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 residue/rejects generated from processing of Aluminium Dross of Aluminium Smelting process for production of synthetic slag

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Central Pollution Control Board

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

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Utilization of residue/rejects generated from processing of Aluminium Dross of Aluminium Smelting process for production of Calcium Aluminate (synthetic slag)

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

1) 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.

2) 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 at least 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. SPCB/PCC may engage CSIR institutes/ research laboratories for validation of process technologies to ensure that SoP of CPCB is followed.

3) SPCBs/PCCs shall provide half yearly updated list of units permitted under Rule 9 of Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016 to 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.

4) 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.

5) 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.

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

51.0 Utilization of Spent Aluminium Dross residue/rejects:

Type of HW	Source of generation	Recovery/Product
Spent Aluminium Dross residue/rejects(Category no.11.5 of Schedule I of HOWM Rules, 2016)	generated during aluminium smelting process	Calcium Aluminate (Synthetic Slag)

Utilization of residue/rejects generated from processing of Aluminium Dross of Aluminium Smelting process for production of Calcium Aluminate (synthetic slag)

51.1 Source of Waste

The Aluminium Dross residue/rejects is generated from utilisation of Al dross ie. white dross (generated from cast house of primary Aluminium Smelters) involves pulverizing of aluminium dross using crusher, pulverisers and mechanical screens to recover >0.5 mm and <20 mm size metal rich granule. These granules are melted in a crucible furnace to recover molten aluminium metal. The rejects from screen and residues/dross from furnace is referred as aluminium dross rejects/residue. The aforesaid Spent Aluminium Dross residue/rejects is categorized as Hazardous waste at S. No. 11.5 of Schedule I of HOWM Rules, 2016 which are required to be disposed in authorized disposal facility in accordance with authorization condition, when not utilized as resource recovery.

Typical Characteristics of the Al dross residues/waste is given below:

Parameters	Results
Alumina (as Al_2O_3)	89.4%
Heavy Metals (As, Mn, Cu, Zn)	0.026%
Calcium Oxide (asCaO)	0.73%
Silica Dioxide (SiO_2)	2.19%
Titanium Dioxide (as TiO_2)	0.004%
Magnesium Oxide (as MgO)	0.81%
Ferrous Oxide (as Fe_2O_3)	1.06%
Disodium Oxide (as Na_2O)	4.89%
Sulphur Trioxide (as SO_3)	BDL
Manganese Oxide (as MnO)	0.03%
Dichromium Trioxide(as Cr_2O_3)	0.02%
Fluoride (as F)	0.12%

51.2 Utilization Process

Aluminium dross residues/ rejects contains large amounts of alumina and is used as an alumina source for calcium aluminate production. The process involves use of Al dross residue which has granulometry of 100 % < 0.5mm. Al dross residue/ reject and other raw materials i.e calcined lime & dololime are fed to the furnace through hoppers. Dust collector and pulsejet bag filters are attached to the suction hood provided to feeding hoppers. As the charge moves down the furnace the temperature increases upto 1550 °C which melts the charge and eliminates the toxic compounds (i.e Aluminium carbide, Aluminium Nitride, Aluminium Sulfides) during the course of the reaction. Calcium aluminates are formed when the appropriate proportions of calcium carbonate and aluminium oxide are heated together.

Molten synthetic slag i.e Calcium Aluminate is then tapped in the refractory tray for air cooling and solidification, which will be used in steel making furnace as desulphurization slag.

