to conduct trial run. They can directly submit their application in the desired format to CPCB through SPCB for regular co-processing. CPCB shall grant permission of regular co-processing within 45 days from the date of receipt of the application.

10.7 For non-hazardous substances like plastic waste, tyre chips etc. similar procedure may be followed both for trial run and regular permission by SPCB/PCC. The permission granted by SPCB/PCC will be endorsed to CPCB along with the trial run report for reference. In case SPCB/PCC desires any clarification, the same may be referred to CPCB.

## Annexure 1

### Categories of Hazardous wastes/substances\*

for which regular permission has been granted by CPCB for co-processing in Cement Industries

#### A. Hazardous Wastes

1. Paint Sludge from automobile sector
2. Petroleum Refining sludge
3. TDI tar waste
4. ETP sludge from M/s BASF India Ltd.

#### B. Other Wastes

1. Plastic Wastes
2. Tyre chips

\*The list will be updated time to time based on trial runs and will be kept on CPCB Website.

## Annexure - 2

### Collection & Transportation of Hazardous Wastes

The occupier of the hazardous waste shall ensure that wastes are packaged in a manner suitable for safe handling, storage and transport. Labeling on packaging is readily visible and material used for packaging shall withstand physical conditions and climatic factors.

- (a) The occupier shall ensure that information regarding characteristics of wastes particularly in terms of being Corrosive, Reactive, Ignitable or Toxic is provided on the label.
- (b) The transport of hazardous waste containers shall be in accordance with the provisions of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, (herein after referred as HW (M, H & TBM) Rules) and the rules made by the Central Government under the Motor Vehicle Act, 1988 and other guidelines issued from time to time.
- (c) The occupier shall provide the transporter with the relevant information in Form 11, regarding the hazardous nature of the waste and measures to be taken in case of an emergency and shall mark the hazardous wastes containers as per Form 12.
- (d) All hazardous waste containers shall be provided with a general label as given in Form 12 of the HW (M, H & TBM) Rules.
- (f) In case of transportation of hazardous waste through a State other than the State of origin or destination, the occupier shall intimate the concerned State Pollution Control Boards before he hands over the hazardous waste to the transporter.
- (g) Manifest System (Movement Document to be used within the country only)-
  - i) The occupier shall prepare six copies of the Manifest in Form 13 comprising of colour code indicated below and all six copies shall be signed by the transporter:

Copy number with colour code (1)	Purpose (2)
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 and disposal of hazardous materials/wastes.

\* Operator means a person who owns or operates a facility for collection, reception, treatment, storage or disposal of hazardous wastes.



- ii) The occupier shall not forward copy 1 (white) to the State Pollution Control Board, and in case of hazardous waste is likely to be transported through any transit State, the occupier shall prepare an additional copy each for information to such State and forward the same to the concerned State Pollution Control Board before he hand over the hazardous waste to the transporter.
  - iii) No transporter shall accept hazardous waste from an occupier for transport unless it is accompanied by copies 3 to 6 of the manifest.
  - iv) The transporter shall submit copies 3 to 6 of the manifest duly signed with date to the operator of the facility along with the waste consignment.
  - v) Operator of the facility upon completion of co-processing of the hazardous waste shall forward copy 5 (green) to the State Pollution Control Board and copy 6 (blue) to the occupier and the copy 3 (pink) shall be retained by the operator of the facility.
- (h) The occupier shall provide the transporter with relevant information in Form 11 (i.e. Transport Emergency (TREM) Card) of the HW (M, H & TBM) Rules regarding the hazardous nature of the wastes and measures to be taken in case of an emergency.

### **Responsibilities of the hazardous waste Transporter**

Transporter of hazardous wastes shall be responsible for:

- (a) Obtaining requisite authorization from SPCB/PCC for transport of hazardous waste (in addition to any other permission that may be required under the Motor Vehicle (Amendment) Act of 1981).
- (b) The transport vehicles shall be designed suitably to handle and transport the hazardous wastes of various characteristics.
- (c) The transporting should follow all the Rules pertaining to transportation of hazardous waste as stipulated under HW (M, H & TM) Rules, 2008.
- (d) Transporting the wastes in closed container at all time.
- (e) Delivering the wastes at designated points only.
- (f) Informing SPCB/PCC in Form 14 of the HW (M, H & TBM) Rules, or local authority, occupier / operator of a facility, and others concerned immediately in case of spillage, leakage or other accidents during transportation.
- (g) The transporter shall train the driver with regard to the emergency response measures to be taken during the transportation of waste.
- (h) Cleanup in case of contamination.
- (i) Cleaning of vehicles shall be carried out at designated places as authorized by SPCB/PCC.

### **Transportation Requirement**

The following are the requirements pertaining to the transportation of hazardous waste:

- (a) Vehicle used for transportation shall be in accordance with the provisions under the Motor Vehicle Act, 1988, and rules made thereunder.
- (b) Transporter shall possess requisite copies of the certificate (valid authorization obtained from the concerned SPCB/PCC for transportation of waste by the waste generator and operator of a facility) for transportation of hazardous waste.

