Standard Operating Procedure and Checklist of Minimal Requisite Facilities for utilization of hazardous waste under Rule 9 of the Hazardous and Other Wastes (Management and Transboundary movement) Rules, 2016

Utilization of Spent Alumina generated from Polymerization in Swing Unit of Petrochemical Plant

cpcb

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Central Pollution Control Board

(Ministry of Environment, Forest & Climate Change, Government of India)

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Procedure for grant of authorisation by SPCBs/PCCs for utilization of Hazardous Waste

(i) While granting authorisation for utilization of hazardous wastes, SPCBs/PCCs shall ensure the following:

a. The waste (intended for utilization) belongs to similar source of generation as specified in SoPs.

b. The utilization process is similar to the process of utilization described in SoPs.

c. End-use / product produced from the waste shall be same as specified in SoPs.

d. Authorisation be granted only after verification of utilization process and minimum requisite facilities as given in SoPs.

e. Issuance of passbooks (similar to the passbooks issued for recycling of used oil, waste oil, non-ferrous scrap, etc.) for maintaining records of receipt of hazardous wastes for utilization.

(ii) After issuance of authorization, SPCB shall verify the utilization process, checklist and SOPs on quarterly basis for initial 2 years; followed by random checks in the subsequent period for atleast once a year.

In-case of lack of requisite infrastructures with the SPCB/PCC, they may engage 3rd party institutions or laboratories having EPA/NABL/ISO17025 accreditation/recognition for monitoring and analysis of prescribed parameters in SoPs for verification purpose.

(iii) SPCBs shall provide half yearly updated list of units permitted under Rule 9 of HOWM Rule, 2016to CPCB and also upload the same on SPCB website, periodically. Such updated list shall be sent to CPCB half yearly by July and January respectively.

(iv) Authorisation for utilisation shall not be given to the units located in the State/UT where there is no Common TSDF, unless the unit ensures authorised captive disposal of the hazardous waste (generated during utilisation) or its complete utilisation or arrangement of sharing with any other authorised disposal facility.

(v) In case utilization proposal is not similar with respect to source of generation or utilization process or end-use as outlined in this SoP, the same may be referred to CPCB for clarification / conducting trial utilization studies and developing SoPs thereof.

(vi) The source and work zone standards suggested in the SoPs are based on the E(P)A notified and OSHA standards respectively, however, SPCB/PCC may impose more stringent standards based on the location or process specific conditions.

27.0 Utilization of Spent Alumina:

Type of HW	Source of generation	Recovery/Product
Spent Alumina Category 1.6 of schedule-I of	Spent activated alumina used as molecular sieve /	For manufacturing of Refractory material like Insulation bricks, High

HOWM Rules, 2016	absorbent for metal chelates in Polymerization in swing unit of Petrochemical Plant	Alumina bricks and High Alumina Refractory Binder

27.1Source of Waste

Activated alumina is used in swing unit of Naptha Cracker plant in petrochemical industry, as an adsorbent, to improve the colour of the product. In swing unit, polymerization reaction takes place in presence of catalyst. The remaining catalyst is deactivated by the deactivators into metal chelates in reactor downstream. These deactivators and metal chelates are adsorbed on activated alumina in solution adsorber to improve the appearance of the finished product. The spent alumina after use is discarded after 3-4 days of operation as hazardous waste categories under S.No. 1.6 of Schedule-I of HOWM Rules, 2016.. Spent alumina constitutes of 93-95% aluminium oxide and is non-combustible. This hazardous waste required to be disposed in authorized disposal facility in accordance with authorization condition, when not utilized as energy/resource recovery.