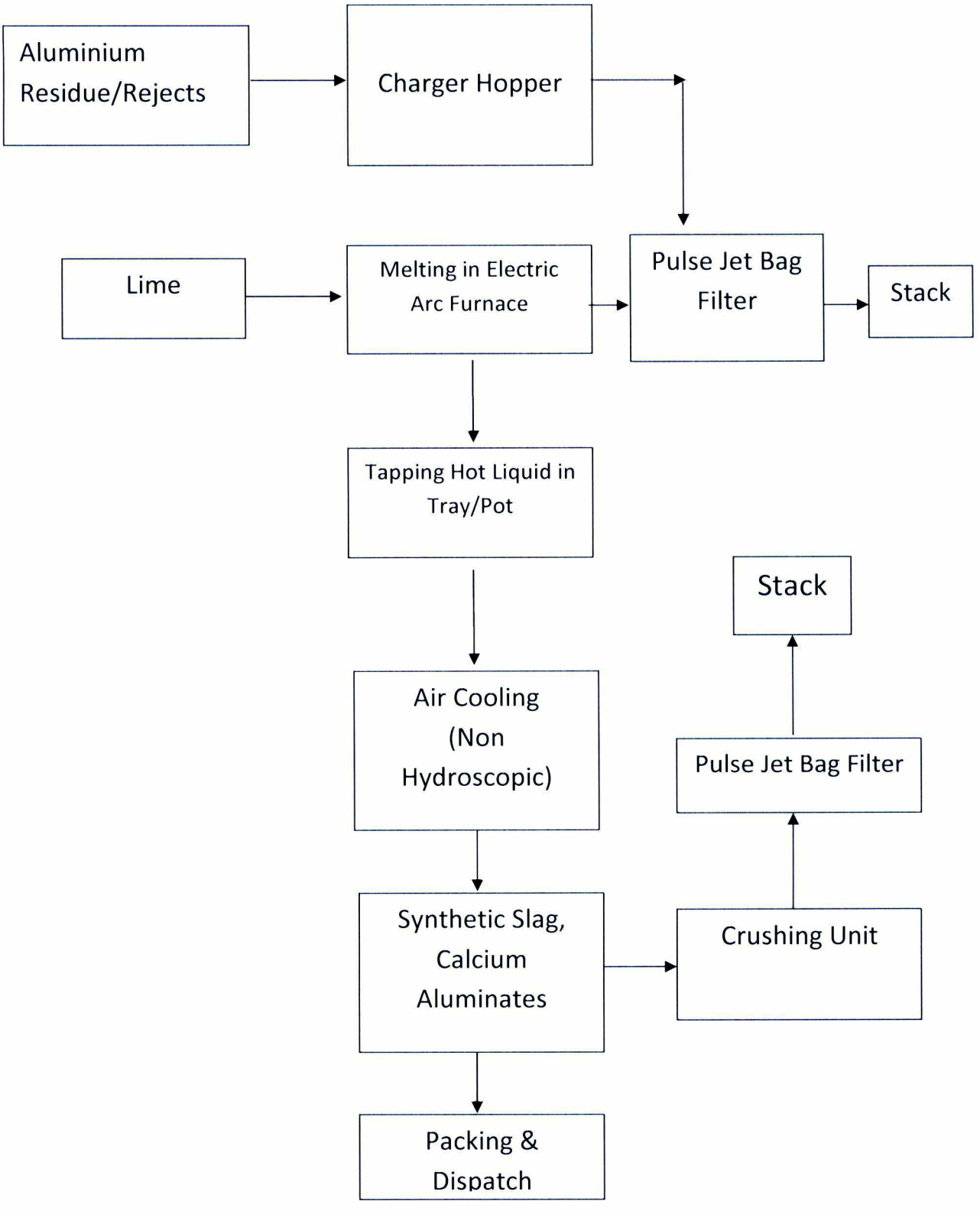

Figure 1: Flow diagram of Utilization of Aluminium Dross residue/rejects for manufacturing of Calcium Aluminate (Synthetic Slag)

51.3 Product Usage / Utilization

The Aluminium Dross residue/rejects will be utilized in the production of Calcium Aluminate (Synthetic Slag).

51.4 Standard Operating Procedure for utilization

This SoP is applicable only for the utilization of Spent Aluminium Dross residue/rejects generated from Aluminium Smelting industries.

1) The Spent Aluminium Dross residue/rejects shall be transported in covered trucks fitted with requisite safeguards. The material shall be stored under covered shed on concreted floor.

2) The furnace shall be enclosed completely with shutters at the front side with facility for charging and material retrieval operations. It shall be ensured that fume extractions systems are operated continuously during firing, charging and retrieval operations of the furnace.

3) There shall be a closed system of crusher and screening unit for size reduction of aluminium dross/rejects, where the fugitives shall be controlled by suction through Pulse jet bag filter followed by stack of adequate height.

4) The flue gases emission alongwith gases from furnace shall be extracted through APCD ie. Spark Arrestor followed by Pulsejet Bag Filter and stack of adequate height.

5) A mechanical mixer shall be installed, to mix the molten material in crucible remotely while the firing in progress.

6) There should be a provision for inspection window with glass lenses to inspect the interior portion of the furnace during firing and mixing operations.

7) The furnace shall be operated at the temperature of about 1500 °C.

8) The storage and handling material shall be done under a shed and over imperviously lined flooring.

9) The handling of hazardous waste shall be carried out using mechanical means with minimal manual intervention.

10) A closed system of crusher and screening unit for size reduction of calcium aluminate (product) shall be installed with control measures for the fugitives such as suction through pulse jet bag filter followed by stack of adequate height.

11) The reject/ residue from flue dust from Pulsejet bag filters, and residue/dross from furnace shall be reused in the said utilization process or shall be packed and temporarily stored in dedicated hazardous waste storage pit (imperviously lined) with cover and disposed in common hazardous waste treatment, storage and disposal facility within 90 days.

12) The unit shall ensure that all personnel involved in the plant operation shall wear proper personal protective equipment such as masks, safety gloves, goggles, safety shoes etc.

