

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 Aluminium dross & its residues for recovery of Aluminium metal and manufacturing of Aluminium oxide briquette



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**Central Pollution Control Board
(Ministry of Environment, Forest & Climate Change,
Government of India)
Parivesh Bhawan, East Arjun Nagar,
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Procedure for grant of authorization by State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) for utilization of Hazardous waste

- 1) While granting authorization for utilization of hazardous wastes, SPCBs/PCCs shall ensure that authorization is given only to those wastes for which SoPs for utilisation have been circulated by Central Pollution Control Board (CPCB) ensuring the following:
 - a. The waste (intended for utilization) belongs to similar source of generation as specified in SoP.
 - b. The utilization shall be similar as described in SoP.
 - c. End-use/ product produced from the waste shall be same as specified in SoP.
 - d. Authorization shall be granted only after verification of details and minimum requisite facilities as given in SoP.
 - e. Issuance of passbooks (similar to passbooks issued for recycling of used oil, waste oil, non-ferrous scraps, etc.) for maintaining records of receipt of hazardous waste for utilization.
- 2) After issuance of authorization, SPCB/PCC shall verify the compliance of checklist and SoP on quarterly basis initially for 2 years; followed by random checks during subsequent period for atleast once in a year.
- 3) In-case of lack of requisite infrastructures with the SPCB/PCC, they may engage 3rd party institutions or laboratories having EPA, 1986/NABL/ISO17025 accreditation / recognition for monitoring and analysis of prescribed parameters in SoP for verification purpose.
- 4) SPCB/PCC shall provide half-yearly updated list of units permitted under Rule 9 of Hazardous & Other Wastes (Management & Transboundary Movement) [HOWM] Rules, 2016 to CPCB and also upload the same on SPCB/PCC website, periodically. Such updated list shall be sent to CPCB on half-yearly basis i.e., by July and January respectively.
- 5) Authorization 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.
- 6) In case of the 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.
- 7) The source and work zone standards suggested in the SoP 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.



74.0 Utilization of Aluminium dross:

| Stage of operation | Type of HW | Source of generation | Recovery/Product |
|--------------------|--|---|--|
| Stage-I & II | Aluminium dross, Category - 11.5 of Schedule-I, HOWM Rules, 2016 | Primary Aluminium smelting process | Recovery of Aluminium metal |
| Stage-III | Aluminium dross residue, Category - 11.5 of Schedule-I, HOWM Rules, 2016 | Generated from separation of metal from Aluminium dross | Manufacturing of Aluminium oxide briquette (Utilized in steel manufacturing) |

74.1 Source of Waste:

Aluminium dross forms within the units handling liquid Aluminium metal. Aluminium dross is mass of solid impurities floating on the molten metal and has formed by the reaction of liquid metallic Aluminium with the atmosphere. Aluminium Dross is a mixture of primarily metallic Aluminium, Aluminium Oxide and Aluminium Nitride. The aforesaid Aluminium Dross & its residues are categorized as hazardous waste at S, No. 11.5 of Schedule-I of HOWM Rules, 2016, and required to be disposed in authorized disposal facility in accordance with authorization condition, when not utilized as resource recovery.

74.2 Utilization Process:

The utilization process for Aluminium metal extraction and Aluminium oxides manufacturing involves three stages namely Stage I, Stage II and Stage III as shown in the process flow diagram given below.

Stage I - Utilization of skimmed hot Aluminium dross for recovery of molten Aluminium:

During this stage, skimming of hot dross from Aluminium smelter is collected in specialized hot dross handling buckets. The buckets are transferred to a hot dross processing unit for extraction of molten Aluminium metal. The rotary processing unit operates at molten temperature of Aluminium. However, if the temperature of the received dross buckets is less than molten temperature (i.e. less than 660⁰C) then transferred for preheating. Extracted molten Aluminium is collected and transferred to the Aluminium smelters. The depleted hot dross is cooled by raking and cold depleted dross is transferred to Stage II process.