27.2 UtilizationProcess

Spent alumina is utilised by replacing use of fresh alumina in producing variety of insulation materials. Depending on type of insulation materials; raw material composition, moulds, temperature in kiln and time of heating are changed. Trial study was carried out to demonstrate safe utilization of spent alumina in producing following types of insulation material;

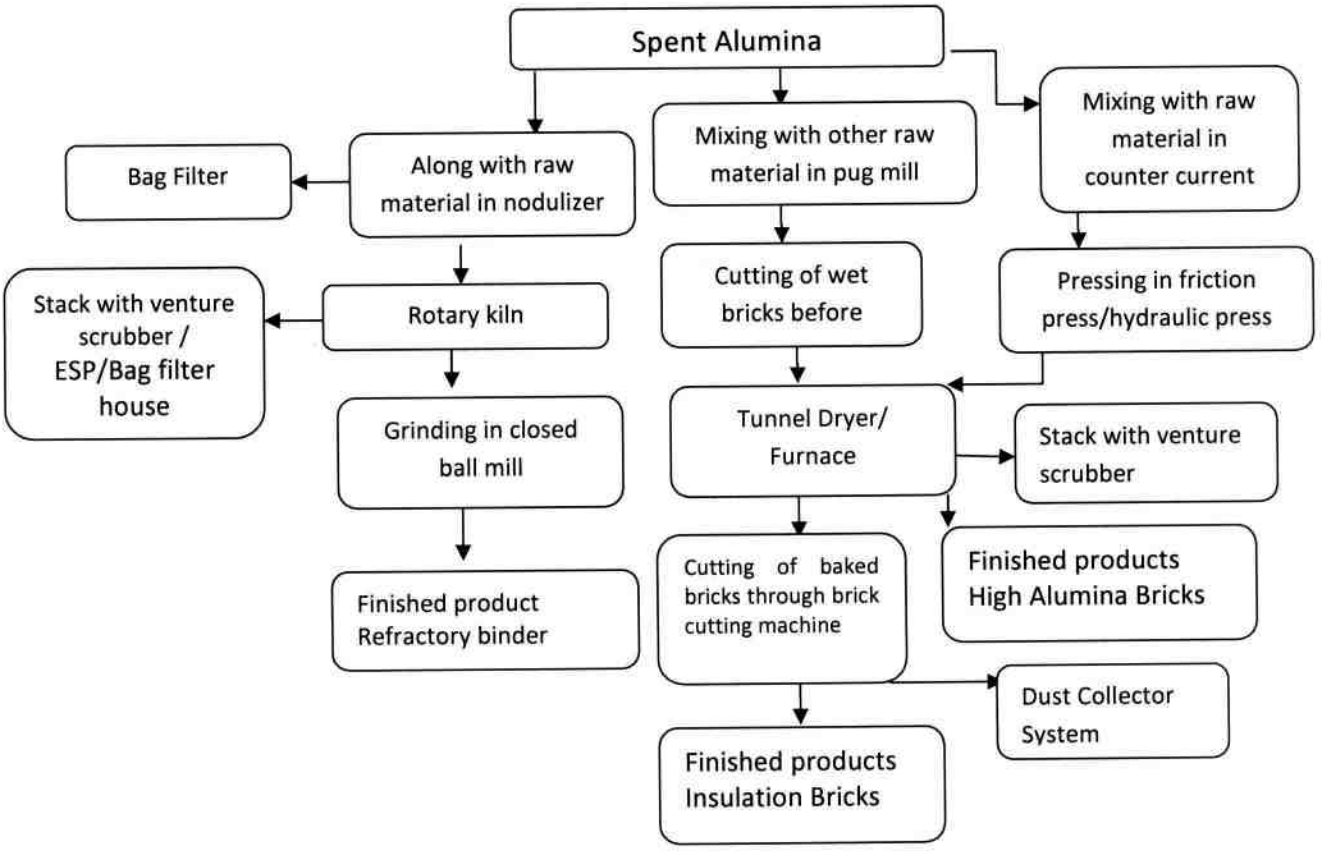
i. For Insulation Bricks -The utilization process involves mixing of spent alumina (25%) with china clay (45%) and saw dust (30%)then extruded through pug mill and kept for air drying after cutting these bricks through wire. After air drying these insulation bricks are passed through tunnel kilns @ 1250-1500^{0}C for 7-8 hours. After cooling these bricks are sent for cutting through machined brick cutting machine to get desired shape.

ii. For High Alumina Refractory Binder- For manufacturing of high alumina refractory binder, spent alumina (85%) is mixed with hydrated lime then passed through noduliser using molasses as binder. These nodules are sent to rotary kiln at 1500^{0}C to get clinker (retention time inside rotary kiln is 03 hours). This clinker is crushed in closed circuit ball mill to get high alumina binder as a product.

iii. High Alumina Bricks- Utilization process involves mixing of spent alumina (25%) with calcined bauxite (50%), calcine ddiaspore (5%) calcined pyrophillite (5%) and fire clay(15%) in counter current mixer with water. After mixing it is pressed in friction screw

press & hydraulic press machine to mould high alumina brick. These pressed bricks are then treated in tunnel kilns @ 1250-1500^{0}C for 7-8 hours.