- (c) Transporter should have valid "Pollution under Control Certificate" (PUCC) during the transportation of hazardous waste and shall be properly displayed.
- (d) Vehicle shall be painted preferably in blue colour with white strip of 15 to 30 cm width running centrally all over the body. This is to facilitate easy identification.
- (e) Vehicle should be fitted with mechanical handling equipment as may be required for safe handling and transportation of the wastes.
- (f) The words "HAZARDOUS WASTE" shall be displayed on all sides of the vehicle in Vernacular Language, Hindi and English.
- (g) Name of the facility operator or the transporter, as the case may be, shall be displayed.
- (h) Emergency phone numbers and TREM Card in Form 11 of HW (M, H & TM) Rules, 2008.
- (i) Vehicle shall be fitted with roll-on /roll-off covers if the individual containers do not possess the same.
- (j) Carrying of passengers is strictly prohibited and those associated with the waste haulers shall be permitted only in the cabin.
- (k) Transporter shall carry documents of manifest for the wastes during transportation as required under Rule 21 of the HW (M, H & TBM) Rules.
- (l) The trucks shall be dedicated for transportation of hazardous wastes and they shall not be used for any other purpose.
- (m) Each vehicle shall carry first-aid kit, spill control equipment and fire extinguisher.
- (n) Hazardous Waste transport vehicle shall run only at a speed specified under Motor Vehicle Act in order to avoid any eventuality during the transportation of hazardous waste.
- (o) Educational qualification for the driver shall be minimum of 10<sup>th</sup> pass (SSC). The driver of the transport vehicle shall have valid driving license of heavy vehicles from the State Road Transport Authority and shall have experience in transporting the chemicals.
- (p) Driver (s) shall be properly trained for handling the emergency situations and safety aspects involved in the transportation of hazardous wastes.
- (q) The design of the trucks shall be such that there is no spillage during transportation.

### 1. Storage Requirement (for incinerable hazardous waste only):

- (a) Flammable, ignitable, reactive and non-compatible wastes should be stored separately and should never be stored in the same storage shed.
- (b) Storage area may consist of different sheds for storing different kinds of hazardous wastes and sheds should be provided with suitable openings.
- (c) Adequate storage capacity (i.e. 25 % of the annual capacity of the hazardous waste utilization as a supplementary resource or for energy recovery, or after processing) should be provided in the premises.
- (d) Storage area should be designed to withstand the load of material stocked and any damage from the material spillage.
- (e) Storage area should be provided with the flameproof electrical fittings and it should be strictly adhered to.
- (f) Automatic smoke, heat detection system should be provided in the sheds. Adequate fire fighting systems should be provided for the storage area, along with the areas in the facility.
- (g) There should be at least 15 m distance between the storage sheds.
- (h) Loading and unloading of wastes in storage sheds should only be done under the supervision of the well trained and experienced staff.
- (i) Fire break of at least 04 meter between two blocks of stacked drums should be provided in the storage shed. One block of drum should not exceed 300 MT of waste.
- (j) Minimum of 1 meter clear space should be left between two adjacent rows of pallets in pair for inspection.
- (k) The storage and handling should have at least two routes to escape in the event of any fire in the area.
- (l) Doors and approaches of the storage area should be of suitable sizes for entry of fork lift and fire fighting equipment;
- (m) The exhaust of the vehicles used for the purpose of handling, lifting and transportation within the facility such as forklifts or trucks should be fitted with the approved type of spark arrester.
- (n) In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and ground water, the storage area should be provided with concrete floor or steel sheet depending on the characteristics of waste handled and the floor must be structurally sound and chemically compatible with wastes.
- (o) Measures should be taken to prevent entry of runoff into the storage area. The Storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.
- (p) The storage area floor should be provided with secondary containment such as proper slopes as well as collection pit so as to collect wash water and the leakages/spills etc.
- (q) All the storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.

## **2. Storage Drums/Containers:**

- (a) The container shall be made or lined with the suitable material, which will not react with, or in other words compatible with the hazardous wastes proposed to be stored.
- (b) The stacking of drums in the storage area should be restricted to three high on pallets (wooden frames). Necessary precautionary measures should be taken so as to avoid stack collapse. However, for waste having flash point less than 65.5 O C, the drums should not be stacked more than one height.
- (c) No drums should be opened in the storage sheds for sampling etc. and such activity should be done in designated places out side the storage areas;
- (d) Drums containing wastes stored in the storage area should be labelled properly indicating mainly type, quantity, characteristics, source and date of storing etc.

## **3. Spillage/leakage control measures:**

- (a) The storage areas should be inspected daily for detecting any signs of leaks or deterioration if any. Leaking or deteriorated containers should be removed and ensured that such contents are transferred to a sound container.
- (b) In case of spills / leaks/dry adsorbents/cotton should be used for cleaning instead of water.
- (c) Proper slope with collection pits be provided in the storage area so as to collect the spills/leakages.
- (d) Storage areas should be provided with adequate number of spill kits at suitable locations. The spill kits should be provided with compatible sorbent material in adequate quantity.

## **4. Record Keeping and Maintenance:**

- (a) Proper records with regard to the industry –wise type of waste received, characteristics as well as the location of the wastes that have been stored in the facility need to be maintained.

## **5 Miscellaneous:**

- (a) Smoking shall be prohibited in and around the storage areas;
- (b) Good house keeping need to be maintained around the storage areas;
- (c) Signboards showing precautionary measures to be taken, in case of normal and emergency situations should be displayed at appropriate locations;
- (d) To the extent possible, manual operations with in storage area are to be avoided. In case of manual operation, proper precautions need to be taken, particularly during loading / unloading of liquid hazardous waste in drums;
- (e) A system for inspection of storage area to check the conditions of the containers, spillages, leakages etc. should be established and proper records should be maintained;
- (f) The wastes containing volatile solvents or other low vapour pressure chemicals should be adequately protected from direct exposure to sunlight and adequate ventilation should be provided;
- (g) Tanks for storage of liquids waste should be properly dyked and should be provided with adequate transfer systems;

