

**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 Gasifier Slag containing Nickel & Spent Catalyst containing Molybdenum generated during production of ammonia in nitrogenous fertilizer industry**



**cpcb**

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**Central Pollution Control Board**  
(Ministry of Environment, Forest & Climate Change, Government of India)  
**Parivesh Bhawan, East Arjun Nagar,**  
**Shahdara, Delhi – 110032**

**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 Standard Operating Procedures (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/PCC 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 3<sup>rd</sup>party institutions or laboratories having EPA/NABL/ISO17025 accreditation/recognition for monitoring and analysis of prescribed parameters in SoPs for verification purpose.
- (iii) SPCBs/PCCs shall provide half yearly updated list of units permitted under Rule 9 of HOWM Rule, 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.
- (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.

**35.0 Utilization of Gasifier slag and Spent Catalyst:**

<b>Type of HW</b>	<b>Source of generation</b>	<b>Recovery/Product</b>
Gasifier Slag containing Nickel (Category A 68 of schedule-II of HOWM Rules, 2016) and Spent Catalyst containing Molybdenum (Category 18.1 of schedule-I of HOWM Rules, 2016)	Generated during production of ammonia in nitrogenous fertilizer industry	For manufacturing of Alloy steel ingots and stainless steel ingots.

### 35.1 Source of Waste

During the production of ammonia, furnace oil (HVFO) is gasified in gasifier which operates at the temperature 800-1300°C for the production of carbon and hydrogen. After certain period of operation (about 3 months) of gasifier there is a slag deposition which is removed. This gasifier slag containing nickel and other heavy metals and is categorised as hazardous waste category A68 of Schedule-II of HOWM Rules, 2016. Catalyst containing molybdenum is used during the conversation of carbon monoxide to carbon dioxide during ammonia production. The same is discarded once it loses its catalytic properties and it is categorised as hazardous waste category 18.1 of Schedule-I of HOWM Rules, 2016.

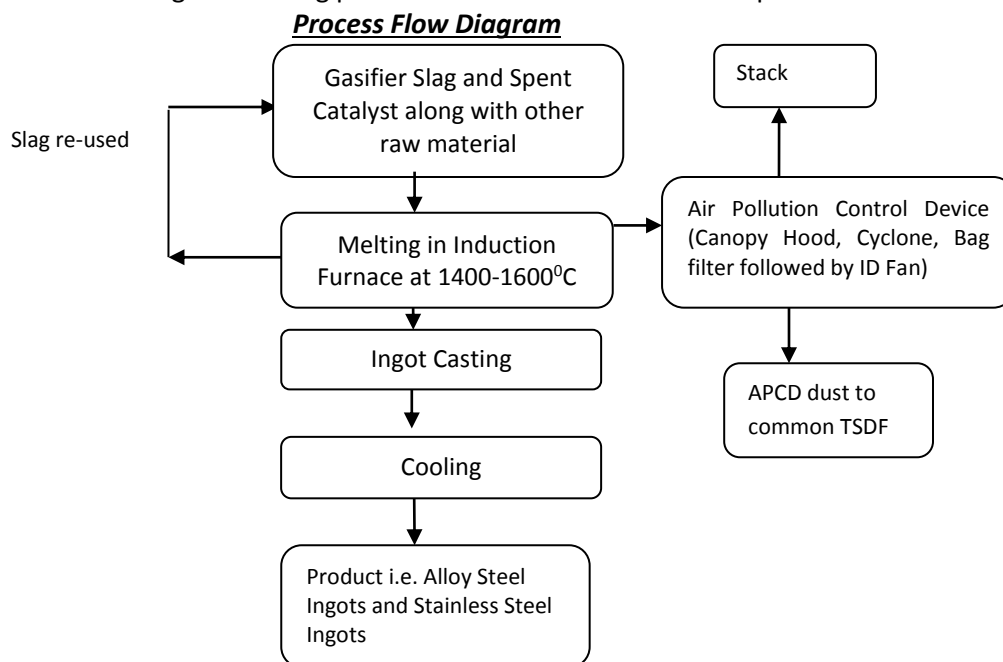
These hazardous wastes are required to be disposed, when not utilized as resource recovery in authorized disposal facility in accordance with authorization condition.