Process Flow Diagram



27.3 Product Usage / Utilization:

Spent alumina and along with other raw material would be utilised as supplementary resource material for production of insulation bricks, high alumina bricks and high alumina refractory binder, which are used as refractory material in various industrial furnaces, ovens and other processes.

27.4 Standard Operating Procedure (SoP) for utilization

This SoP is applicable only for the utilization of spent alumina generated from swing unit of Naptha Cracker plant in petrochemical industry to produce Insulation Bricks, High Alumina Bricks and High Alumina Refractory Binder.

(1) The spent alumina should be transported in non-reactive bags/drums mounted on vehicles fitted with requisite safeguards ensuring no spillage of waste.

(2) Transportation of spent alumina shall be carried out by the sender (generator) or receiver (utilizer) as per the authorization issued by concerned SPCB under the Hazardous and Other Wastes (Management &Transboundary Movement) Rules, 2016.

(3) There should be a designated space for unloading of spent alumina bags/drums. The receiving storage area shall be placed above the ground and contained with low raise bund wall &concrete floor.

(4) The unit shall store spent alumina under dry and well-ventilated covered storage shed(s) within premises, as authorized by the concerned State Pollution Control Board/Pollution Committee under Hazardous and Other Wastes (Management &Transboundary Movement) Rules, 2016 so as to eliminate rain water intrusion. Unit shall provide sprinkler system in the storage area to avoid dust emission during handling and transfer.

(5) The entire process area shall have impermeable tiled/concrete floor.

(6) There shall be no manual handling and transfer of spent alumina.

(7) Mechanised equipment having cover shall be used for mixing of spent alumina with other raw material under covered shed with adequate safety gadgets provided to workers ensuring proper ventilation in the process area.

(8) Water sprinkling system should be used in handling area and mixing process to minimise the dust emission.

(9) The unit shall also provide proper storage and handling of saw dust to keep it moistened from time to time to arrest dust emission. There should be adequate systems for fire protection.

(10) There shall be minimal manual handling of bricks and other refractory materials.

(11) The unit shall maintain proper ventilation in the work zone and process areas (preferably ventilation ducts connected with ID fan and roof top exhaust may be provided). All personnel involved in the plant operation shall wear proper personal protective equipment such as Safety glasses with side shields, heat resistant gloves,

helmet, mask, safety footwear with good traction to prevent slipping etc.in accordance with the OSHA guideline for personnel protective equipment.

(12) The unit shall separately store the finished products under cool, dry and well-ventilated covered storage shed within the premises.

(13) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.

(14) It shall be ensured that spent alumina is procured from the industries who have valid authorization for generation/storage of the same from the concerned SPCB/PCC as required under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

(15) Un-utilized spent alumina, if any, should be collected and temporarily stored in steel drums in a dedicated hazardous waste storage area and sent to TSDF within 90 days from generation of the waste. Such storage area shall be covered with proper ventilation.

(16) Prior to utilization of spent alumina, the unit shall obtain authorization for generation, storage and utilisation of spent alumina from the concerned State Pollution Control Board under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.

(17) In case of environmental damages arising due to improper handling of hazardous wastes including accidental spillage during generation, storage, processing, transportation and disposal, the unit shall be liable to implement immediate response measures, environmental site assessment and remediation of contaminated soil/groundwater/sediment etc. as per the "Guidelines on Implementing Liabilities for Environmental Damages due to Handling & Disposal of Hazardous Wastes and Penalty" published by CPCB.

(18) During the process of utilization and handling of hazardous waste, the unit shall comply with the requirements in accordance with the Public Liability Insurance Act, 1991 as amended, wherever applicable.