- (h) Storage sites should have adequate & prompt emergency response equipment systems for the hazardous waste stored on-site. This should include fire fighting arrangement based on the risk assessment, spill management, evacuation and first aid;
- (i) Immediately on receipt of the hazardous waste, it should be analyzed and depending upon its characteristics its storage should be finalized;
- (j) Only persons authorized to enter and trained in hazardous waste handling procedures should have access to the storage site;
- (k) Mock drill for onsite emergency should be conducted regularly and records maintained;

**6. Recommended Storage time and the Quantity of the Incinerable Hazardous Wastes:**

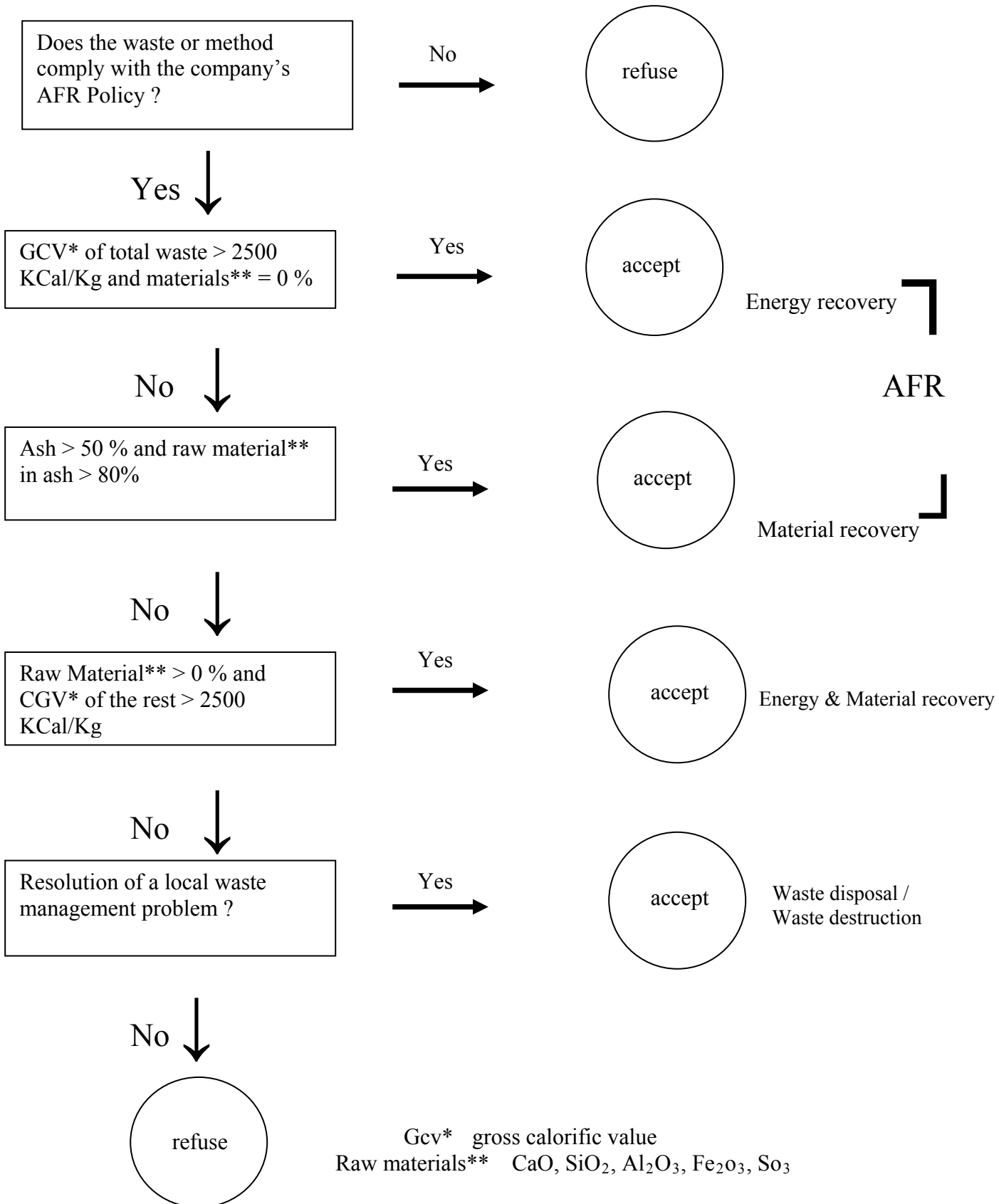
Normal storage of incinerable hazardous wastes at the facility site for utilization as a supplementary resource or for energy recovery, or after processing should be restricted to maximum of 3 months. However State Pollution Control Board/Pollution Control Committee may extend the period upto 6 months in accordance with the Hazardous wastes (M,H & TM) Rules,2008

**7. Hazard Analysis and Safety Audit:**

For every facility for utilization as supplementary resource or for energy recovery, or after processing, a preliminary hazard analysis should be conducted. Safety Audit internally by the facility operator every year & externally once in two years by a reputed expert agency should be carried out and same should be submitted to the SPCB/PCC.

Such conditions should be stipulated by SPCBs while granting authorization under the HW (M, H & TBM) Rules to the operators.