Stage II - Recovery of Aluminium metal from cold depleted dross: During this stage, cold depleted dross is sieved to separate Aluminium dross residue < 2 mm followed by hammer mill. The metallic Aluminium particles > 2 mm are separated, collected using eddy current separator and transferred to Aluminium smelters. The dross residue < 2 mm are collected from the sieve for further processing in the Stage III.

Stage III – Production of Aluminium oxide briquette from Aluminium dross residue: The dross residue < 2 mm is transferred to mixer and mixed with organic binder by sprinkling water through fine mist spray. The mixer is followed by vibrating feeder, roller mixer and briquetting press. The mixer is briquetted in the briquetting press and collected as Aluminium oxide briquette.

74.3 Product Usage / Utilization

Aluminium dross and its residues is used for recovery of Aluminium metal and manufacturing of Aluminium oxide briquette respectively. Aluminium oxide briquette is further used as a slag conditioner in steel manufacturing.

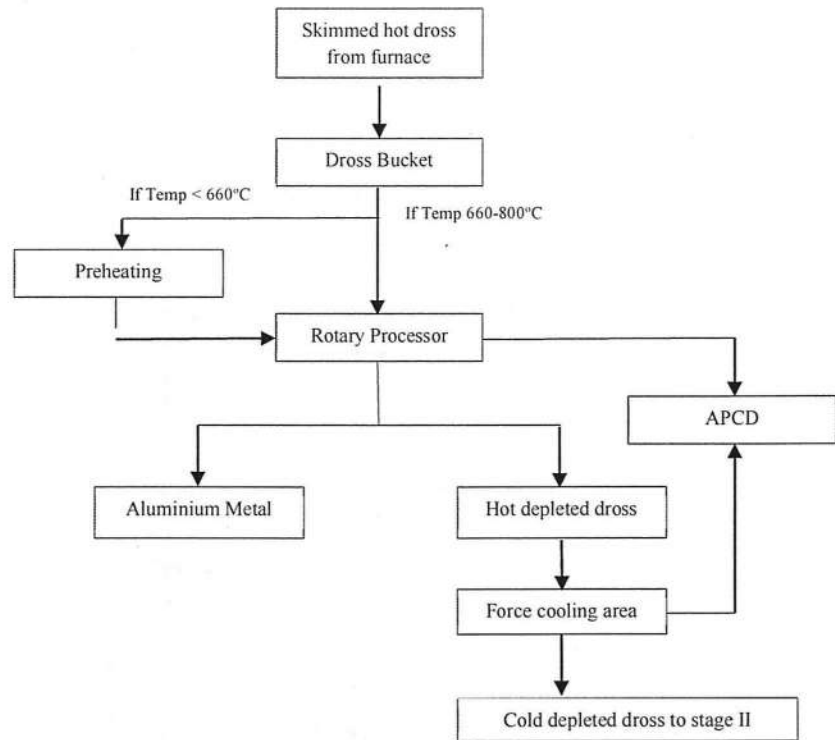
74.4 Standard Operating Procedure for utilization

This SoP is applicable for Utilization of Aluminium Dross and its residues for recovery of Aluminium metal and manufacturing of Aluminium oxide briquette respectively.