This gasifier slag contain heavy metals like Nickel(about 14%), Vanadium(about 20%), Aluminium(about 18%), Iron(about 5%), Sulphur(about 2.5%) and Acid Insolubles (about 9%).

The spent catalyst containing molybdenum contains Aluminium (about 43%), Magnesium (about 20%), Molybdenum (about 8%) and Cobalt (about 3%).

### 35.2 Utilization Process

The utilization process involves melting of proportionate quantity of Iron Scrape along with gasifier slag containing nickel and spent catalyst containing molybdenum into Induction Furnace. Based on product requirement, other raw material like ferro alloys containing Magnesium, Silicon, Aluminium and Chromium may also be added proportionally in the induction furnace. When the metal gets melted it is transferred into refractory lined bucket. The molten metal is poured from bucket to ingots moulds through mechanical system. When the hot metal gets solidified, the ingots are taken out and transferred to cooling area. The finished ingots are obtained after cooling as product i.e. Alloy Steel Ingots and Stainless Steel Ingots. About 1.5-3.0 % slag generated during the melting process is re-used in the utilization process.



### **35.3 Product Usage / Utilization**

For manufacturing of Steel Alloy Ingots and Stainless Steel Ingots which may be used for various industrial purposes.

### **35.4 Standard Operating Procedure (SoP) for utilization**

This SoP is applicable only for the utilization of gasifier slag containing nickel and spent catalyst containing molybdenum generated during manufacturing of ammonia in fertilizer industries.

- (1) The gasifier slag containing nickel and spent catalyst containing molybdenum shall be transported in dry form only in covered container mounted on vehicles fitted with requisite safeguards ensuring no spillage of waste in accordance with provisions stipulated under Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
- (2) Transportation of gasifier slag containing nickel and spent catalyst containing molybdenum 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 and in compliance with other provisions of the said Rules.
- (3) The unit shall store gasifier slag containing nickel and spent catalyst containing molybdenum under cool, dry and well-ventilated covered storage shed(s) within premises having impervious floor, 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.  
  
There shall be a designated space for unloading of gasifier slag containing nickel and molybdenum within the said covered storage shed(s).
- (4) The gasifier slag and spent catalyst shall be transported from storage area to feeding /work zone area through mechanical system with no exposure to personnel engaged in the same.
- (5) Pre determined quantity of raw material including gasifier slag containing nickel and spent catalyst containing molybdenum shall be fed into the induction by using an electromagnetic device attached to an overhead crane.
- (6) Canopy hood shall be connected to cyclone, pulse jet bag filter and ID fan followed by stack of height as prescribed by concerned SPCB/PCC.
- (7) Molten metal shall be transferred to refractory lined bucket followed by transferring to ingot moulds to get the desired size of steel.

- (8) The hot ingots mould shall be transferred to cooling area through mechanical system and be allowed to cool down at room temperature. After cooling of ingots, surface defects, if any, may be removed by grinding, chipping etc.
- (9) The emission from the induction furnace shall be channelized by placing canopy hood over it at appropriate distance with adequate suction for effective arrest of the same. The canopy hood shall be connected with cyclone, pulse jet bag filter and ID Fan followed by common stack of height as prescribed by SPCB/PCC.
- (10) Slag generated during the melting shall be re-used in the induction furnace.
- (11) The waste generated (viz. APCD dust from bag filter) shall be collected and temporarily stored in non reactive drums / bags under a dedicated hazardous waste storage area and be sent to authorized common TSDF or other authorized facility within 90 days from generation of the waste in accordance with the authorization issued by the concerned SPCB/PCC. Such storage area shall be covered having proper ventilation.
- (12) 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 such as hard hats, goggles, face shield, steel toed shoes, gloves, aprons, respirators etc.
- (13) The unit shall provide suitable fire safety arrangements and flame proof electrical fittings.
- (14) It shall be ensured that gasifier slag containing nickel and spent catalyst is procured from the industries who have valid authorization for generation and storage of the same from the concerned SPCB/PCC as required under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- (15) Prior to utilization of gasifier slag containing nickel and spent catalyst containing molybdenum, the unit shall obtain authorization for storage and utilisation of gasifier slag and spent catalyst from the concerned State Pollution Control Board under the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
- (16) In case of environmental damages arising due to improper handling of hazardous wastes including accidental spillage during storage, processing, transportation or 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.
- (17) 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.