**Accept or Refuse Flowchart for a Cement Plant Operator**



## Acceptance Criteria

**Table 1.0: Specification of HW for use as Alternative Raw Material**

Parameter	Limit
Volatile organic Hydrocarbon	< 5000 ppm
Total organic Carbon (TOC)	< 1000 ppm
CaO + SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub> + Fe <sub>2</sub> O <sub>3</sub> + SO <sub>3</sub> (In Ash)	> 80 %
Chloride	< 1.5 %
Sulphur	< 1.5 %
PCB/PCT (ppm)	< 5.0
Heavy Metals (ppm)	
Hg	< 10
Cd+Tl+Hg	< 100
As+Co+Ni+Se+Te+Sb+Cr+Sn+Pb+V	< 10,000

**Table 2.0: Specification of HW for use of energy recovery**

Parameter	Limit
Calorific Value As received basis	>2500 k Cal/Kg
Ash	
-Liquid	< 5%
-Solid	< 20%
Chloride	< 1.5 %
Halogens (F+Br+I)	< 1.0 %
Sulphur	< 1.5 %
PCB/PCT (ppm)	< 50
Heavy Metals (ppm)	
Hg	< 10
Cd+Tl+Hg	< 100
As+Co+Ni+Se+Te+Sb+Cr+Sn+Pb+V	< 25,00
pH	4 to 12
Viscosity (cSt) for Liquid	< 100
Flash point (Deg Centigrade) (for Liquid)	> 60

## NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke - Ultraviolet fluorescence
2	Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O <sub>3</sub> ) µg/m <sup>3</sup>	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m <sup>3</sup>	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH <sub>3</sub> ) µg/m <sup>3</sup>	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method



(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C <sub>6</sub> H <sub>6</sub> ) µg/m <sup>3</sup>	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m <sup>3</sup>	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m <sup>3</sup>	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m <sup>3</sup>	Annual*	20	20	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

\* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

\*\* 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

**Format\* for obtaining approval from the Central Pollution Control Board under the Rule 11 of the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008**

1	Name & Address of the Unit:	
1.1	Contact Person and phone number:	
1.2	Products to be manufactured and quantity (MT/Day):	
2	<i>Details of source of hazardous waste to be utilized</i>	
2.1	Name & address of hazardous waste generating industry:	
2.2	Name of the hazardous wastes including category as per the Schedule I:	
2.3	Generation (MTA) of hazardous waste proposed for utilization:	
2.4	Detailed characteristics of hazardous waste proposed for utilization:	
2.5	Process flow diagram of hazardous waste generating unit:	
3	<i>Details of utilization of hazardous wastes</i>	
3.1	Process Flow Diagram:	
3.2	Please attach copy of air consent, water consent and authorization:	
3.3	Base line data including characteristics pertaining to air emissions, waste water generation and other solid wastes including hazardous waste being generated:	
3.4	Material Balance without utilizing hazardous wastes:	
3.5	Name and category of hazardous waste including quantity proposed to be to be utilized:	
3.6	Quantity of coal to be replaced by co-processing	
3.7	Material balance with utilization of hazardous wastes:	
3.8	Chemistry involved with and without utilization of hazardous wastes:	
3.9	Data including characteristics pertaining to air emissions, waste water generation and other solid wastes including hazardous waste being generated during utilization of hazardous wastes, if available:	
3.10	Details of findings of laboratory/ pilot scale study, international practice etc.	

*\* To be filled and submitted by the unit, who desires to utilize hazardous wastes as a supplementary resource or for energy recovery, or after processing. It shall also be forwarded by the SPCB/PCC under whose jurisdiction the unit falls.*

# Protocol of Trial Run for Co-processing of Hazardous Waste in Cement Kiln

## Part – A

### Requirement of testing for hazardous waste

Atleast one representative sample shall be collected (for the whole trial period) and analysed for the following.

- Calorific value of the waste (KCal / Kg) : Gross and net
- Proximate analysis (Moisture content, Ash content, Volatile matter content, Fixed carbon content)
- Ultimate analysis (Carbon content, Hydrogen content, Sulphur content, Nitrogen content, Oxygen content)
- Characteristics of the waste (Chlorine, fluorine and metal content lead, zinc, tin, cadmium, arsenic, mercury, chromium, cobalt, nickel, thallium, copper, vanadium, antimony, manganese, selenium, Iron)
- Total Organic Carbon (TOC)
- TCLP Test
- Total Petroleum Hydrocarbon
- Organo - chlorine compounds
- VOCs and Semi-VOCs
- Poly Chloro Biphenyls (PCBs)
- Poly Chloro Phenols (PCPs)
- Viscosity (for Liquid Hazardous Wastes)
- Water content (for Liquid Hazardous Wastes)
- Solid content (for Liquid Hazardous Wastes)

### Requirement of testing for conventional fuel

Atleast one representative sample shall be collected (for the whole trial period) and analysed for the following.

- Calorific value of sludge (KCal / Kg) : Gross and net
- Proximate analysis (Moisture content, Ash content, Volatile matter content, Fixed carbon content)
- Ultimate analysis (Carbon content, Hydrogen content, Sulphur content, Nitrogen content, Oxygen content)
- Characteristics of the fuel (Chlorine, fluorine and metal content lead, zinc, tin, cadmium, arsenic, mercury, chromium, cobalt, nickel, thallium, copper, vanadium, antimony, manganese, selenium, Iron)
- Total Organic Carbon (TOC)

## Monitoring Programme at Cement Plant

S. No.	Date and duration	Operation of Cement Kiln
1.	One Day	Emission monitoring during normal operation of cement kiln
2.	Three Days	Emission monitoring during trial run of cement kiln at a fixed percentage of hazardous waste
3.	One Day	Emission monitoring during normal operation of cement kiln

**Detailed emission monitoring schedule to be followed before, after and during trial run of co-processing of hazardous waste in cement kiln**

S.No.	Parameter	Frequency
1.	Particulates	4 samples / day
2.	SO <sub>2</sub>	4 samples / day
3.	HCl	4 samples / day
4.	CO	4 samples / day
5.	NO <sub>x</sub>	4 samples / day
6.	Total Organic Carbon	1 sample / day
7.	HF	4 samples / day
8.	Hydrocarbons	2 samples / day
9.	Opacity (continuous dust emission monitoring)	Continuous
10.	VOC	2 samples / day
11.	PAH	2 samples /day
12.	Metals (both particulate and vapour phase) Cd, Th, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V, Zn, Sn, Se	1 sample / day

13.	Dioxin & furans	1 sample / day
14.	Cyanide	1 sample / day

## Ambient Air Quality Monitoring

SPM, RSPM, SO<sub>2</sub>, NO<sub>x</sub> Monitoring at three locations (one in upwind and two in down wind direction). The monitoring shall be carried out 24 hourly basis during whole trial period.