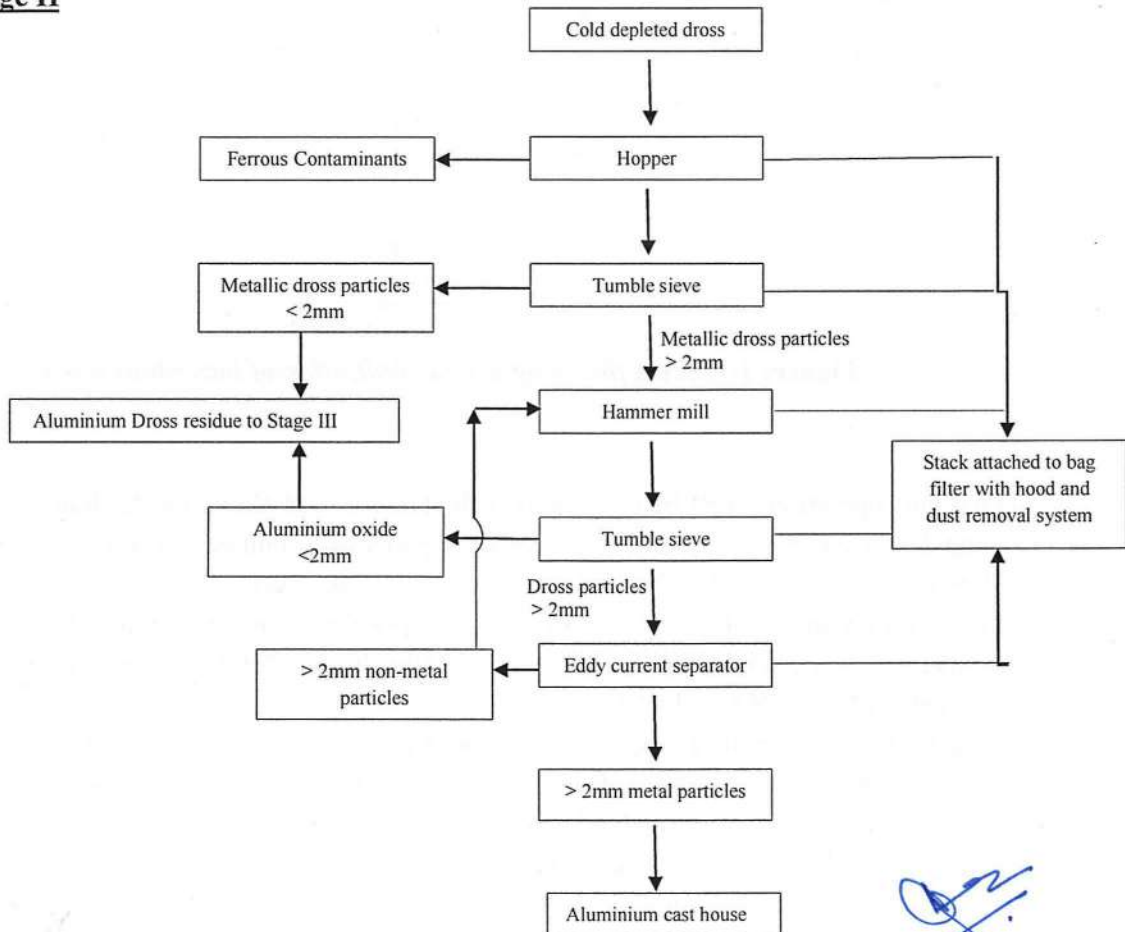
- 1) Aluminium dross & dross residue shall be procured only in SPCB/PCC authorized closed trucks fitted with requisite safeguards ensuring no emission and unloaded in covered sheds to avoid contact with any moisture. If the hazardous waste (i.e., Aluminium dross & dross residue) movement is within the premises of the unit necessary measures shall be ensured for no emissions.
- 2) The unit shall maintain storage area under cool, dry, well ventilated covered storage shed(s) of proper vertical height and over imperviously lined flooring surrounded by garland drain and settling pit within premises, as authorized by the concerned SPCB/ PCC under HOWM, Rules, 2016, so as to eliminate rain water intrusion.
- 3) The unloading, storage, crushing, transfer and other handling of hazardous waste (i.e., Aluminium Dross & residues) shall be carried out using mechanical means with minimal manual intervention.
- 4) There shall be a closed system for all unit operations of utilization process with APCD i.e., Bag Filter followed by stack.
- 5) The handling of hot dross shall be done mechanically with care.
- 6) To alert the operators an automatic NH₃ detector shall be installed near the unit operation in stage-III process, if NH₃ exceeds the limit and to take appropriate measures.
- 7) The unit shall install wet Scrubber after Bag Filter to control emission of Ammonia in Stage-III.
- 8) The unit shall stop the operation if there is any failure in the detectors/sensors or any other pollution control device.
- 9) The fugitive emission of dust anywhere near the work zone shall be extracted through suction hood followed by APCD i.e., Bag Filter and stack.
- 10) The solid residues generated from the said utilization process (i.e., dust from bag filters) shall be reused in the 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 as per the provisions of HOWM Rules, 2016.