### **35.5 Record/Returns Filing**

- (1) The unit shall submit quarterly and annual information on the said hazardous wastes consumed, its source, products generated and resources conserved (specifying the details like type and quantity of resources conserved) to the concerned SPCB.
- (2) The unit shall maintain a passbook issued by concerned SPCB wherein the following details of each procurement of gasifier slag containing nickel and spent catalyst containing molybdenum shall be entered:
  - Address of the sender
  - Date of dispatch
  - Quantity procured
  - Seal and signature of the sender
  - Date of receipt in the premises
- (3) A log book shall be maintained with information on source and date of procurement of gasifier slag containing nickel and spent catalyst containing molybdenum, quantity, date wise utilization of the same, hazardous waste generation and its disposal, etc.
- (4) 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.

### **35.6 Standards**

- (1) Fugitive emissions in the work zone shall comply with following:
  - PM<sub>10</sub>-5mg/m<sup>3</sup>TWA

*(Reference: Occupational Safety and Health Standards 1910:1000);*  
*TWA - Time-weighted average*  
*The Permissible Exposure Limit is 8-hour TWA.*
- (2) Emissions from common stack connected to induction furnace followed by APCD shall comply with the following:
  - PM - 150mg/Nm<sup>3</sup>
- (3) 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 and results shall be submitted to the concerned SPCB/PCC quarterly.

### **35.7 Siting of Industry**

Facilities for processing of gasifier slag containing nickel and spent catalyst containing molybdenum shall be located in a notified industrial area or industrial park/estate/cluster and in accordance with Consent to Establish issued by the concerned SPCB/PCC.

**35.8 Size of Plant & Efficiency of utilisation**

For 1 metric ton production of alloy steel ingot about 9 kg of gasifier slag containing nickel and 25 kg of spent catalyst containing molybdenum is required along with other raw materials and for 1 metric ton production of stainless steel ingots 28 kg of gasifier slag containing nickel and 50 kg of spent catalyst containing molybdenum is required along with other raw material. Therefore, requisite facilities of adequate size of storage shed and other plant & machineries as given in para 35.10 below shall be installed accordingly.

**35.9 On-line detectors / Alarms / Analysers**

Online emission monitoring systems for PM emission should be installed in stacks attached to induction furnace as and when directed by SPCB/PCC/CPCB.

**35.10 Checklist of Minimal Requisite Facilities**

S. No.	Requisite Facilities
1.	Designated space for storage of gasifier slag containing nickel and spent catalyst containing molybdenum only under cool, dry, well-ventilated covered storage shed with concrete flooring within premises, so as to eliminate water intrusion.
2.	Mechanized handling system for loading and unloading of gasifier slag containing nickel and spent catalyst containing molybdenum.
3.	Induction furnace
4.	Canopy hood over the induction furnace with adequate suction of sufficient capacity
5.	Canopy hood shall be connected with cyclone, pulse jet bag filter and ID Fan followed by common stack of height as prescribed by SPCB/PCC.
6.	Sampling port, platform, access to the platform etc. in the stack as per the Guidelines on Methodologies for Source Emission Monitoring published by CPCB under Laboratory Analysis Techniques LATS/80/2013-14.
7.	Mechanical feeding system for feeding of gasifier slag and spent catalyst to the induction furnace.
8.	Mechanical system for pouring of hot molten metal into mould.
9.	Separate storage shed/space for storage of product and other raw material.
10.	Dedicated hazardous waste storage area under shed for temporary storage of

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	hazardous waste generated during utilization process.
11.	Online emission monitoring systems for PM emission should be installed in stacks attached to induction furnace as and when directed by SPCB/PCC/CPCB.

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