## Clinker Analysis

- Daily one representative sample shall be collected and analysed for the following.
  - Chlorine, Flourine, Sulphur, Cyanide
  - Metals i.e. Cd, Th, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, V, Zn, Sn, Se
- Leachability study of clinker (produced before trial run and during trial run) for fluoride, cyanide etc. including metals i.e. Cd, Th, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, V, Zn, Sn, Se with proper conclusion
- Total Organic Carbon (TOC)

## Raw Meterial Analysis

Atleast one representative sample shall be collected (for the whole trial period) and analysed for the following.

- Fluorides as F, Sulphates as SO<sub>4</sub>, Aluminium as Al<sub>2</sub>O<sub>3</sub>, Silica as SiO<sub>2</sub>, Iron as Fe<sub>2</sub>O<sub>3</sub>
- Metals i.e. Cd, Th, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, V, Zn, Sn, Se
- Total Organic Carbon (TOC)

## Material Balance

A detailed report with complete interpretation including material balance for heavy metals and other important parameters shall be prepared.

## Part - B

### Information required to be collected during the trial run by cement industry

- Coloured computer print of process chart of different sections from Central Control Room

- Sketch showing stack duct connections and port hole with dimensions
- Note on hazardous waste handling and feeding mechanism i.e. from arrival of waste from hazardous waste generator to kiln burner / pyro
- Process flow diagram for co-incineration of hazardous waste in cement kiln
- Note on difficulties faced in grinding the hazardous waste with suggestions for improvement
- Distance between hazardous waste generator and cement plant.
- Copy of Safety manual for transportation of hazardous waste and other related documents, if any
- Process flow diagram for cement manufacturing (Limestone stacking to packing plant)
- Layout plan
- Pyro drawings (with marking of temp.)
- Copy of consent order (showing prescribed standards)
- Stack emission and ambient air quality data of previous month
- Meteorology data (wind speed & direction, temp., rainfall) of trial period
- Wind rose diagram on daily basis
- Copy of daily log sheets of Kiln, clinker cooler and Coal mill for the entire period of trial run.
- Sketch showing locations of ambient air quality stations and soil sampling points w.r.t. cement plant (with marking of North, South direction)
- Photographs of trial run in CD
- Hourly data of continuous emission monitoring system for entire period of trial run (along with trend chart) for kiln section
- Note on manufacturing process of cement
- Kiln stoppages with date, time, duration and reason
- Coal mill stoppages with date, time, duration and reason
- Kiln ESP stoppages with date, time, duration and reason

## **Design (Optimum) Values**

- Design raw mill out put in TPH
- Design kiln feed in TPH
- Design clinker production in TPH
- Design coal consumption in kiln burner in TPH
- Design coal consumption in pyro in TPH
- Design temp. of pyro (max.)
- Design temp. of Kiln (burning zone)
- Average coal mill output in TPH in normal operation
- Average running hours of coal mill in normal operation
- Design coal mill out put in TPH
- Gas residence time in kiln
- Gas residence time in pre-heater

## **Production data for entire trial period**

- Raw mill output in TPH
- Kiln feed in TPH (with trend chart)
- Clinker production in TPH (Hourly average)
- Coal consumption in TPH in kiln (hourly average)
- Coal consumption in TPH in pyro (hourly average)
- hazardous waste consumption in TPH (Hourly average)
- Temp. of pyroclone 6<sup>th</sup> stage maximum (hourly average)
- Temp. of kiln maximum at burning zone (hourly)
- Coal mill out put in TPH (hourly)

## **Chemical analysis of clinker (hourly sample homogenized on daily basis) for entire trial period**

- Loss on Ignition (LOI) %
- Silica (SiO<sub>2</sub>) %
- Iron Oxide (Fe<sub>2</sub>O<sub>3</sub>) %
- Aluminium Oxide (Al<sub>2</sub>O<sub>3</sub>) %
- Calcium Oxide (CaO) %
- Magnesium Oxide (MgO) %
- Sulphate (SO<sub>3</sub>) %
- Free Lime (CaO) %
- Total Alkalies
  - a) Na<sub>2</sub>O%
  - b) K<sub>2</sub>O%
- Minor Constituents
  - a) P<sub>2</sub>O<sub>5</sub>%
  - b) Cl%

## **Physical tests of cement (hourly sample homogenized on daily basis) for entire trial period**

- Blain (m<sup>2</sup> / kg)
- Setting Time (minutes)
  - a) Initial setting time
  - b) Final setting time
- Soundness
  - a) Le - Chat (mm)
  - b) Autoclave (%)
- Compressive Strength (MPa)
  - a) 3days
  - b) 7days
  - c) 28 days

## **Productivity Parameters during Trial Run**

- Kiln Output Rate
  - (a) TPD
  - (b) TPH
- Energy Consumption
  - (a) Electrical, kWh/t Clinker
  - (b) Thermal, %
  - (c) Kcal/kg Clinker
  - (d) Coal Mill Power, kWh/t Coal