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Stage I



Stage II



Stage III

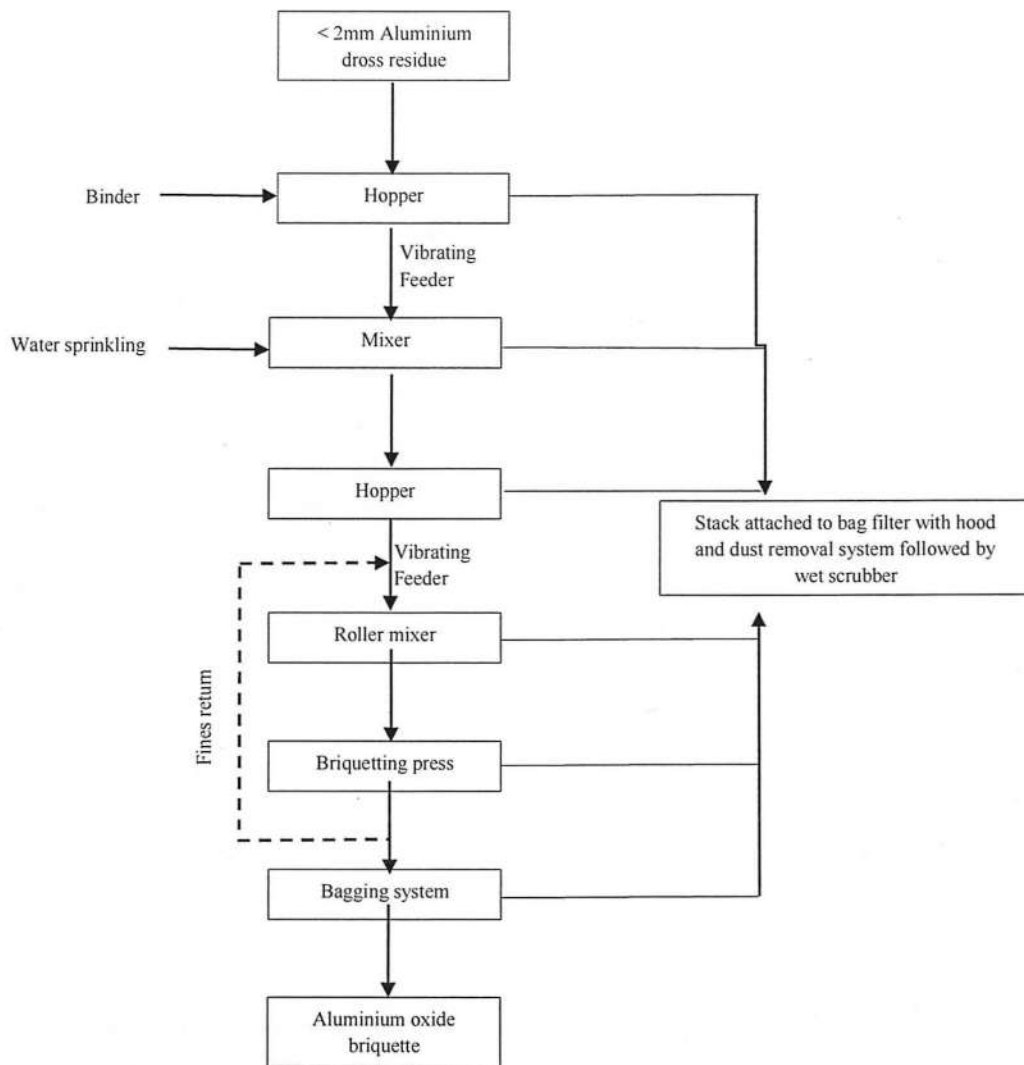


Figure: 1-Process flow diagram for utilization of hazardous waste.