13) The unit shall install storage tank under cool, dry, well ventilated covered storage shed(s), surrounded by garland drain and settling pit within premises, as authorized by the concerned SPCB/ PCC under Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016 so as to eliminate rain water intrusion.

14) It shall be ensured that the aforesaid hazardous waste is procured from the industries who have valid authorization for the same from the concerned State Pollution Control Board as required under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

15) Transportation of Spent Aluminium Dross residue/rejects shall be carried out by sender (generator) or receiver (utilizer) only after obtaining authorisation from the concerned SPCB under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016. Requisite manifest document shall be followed as laid down under the said Rules.

16) Prior to utilization of Spent Aluminium Dross residue/rejects, the unit shall obtain authorization for generation, storage, and utilization of Aluminium Dross residue/rejects from the concerned State Pollution Control Board under the Hazardous and Other Wastes (Management and 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 occupier (sender or receiver, as the case may be) 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) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.

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

51.5 Record/Returns Filing

1) The utilizer shall maintain a passbook issued by the concern SPCB wherein the following details of each procurement of Spent Aluminium Dross residue/rejects shall be entered:
   - Address of the sender
   - Date of dispatch
   - Quantity procured
   - Seal and signature of the sender
   - Date of Receipt in the premises

2) A log book with information on source and date of procurement of Spent Aluminium Dross residue/rejects, quantity, date wise utilisation of the same, quantity of synthetic slag

manufactured, hazardous waste generation and its disposal, etc. shall be maintained including analysis report of emission monitoring & effluent discharged, as applicable.

3) 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/PCC.

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.

51.6 Standards

1) Fugitive emission in the work zone shall comply with the following standards:

Ammonia	35.0 mg/m^3 TWA*
PM_{10}	5.0 mg/m^3 TWA*

Reference: Occupational Safety and Health Standard 1910:1000
TWA: time-weighted average*
The permissible Exposure Limit is 8-hours TWA

A ceiling limit is one that may not be exceeded for any period of time, and is applied to irritants and other materials that have immediate effects.

2) Source emission monitoring from the stack attached to the Pulsejet bag filter shall comply with the following standards or as prescribed by the concerned SPCB/PCC, whichever is stringent;

Carbon Monooxide	100.0 mg/Nm^3
PM	50.0 mg/Nm^3

3) Monitoring of the specified parameters for source emission shall be carried out quarterly for the first year followed by at least 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 orISO17025 /EPA approved laboratories and the results shall be submitted to the concerned SPCB/PCC on a quarterly basis.

51.7 Siting of Industry

Facilities for utilization of Aluminium Dross residue/rejects shall be located in a notified industrial area or industrial park/estate/cluster or inside existing premises of Aluminium Smelter Plant or Al dross reprocessing plant and in accordance with Consent to Establish issued by the concerned SPCB/PCC.

51.8 Size of Plant & Efficiency of utilisation

Maximum 506 Kg of Aluminium Dross residue/rejects would be required to yield 1 Metric Tonne of synthetic slag. Therefore, requisite facilities of adequate size of storage shed and other plants & machineries as given in para 51.10 below shall be installed accordingly.

51.9 On-line detectors / Alarms / Analysers

Online emission monitoring systems shall be installed in case of continuous process operations for parameters as prescribed by the SPCBs/PCCs.

51.10 Checklist of Minimal Requisite Facilities

S.No	Particulars
1.	Covered Storage shed of adequate capacity to store Aluminium Dross residue/rejects of at least two weeks requirement but preferably for 90 days
2.	Cool, dry well-ventilated covered storage shed(s) for Aluminium Dross residue/rejects storage, product storage and process activities within premises
3.	Crusher, Pulveriser and screen for size reduction of Aluminium dross residues/rejects
4.	Mechanized system for transfer of Spent Aluminium Dross residue/rejects from storage area to the charge hopper
5.	The process units shall have proper ventilation (preferably with ventilation ducts above the process units connected to ID fan with exhaust above roof level)
6.	Electric Arc Furnace
7.	Electric Arc Furnace be attached with Spark Arrester followed by pulsejet Bag filter and stack of height as prescribed by the SPCBs/PCCs
8.	Tapping Trays
9.	Suction arrangement to channelize emissions from charge hopper and Electric Arc furnace to the pulsejet Bag filter
10.	Dedicated hazardous waste storage area for temporary storage of hazardous waste generated during utilization process.
11.	Crusher, Pulveriser and screen for sizing of the product after cooling
12.	Pulse jet bag filter be attached to the material transfer points of crusher and screen of the raw material and product followed by stack of adequate height.
13.	Dumpers, loaders, feeders and other equipment for mechanical handling of aluminium dross and its residues.
14.	Stack to have sampling port, platform, access to the platform etc. as per the guidelines on methodologies for source emission monitoring published by CPCB under Laboratory Analysis Techniques LATS/80/2013-14.

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