## **Kiln Parameters Observed During the Period of Trial**

- Kiln Speed, rpm
- Kiln Torque, Amp.
- Kiln Feed, tph
- BE Temperature, °C
- BZ Temperature, °C
- PH Outlet (P-Line)
  - (a) Gas Temperature, °C
  - (b) Draft, mmWG
  - (c) O<sub>2</sub>, %
  - (d) CO, %
- PH Outlet (K-Line)
  - (a) Gas Temperature, °C
  - (b) Draft, mmWG
  - (c) O<sub>2</sub>, %
  - (d) CO, %
- Secondary Air temperature, °C
- Tertiary Air temperature, °C
- Moisture in Coal as fed, %
- Fine Coal residue, % on 90μ
- Litre Weight, g/l

## **Information related to hazardous waste generator**

- About the company
- Address of the company
- Name of the head of the company
- Year in which plant was commissioned
- List of the products manufactured with capacity and production data
- Manufacturing process of each product
- Process flow chart of each product (including waste generation)
- Waste water treatment plant details including capacity of tanks, retention time, characteristics of waste water, efficiency of ETP, sludge generation, process description of ETP, flow chart of ETP etc / Details of the process by which hazardous waste is generated
- Quantity of hazardous waste generation, physical state of hazardous waste, present method of storage and disposal, cost of disposal
- Copy of air, water consent and authorization for hazardous waste disposal



## Annexure 9

### Model Permission for Trial run for co-processing of hazardous waste in cement kiln

Permission is hereby accorded for trial run for co-processing of hazardous waste viz. .... from ..... in the cement kiln of M/s ..... under the Rule 11 of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, subject to compliance of various provisions of the Environment (Protection) Act, 1986 including the following:

1. Handling, storage, transportation and co-processing of hazardous waste shall follow the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.
2. For transportation of proposed hazardous wastes to conduct trial run for co-processing in cement kiln, manifest system as per Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and guidelines of CPCB shall be followed.
3. The generator of hazardous waste shall obtain the permission from the State Pollution Control Board to conduct the trial run for co-processing of hazardous waste in cement plant under Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.
4. Monitoring during the trial run shall be conducted as per the enclosed monitoring protocol (Annexure-8, Part A). Emission monitoring shall be conducted by recognized laboratory in consultation with SPCB/CPCB. Other tests related to quality of clinker & cement should be carried out and information as per Annexure-8, Part B, should be generated / collected.
5. The cement plant shall take the hazardous waste only from the authorized generator.
6. The plant shall estimate the quantity of hazardous waste required to conduct the trial run as per Annexure-8, Part A. Only estimated quantity of hazardous waste shall be stored and co-processed in the plant during trial run. Cement industry shall provide adequate covered storage space for the hazardous waste in accordance with Hazardous Waste Rules and also ensure that there is no leaching of any pollutant.

7. The cement plant shall ensure the compliance of the conditions stipulated in the consents issued under the Water Act, 1974 and Air Act, 1981 during the trial run of co-processing of hazardous waste.
8. The cement plant shall comply with all the requirements in accordance with the Public Liability Insurance Act, 1991 as amended.
9. SPCB reserves the right to review / impose additional conditions or revoke, change or alter any of the terms and conditions.

Necessary arrangement shall be made to conduct the trial run smoothly. The final programme of the trial run shall be communicated to SPCB and CPCB within a month. The cement plant shall inform the date of trial run well in advance so that SPCB and CPCB representative can be present during the trial run. After trial run, the study report incorporating the information as at Annexure - 8 of the guidelines shall be submitted to SPCB for further forwarding the case to CPCB for consideration.

### Model Permission for co-processing of hazardous waste in cement kiln

Permission is hereby accorded for co-processing of hazardous waste viz. .... from ..... in the cement kiln of M/s ..... under the Rule 11 of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, subject to compliance of various provisions of the Environment (Protection) Act, 1986 including the following:

1. The permission is valid only for co-processing of above specified hazardous waste. The waste characteristics should be similar to that for which trial runs have been conducted by CPCB/SPCB. The details enclosed as Annexure. Prior permission has to be obtained for co-processing of any other hazardous waste.
2. The cement plant shall obtain the authorization from the concerned State Pollution Control Boards as required under Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 for storage, handling, transportation and co-processing of hazardous waste.
3. For transportation of proposed hazardous wastes for co-processing in cement kiln, manifest system as per Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and guidelines of CPCB shall be followed.
4. The generator of hazardous waste shall obtain authorization from the State Pollution Control Board as required under Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 for storage, handling, transportation and co-processing of hazardous waste in cement plant.
5. The cement plant shall estimate the quantity of hazardous waste required to be co-processed. Cement industry shall provide adequate covered storage space for the hazardous waste in accordance with Hazardous Waste Rules and also ensure that there is no leaching of any pollutant. The actual quantity of hazardous waste co-processed in each calendar year shall be reported to the CPCB and SPCB.
6. The cement plant shall ensure the compliance of the conditions stipulated in the consents issued under the Air Act, 1981 and Water Act, 1974 during the co-processing of hazardous waste.
7. The emission standards for particulate matter prescribed for cement kiln by the concerned State Pollution Control Board shall be applicable during co-processing in cement kiln also. For other pollutants i.e.; CO, TOC, NO<sub>x</sub>, HCl, SO<sub>2</sub>, HF total dioxins and furans,

Cd + Tl + their compounds, Hg and its compounds, Sb + As + Pb + Co + Cr + Cu + Mn + Ni + V + their compounds, the emission values during co-processing shall not exceed the base line emissions i.e. during pre co-processing phase of trial run. The continuous measurement of particulate matter emission shall be carried out at co processing plant and the emission data shall be submitted to CPCB and the concerned SPCB/PCC. As per direction of CPCB monitoring of dioxins and furans including other parameters will be done by the cement plant.