- 11) All unit operations shall be connected with suction hood above the feeding point/ material transfer points (if open) and potential dust generating points to control fumes/emissions liberated. The suction hood shall be connected with bag filter and stack of adequate height.
- 12) The gases shall comply with emission norms prior to dispersion into atmosphere through stack. The stack height shall be minimum of 30m from ground level or as prescribed by the concerned SPCB/PCC, whichever is higher.
- 13) The unit shall maintain proper ventilation in the work zone and process areas. All personnel involved in the plant operation shall wear proper personal protective equipment (PPE) specific to the process operations involved and type of chemicals handled as per Material Safety Data Sheet (MSDS). The safety precautions of the worker shall be in accordance with the Factory Act, 1948, as amended from time to time.

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- 14) Treatment and disposal of wastewater: Wastewater generated from floor-washings, reactor washing shall be treated Physico-Chemically in an ETP or may be sent to CETP for final disposal or be treated further in a captive facility to comply with surface water discharge standards. In case of zero discharge condition, the treated waste water from ETP may be managed as per conditions stipulated by the SPCB/PCC.
- 15) The treated effluent shall be discharged in accordance with the conditions stipulated in the Consent to Operate issued by concerned SPCB/PCC under the Water (Prevention and Control of Pollution) Act, 1974.
- 16) This SoP shall be valid for units intend to operate Stage-I, II & III in conjunction or individually. However, Stage-I is applicable only for Aluminium smelter units.
- 17) The unit shall ensure that the hazardous waste is procured from the authorized industries, as per HOWM Rules, 2016.
- 18) Transportation of Aluminium Dross & and its residues shall be carried out by sender (generator) or receiver (utilizer) only after obtaining authorization from the concerned SPCB/PCC under HOWM, Rules, 2016. Requisite manifest document shall be followed as laid down under the said Rules.
- 19) Prior to utilization of Aluminium Dross and/ its residues, the unit shall obtain authorization for generation, storage and utilization of Aluminium Dross and/ its residues from the concerned State Pollution Control Board under HOWM, Rules, 2016.
- 20) 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.
- 21) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.
- 22) During the process of utilization and handling of hazardous waste the unit shall comply with requirement in accordance with the Public Liability Insurance Act, 1991 as amended, wherever applicable. The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.

74.5 Record>Returns Filing

- 1) The unit shall maintain a passbook issued by concern SPCB/PCC wherein the following details of each procurement of Aluminium Dross and its residues and its rejects/residues 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 Aluminium Dross and its residues, date wise utilization of the same, hazardous waste generation and its disposal, etc.

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shall be maintained including analysis report of fugitive 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 HOWM, 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/PCC.

74.6 Standards

1) Source emissions from the stack connected to reactors/process stack shall comply with the following Emission standards or as prescribed by the concerned SPCB/PCC, whichever is stringent;

| | |
|--------------------|------------------------|
| Particulate Matter | 50 mg/Nm ³ |
| CO | 100 mg/Nm ³ |
| NH ₃ | 30 mg/Nm ³ |
| Total Flouride | 25 mg/Nm ³ |

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

| | |
|------------------|--------------------------------|
| PM ₁₀ | 5 mg/m ³ TWA* (PEL) |
| NH ₃ | 1 mg/m ³ TWA*(PEL) |
| Fluoride | 3 mg/m ³ TWA*(PEL) |

**PEL - Permissible Exposure Limit*

**time-weighted average (TWA)- measured over a period of 8 hours of operation of process.*

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 effect.

3) Monitoring of the above specified parameters for source emission shall be carried out quarterly for 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 ISO 17025 accredited or EPA, 1986 approved laboratories and the results shall be submitted to the concerned SPCB/PCC on a quarterly basis.

4) Standard for wastewater discharge: Treated effluent shall be discharged in accordance with the conditions stipulated in Consent to Operate issued by concerned SPCB/PCC under the Water (Prevention and Control of Pollution) Act, 1974. In case of zero discharge or no discharge condition stipulated in the said consent or non-availability of the common Effluent Treatment Plant (CETP), zero discharge shall be met.



74.7 Siting of Industry

Facilities for utilization of Aluminium dross and its residues shall be preferably located in a notified industrial area or industrial park/estate/cluster or inside the existing premises of Aluminium smelter plant or Aluminium dross reprocessing plant and in accordance with Consent to Establish issued by the concerned SPCB/PCC.