27.5<u>Standards</u>

(1) Emissions from stack connected to rotary kiln and tunnel furnace shall comply with:

i. PM emission –(As prescribed by the SPCB/PCC in the consent to operate)

ii. NO_xemission–400 mg/Nm^3

(2) Fugitive emissions in the all four work zone area shall comply with:

- Respirable dust (PM10) - 5000 $\mu g/m^3$ TWA

TWA - Time-weighted average
The Permissible Exposure Limit is 8-hour TWA.

{Reference: OCCUPATIONAL SAFETY AND HEALTH STANDARDS 1910.1000}

TWA - Time-weighted average
The Permissible Exposure Limit is 8-hour TWA.

(3) STCL value of the refectory material shall meet the concentration value of vanadium less than 1.1 mg/l.

(4) Monitoring of the specified parameters for source emission shall be carried out quarterly for the first year followed by atleast annually in the subsequent year of utilization. Fugitive emission for specified parameters shall be carried out quarterly. The monitoring shall be carried out by NABL accredited or EPA approved laboratories results shall be submitted to the concerned SPCB/PCC quarterly.

27.6 Record/ Returns Filing

(1) The unit shall maintain record of hazardous waste utilised, hazardous waste generated and disposed as per Form 3 & shall file annual returns in Form 4 as per Rule 20 (1) and (2) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, to concerned SPCB.

(2) A log book with information on source and date of procurement of spent alumina, quantity, date wise utilization of the same, hazardous waste generation and its disposal, etc. shall be maintained.

(3) The unit shall maintain a passbook issued by concerned SPCB wherein the following details of each procurement of spent alumina shall be entered:

- Address of the sender
- Date of dispatch
- Quantity procured
- Seal and signature of the sender

(4) The unit shall submit quarterly and annual information on hazardous wastes consumed, its source, products generated or resources conserved (specifying the details like type and quantity of resources conserved) to the concerned SPCB.

27.7 Siting of Industry

Facilities for processing of spent alumina should preferably be located in a notified industrial area or industrial park/estate/cluster.

27.8 Size of Plant & Efficiency of utilisation

Spent alumina may be utilised as alternate raw material to supplement up to 85% by weight of the refractories produced. It is expected that spent alumina would be used completely without any residues. The requisite facilities of adequate size shall be installed accordingly as mentioned under para 27.10 below.

27.9 On-line detectors / Alarms / Analysers

Online emission analysers for PM and NO_x in the stack shall be installed and the online data be connected to the server of the concerned SPCB/PCC and CPCB.

27.10 Checklist of Minimal Requisite Facilities

S. No.	Requisite Facilities
1.	Storage shed(s) for storage of spent alumina in non-reactive bags/drums only under cool, dry, well-ventilated covered storage shed(s) within premises.
2.	Separate storage shed(s) for storage of other raw materials only under dry, well-ventilated covered storage shed(s) within premises.
3.	Mechanized system for handling, transfer and mixing of spent alumina with other raw materials and product manufactured.
4.	Ventilation system in the work zone and process areas (preferably install ventilation ducts connected with ID fan and roof top exhaust).
5.	Dust suppression water sprinklers in material handling areas
6.	Nodulizers connected to dust extraction system comprising of bag house dust collectors (pulse jet type).
7.	Tunnel Furnace with APCD comprising of multicyclone and venturi scrubbers
8.	Rotary kiln with APCD comprising of multicyclone and venturi scrubbers or ESP/Bag filter house
9.	Stack of height as prescribed by SPCB with easy access to port hole and arrangement

	of platform, ladder for conducting stack monitoring
10.	Covered hazardous waste storage area to store hazardous generated during utilization process.
11.	Pulverizer/Ball Mill in closed system connected with bag dust collectors
12.	Pug Mill
13.	Mechanized brick cutting machine along with space de-dusting systems connected to dust collector bag house.
14.	Brick pressing/Friction screw press/Hydraulic press
15.	Blender
16.	Water sprinkling system
17.	Conveyer System
18.	Storage hoppers for raw feeding
19.	Fire extinguisher systems and fire detectors
20.	Online analyzers for PM and NO_X emission monitoring in stack

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