8. The cement plant shall take the hazardous waste only from the authorized generator/TSDF.
9. A log book of the waste co-processed shall be maintained including emission monitoring result during co-processing.
10. During co-processing of hazardous waste in cement kiln, the cement plant shall comply with all the requirements in accordance with the Public Liability Insurance Act, 1991 as amended.
11. In case of any violation in the conditions stipulated, the permission can be withdrawn at any time.
12. CPCB reserves the right to review / impose additional conditions or revoke, change or alter any of the terms and conditions.

## Appendix A

### Substances having potential to be used in Co-processing in Cement Plant

#### A. Industrial Wastes

##### 1.0 Organic Chemical Wastes

##### 1.1 Mineral oils, synthetic oils and fats oil sludges and solid wastes

sludges from on-site effluent treatment  
tank bottom sludges

**wastes from shaping (including forging, welding, pressing, drawing, turning, cutting and filing)**

waste machining oils containing halogens (not emulsioned)  
waste machining oils free of halogens (not emulsioned)  
waste machining emulsions containing halogens  
waste machining emulsions free of halogens  
synthetic machining oils

##### **waste hydraulic oils and brake fluids**

hydraulic oils, containing PCBs or PCTs  
other chlorinated hydraulic oils (not emulsions)  
non-chlorinated hydraulic oils (not emulsions)  
chlorinated emulsions  
non-chlorinated emulsions  
hydraulic oils containing only mineral oil  
other hydraulic oils

##### **waste engine, gear and lubricating oils**

chlorinated engine, gear and lubricating oils  
non-chlorinated engine, gear and lubricating oils  
other engine, gear and lubricating oils

##### **waste insulating and heat transmission oils and other liquids**

insulating or heat transmission oils and other liquids containing PCBs  
(chlorinated waste and PCB are subject to legal limitations, maximum concentration in input and maximum T/year allowed)  
other chlorinated insulating and heat transmission oils and other liquids  
non-chlorinated insulating and heat transmission oils and other liquids  
synthetic insulating and heat transmission oils and other liquids  
mineral insulating and heat transmission oils and other liquids

### **bilge oils**

bilge oils from inland navigation  
bilge oils from jetty sewers  
bilge oils from other navigation

### **oil/water separator contents**

oil/water separator sludges  
interceptor sludges  
desalter sludges or emulsions  
other emulsions

### **oil waste not otherwise specified**

oil waste not otherwise specified

## **1. 2 Petrochemical wastes oil sludges and solid wastes**

sludges from on-site effluent treatment  
desalter sludges  
tank bottom sludges  
acid alkyl sludges  
oil spills  
sludges from plant, equipment and maintenance operations  
wastes not otherwise specified

### **oil desulphurisation waste**

waste containing Sulphur

### **waste from the pyrolytic treatment of coal**

acid tars  
other tars  
waste from cooling columns

## **1. 3 Solvents, paints, varnishes, glues (adhesive, sealants), organic rubbers**

### **1.3.1 waste for the MFSU of organic dyes and pigments (excluding 06 11 00)**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors

halogenated still bottoms and reaction residues  
halogenated filter cakes, spent absorbents

**1.3.2 wastes from the MFSU of paint and varnish**

waste paints and varnish containing halogenated solvents  
waste paints and varnish free of halogenated solvents  
waste from water-based paints and varnishes

**1.3.3 sludges from paint and varnish removal containing halogenated solvents**

sludges from paint and varnish removal free of halogenated solvents  
aqueous sludges containing paint or varnish  
wastes from paint or varnish (except 08 01 05 and 08 01 06)  
wastes not otherwise specified

**1.3.4 wastes from the MFSU of printing inks**

waste ink containing halogenated solvents  
waste ink free of halogenated solvents

**1.3.5 wastes from the MFSU of adhesives and sealants (including waterproofing products)**

waste adhesive and sealants containing halogenated solvents  
waste adhesive and sealants free of halogenated solvents  
waste from water-based adhesive and sealants  
adhesive and sealants sludges containing halogenated solvents  
adhesive and sealants sludges free of halogenated solvents  
aqueous sludges containing adhesive and sealants  
aqueous liquid waste containing adhesive and sealants

**1.3.6 wastes from solvent and coolant recovery (still bottoms)**

Chlorofluorocarbons  
other halogenated solvents and solvent mixes  
other solvents and solvent mixes  
sludges containing halogenated solvents  
sludges containing other solvents

**1.4 Wastes from synthetic materials and rubbers waste for the MFSU of plastics, synthetic rubber and man-made fibres**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors

halogenated still bottoms and reaction residues  
other still bottoms and reaction residues

**2.0 Other Chemical Wastes**

**2.1 wood preservation waste**

non-halogenated organic wood preservatives  
organochlorinated wood preservatives

**2.2 wastes from pulp, paper and cardboard production and processing**

de-inking sludges from paper recycling  
fibre and paper sludge

**2.3 wastes from the leather industry**

degreasing wastes containing solvents without a liquor phase

**2.4 wastes from textile industry**

halogenated waste from dressing and finishing  
dye stuffs and pigments

**2.5 waste from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors  
halogenated still bottoms and reaction residues  
other still bottoms and reaction residues

**2.6 waste for the MFSU of organic pesticides**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors  
halogenated still bottoms and reaction residues  
other still bottoms and reaction residues

**2.7 waste for the MFSU of pharmaceuticals**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors  
halogenated still bottoms and reaction residues



other still bottoms and reaction residues

**2.8 waste for the MFSU of fats, grease, soaps, detergents, disinfectants and cosmetics**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors  
halogenated still bottoms and reaction residues  
other still bottoms and reaction residues