74.8 Size of Plant and Efficiency of Utilisation

Stage-I: Processing 1 MT of Hot dross yields 400 Kg of Aluminium metal and 660 Kg Depleted dross (10% weight gain due to hygroscopic nature and oxidation).

Stage-II: Processing 660 Kg of depleted dross yields 40 Kg of Aluminium metal and 620 Kg Aluminium dross residue (particle size of < 2mm)

Stage-III: Processing 620 Kg of Aluminium dross residue (particle size of < 2mm) along with other raw materials yields to 670 Kg Aluminium oxide briquette.

Therefore, requisite facilities of adequate size of storage shed and other plant & machineries as given in para 74.10 below shall be installed accordingly.

74.9 On-line Detectors / Alarms / Analyzers

In case of continuous process operations, online emission analyzers for PM, Ammonia, Fluoride, in the stack shall be installed and the online data be connected to the server of the concerned SPCB/PCC.

74.10 Checklist of Minimal Requisite Facilities:

- i. **Stage I - Utilization of skimmed hot Aluminium dross for recovery of metal Aluminium:**

| Sl. No | Particulars |
|--------|--|
| 1. | Closed system for all unit operations in the utilization process. |
| 2. | Suction hood/Dust extraction system followed by Bag filter and stack. |
| 3. | Covered storage shed of adequate capacity to store raw material i.e., Aluminium dross (at least two weeks requirement) and wastes generated such as APCD dust, residues and rejects to store at least for 90 days. |
| 4. | Cool, dry well-ventilated covered sheds for process operations including material handling. |
| 5. | Mechanized system for transfer of Aluminium dross handling and transfer. |
| 6. | Hot dross handling bucket, hot dross rotatable machine, catch tray and other equipment for mechanical handling of hot Aluminium dross and product molten i.e., Aluminium metal. |
| 7. | 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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ii. **Stage II - Recovery of Aluminium metal from cold depleted dross:**

| Sl. No | Particulars |
|--------|--|
| 1. | Closed system for all unit operations in the utilization process. |
| 2. | Suction hood/Dust extraction system followed by Bag filter and stack. |
| 3. | Covered storage shed of adequate capacity to store raw material i.e., Aluminium dross (at least two weeks requirement) and wastes generated such as APCD dust, residues and rejects to store at least for 90 days. |
| 4. | Cool, dry well-ventilated covered sheds for process operations including material handling. |
| 5. | Covered storage shed(s), of adequate capacity shall be provided to temporarily store APCD dust, residues and rejects. Size of shed shall be adequate to store at least 90 days of waste generation |
| 6. | Mechanized system for handling and transfer of Aluminium dross. |
| 7. | Hoppers, feeders, Conveyors, sieves, size reduction equipment, Eddy Current Separator, and other equipment for mechanical handling of Aluminium dross. |
| 8. | 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. |

iii. **Stage III – Production of Aluminium oxide briquette from Aluminium dross residue:**

| Sl. No | Particulars |
|--------|--|
| 1. | Closed system for all unit operations in the utilization process. |
| 2. | Suction hood/Dust extraction system followed by Bag filter and stack. |
| 3. | Covered storage shed of adequate capacity to store Aluminium dross residue of at least two weeks requirement but preferably for 90 days. |
| 4. | Cool, dry well-ventilated Covered sheds for process operations including material handling. The sheds for utilization of Hazardous Waste should prevent entry of any moisture/rain water during monsoon. |
| 5. | Covered storage shed(s), of adequate capacity shall be provided to temporarily store APCD dust, residues and rejects. Size of shed shall be adequate to store at least 90 days of waste generation |
| 6. | Mechanized system for handling and transfer of Aluminium dross residue. |
| 7. | Automatic NH ₃ detector. |
| 8. | Wet Scrubber after Bag Filter to control emission of Ammonia from the process of Stage-III. |
| 9. | Hoppers, feeders, mixers, Conveyors, and other equipment for mechanical handling of Aluminium dross residue. |
| 10. | 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. |