**2.9 waste for the MFSU of fine chemical products not otherwise specified**

aqueous washing liquids and mother liquors  
sludges from on-site effluent treatment  
organic halogenated solvents, washing liquids and mother liquors  
other organic solvents, washing liquids and mother liquors  
halogenated still bottoms and reaction residues  
other still bottoms and reaction residues

**2.10 wastes from the MFSU of printing inks**

waste from water-based inks  
ink sludges containing halogenated solvents  
ink sludges free of halogenated solvents  
aqueous sludges containing ink  
aqueous liquid waste containing ink  
wastes not otherwise specified

**2.11 wastes from the photographic industries**

water based developer and activator solutions  
water based offset plate developer solutions  
solvent based developer solutions  
fixer solution  
bleach solutions and bleach fixer solutions

**2.12 wastes from aluminium thermal metallurgy**

tars and other carbon-containing wastes from anode manufacture

**2.13 waste from metal degreasing and machinery maintenance**

Chlorofluorocarbons  
other halogenated solvents and solvent mixes  
other solvents and solvent mixes  
aqueous solvent mixes containing halogens  
aqueous solvent mixes free of halogens

sludges and solid wastes containing halogenated solvents  
sludges and solid wastes free of halogenated solvents

**2.14 wastes from textile cleaning and degreasing of natural products**

halogenated solvents and solvent mixes  
solvent mixes or organic liquids free of halogenated solvents  
sludges and solid wastes containing halogenated solvents  
sludges and solid wastes containing other solvents

**2.15 wastes from the electronic industry**

Chlorofluorocarbons  
other halogenated solvents and solvent mixes  
other solvents and solvent mixes  
sludges and solid wastes containing halogenated solvents  
sludges and solid wastes containing other solvents

**2.16 wastes from coolants, foam/aerosols propellants**

Chlorofluorocarbons  
other halogenated solvents and solvent mixes  
other solvents and solvent mixes  
sludges and solid wastes containing halogenated solvents  
sludges and solid wastes containing other solvents

**2.17 off-specification batches**

organic off-specification batches

**2.18 chemicals and gases in containers**

other wastes containing organic chemicals, e.g. lab  
chemicals not otherwise specified

**2.19 asphalt, tar and tarred products**

tar and tar products

**2.20 waste from research, diagnosis, prevention of diseases involving animals**

discarded chemicals

**B. Wastes of Animal and Vegetal Origin (except municipal, textile, agricultural and hospital wastes)**

**1.0 Fats and oils from animal and vegetal origin**

**1.1 primary production waste**

sludges from washing and cleaning  
animal feces, urine and manure (including spoiled straw), effluent, collected separately and treated off-site

**1.2 wastes from the preparation and processing of meat, fish and other foods of animal origin**

sludges from washing and cleaning  
materials unsuitable for consumption or processing  
sludges from on-site effluent treatment

**1.3 wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee and tobacco preparation, processing; conserve production; tobacco processing**

sludges from washing, cleaning, peeling, centrifuging and separation  
wastes from preserving agents  
wastes from solvent extraction  
materials unsuitable for consumption or processing  
sludges from on-site effluent treatment

**1.4 wastes from sugar processing**

sludges from on-site effluent treatment

**1.5 wastes from dairy products industry**

materials unsuitable for consumption or processing  
sludges from on-site effluent treatment

**1.6 wastes from baking and confectionery industry**

wastes from preserving agents  
sludges from on-site effluent treatment

**wastes from the production of alcoholic and non-alcoholic beverages (excluding coffee, tea and cocoa)**

wastes from washing, cleaning and mechanical reduction of the raw material  
wastes from spirits distillation  
wastes from chemical treatment

Materials unsuitable for consumption or processing  
sludges from on-site effluent treatment

## **C. Other Wastes**

- 1.0** Disposed, sorted and/or stocked wastes from a waste treatment facility
- 1.1 waste from oil regeneration**
- acid tars
  - other tars
  - Aqueous liquid waste from oil regeneration
- 1.2 wastes from solvent and coolant recovery (still bottoms)**
- Chlorofluorocarbons
  - other halogenated solvents and solvent mixtures
  - other solvents and solvent mixtures
  - sludge containing halogenated solvents
  - sludge containing other solvents
- 1.3 waste from transport and storage tank cleaning**
- wastes from marine transport tank cleaning, containing chemicals
  - wastes from marine transport tank cleaning, containing oil
  - wastes from marine transport tank cleaning, containing oil
  - wastes from railway and road transport tank cleaning, containing oil
  - wastes from railway and road transport tank cleaning, containing chemicals
  - wastes from storage tank cleaning, containing chemicals
  - wastes from storage tank cleaning, containing oil
- 1.4 Wastes from drums and tanks treatment facility, contaminated by one or more constituent enumerated in Annex II of Directive 91/689/CEE**
- 1.5 Wastes from incineration or pyrolysis of municipal and similar commercial, industrial and instit. Waste**
- pyrolysis wastes
- 1.6 wastes from anaerobic treatment of wastes**
- anaerobic treatment sludges of municipal and similar wastes
  - anaerobic treatment sludges of animal and vegetable wastes
- 1.7 landfill leachate**
- landfill leachate
- wastes from waste water treatment plants not otherwise specified**
- grease and oil mixture from oil/waste water separation

**1.8**            **separately collected fractions**

oil and fat  
paint, inks, adhesive and resins  
solvents  
detergents  
medicines  
pesticides

**1.9**            **other municipal waste**

Septic Tank Sludge