

## **Management of battery waste**

Production of lead from secondary sources exceeds its primary production. As per an estimate, consumption of lead in the country is about 4.5 lakh tons out of which, only about 1.6 lakh tons of lead is produced from primary sources. Production of primary lead is also declining throughout the world. This means every year more and more lead is being produced through secondary route involving hundreds of small scale recyclers in the country. It is necessary to ensure that production of lead through secondary smelting is done only in environmentally sound manner, failing which will lead to serious environmental and health problems. The Batteries Management and Handling Rules enacted in the year 2001 with the primary objective of ensuring safe disposal of discarded lead acid batteries involving all stake holders. Rules are evolved to have proper control and record keeping on the sale or import of lead acid batteries and recollection of the used batteries for their recycling by registered recyclers to ensure environmentally sound recycling of used batteries.

Improper handling and recycling of lead would cause risk health of the workers and environmental impacts in surrounding area. It is therefore essential to ensure that secondary production of lead is done in environmentally sound manner in the facilities registered by Central or State Pollution Control Boards. It is required to ensure that all the recycled channelized to registered recycling facilities. It is also required to stop backyard smelting of used lead acid batteries which at present is rampant in the country.

In the Batteries Rules, Responsibilities have been fixed for manufacturers, importers, re-conditioners and assemblers to ensure that used batteries are collected back and routed to registered recyclers. Responsibilities were also fixed on other stake holders such as dealers, recyclers, consumers, auctioneers, regulators including the customs authorities.

### **Lead Bearing Wastes**

Lead bearing wastes are generated from used lead acid batteries, battery manufacturing industries, lead oxide manufacturers, cable companies, slag from smelters and other lead bearing scrap materials such as used lead electrodes from primary and secondary zinc producing units using electrolytic methods, lead scrap from printing press, lead pipes, etc.

### **Environmentally Sound Recycling of Lead Bearing Wastes**

The lead bearing wastes as specified in schedule IV are used for production of lead ingots, lead alloy, lead oxides, etc. The main steps involved in the process are smelting of the lead bearing wastes after addition of reductant and Flux (charcoal/ lime and silica), cooling and casting of the molten lead to lead ingots. The production of lead alloy ingots involves further refining after mixing with antimony depending upon the type of alloy ingots needed.

Lead bearing waste could comprise of used Lead Acid Battery Plates, Lead Scrap, Process residues containing Lead, Lead Sheathing on Cable, etc.

The various steps involved in recycling of Lead bearing Wastes are as follows:

1. **Battery-Breaking Processes:** After draining the acid there are two modes of dismantling/breaking of batteries before battery plates are processed for smelting. The first mode is manual where the battery is cut from the top, plates are removed and left over acid is drained. The second mode is where the battery is mechanically broken along with the casing.
  - a. The facilities required for manual dismantling include suction hood, connected to the pollution control device, arrangement for washing of the plastics component before being sent for recycling and acidic water neutralization facility. The capacity for manual breaking of batteries should be restricted to 5000 MTA.
  - b. Facilities required for mechanical breaking include arrangements for noise control and dust and fume extraction system and acidic collection / neutralization facilities.
2. **Lead-Smelting Processes:** The smelting process to recycle lead scrap requires the use of Mandir Bhattis and Rotary furnaces sweat furnace etc. The pollution control system required for both types of furnaces include cooling chambers, cyclone separators, bag filter, alkaline scrubber followed by exhaust blower and chimney of 30m height (minimum).
3. **Lead Sweat Furnaces:** Small amounts of lead are recycled using lead sweat furnaces. Some major materials that are recycled in sweat furnaces are lead-coated power and communications cable, lead sheet and pipe, and other products, which contain lead as a coating or as part of a complex part. The process is executed at relatively lower temperatures and produces both metal for refining and dross; the dross is recycled to smelters.

The overall process including the streams that are required to be connected to the requisite Air Pollution Control Devices (APCD). Waste slag should be stored in impervious pit under a shed and disposed at common HW disposal facilities at regular intervals as per HW (HMTM) Rules 2008.

#### **Standard for Emission/Discharge for Lead**

The parameters and control limits, which are in force in the country, are as follows:

Lead in work area, NIOSH 8-hr avg ( $\text{mg}/\text{m}^3$ )*	: 0.05
Lead in emission through stack ( $\text{mg}/\text{Nm}^3$ )	: 10.0
Lead in effluents ( $\text{mg}/\text{l}$ )	: 0.10

Lead in ambient air 24-hr avg ( $\mu\text{g}/\text{m}^3$ ) :1.0  
(\*  $\text{nm}^3$  – normal cubic meter)

#### **Steps to minimize fugitive emissions of Lead**

- i. The design of hood/fume collection system from the smelting/refining operations (from metal tapping point, charging doors, furnace joints etc.) should be capable of collecting lead emissions and transfer to the air pollution control system.
- ii. The storage and handling of all the raw materials, intermediates and products should be in covered area/shed having concrete floors and mechanized equipment should be used to handle these materials as far as possible.
- iii. The floors in the loading area should be kept wet through sprinklers to reduce the chances of lead particles/dust getting airborne.
- iv. Any water used for washing, rain water etc., should be collected through separate pits (to delink this from the regular drain) for removing metallic lead etc. and the pit should have fine screens for passage of clear water.
- v. The movement of vehicles to the administrative/working/production areas should ensure that only the trucks/vehicles involved in the material handling/transportation reach the work areas, and their tyres are washed before they leave these areas.

#### **Steps to minimize Lead Exposure**

The precautions/measures to be taken for minimization of exposure to the workers involved in handling/processing of the lead and lead bearing material.

#### **Instructions for Lead based industrial workers:**

The following precautions will ensure in minimizing exposure from lead dust prior to leaving the work place.

- (1) Change over the uniform of workers including shoe, socks, head gear etc. preferably in a lead free chamber prior to entering the work premises.
- (2) Change dress material (which should be preferably made of cotton and not any synthetic material) should be packed in a polythene cover and stored away from coming into contact with any lead dust.
- (3) Cover head with airtight shower cap either made up of disposable papers or thin cotton material. The floor needs to be kept wet sprinkles at work place help in reducing the dust level.

- (4) Use face mask all through the working hours.
- (5) Make sure that the inner portion of the gum boots and the thick gloves used is free from dust. (This can be achieved using leadazol solvent to clean from time to time)
- (6) Goggles used need to be cleaned for any dust accumulated from time to time.
- (7) Use disposable cotton ear plugs to prevent any lead dust getting into inner ear and also for noise control.
- (8) Nails need to be trimmed and cleaned more frequently to ensure that no lead dust gets under nail bed.
- (9) All workers should take shower before going home for the day. Prior to the shower at the end of the working day, the working dress material shall be kept away in a dry place. The (dress material- that is uniform) should be periodically dry cleaned.

### **Monitoring of Blood Lead (PbB) Levels**

As a practice, all lead related units should periodically examine their workers for lead level in blood as well as urine. Persons with higher lead levels should be shifted immediately to non-lead activity areas and given special medical treatment till the lead levels come back to acceptable level.

Precautions/measures to be taken for minimization of the exposure involved in handling/processing of the lead bearing materials.

### **Under any circumstances:**

1. Do not consume water or food at work place/eating place with your working dress on.
2. Do not walk over any dusted area or against the wind direction as far as possible in a dusted environment in spite of having protecting gears.
3. Do not smoke, or consume alcoholic beverages as they are found to increase the risk for lead absorption.
4. Do not used printed papers for packing food as the printing inks do contain some amount of lead.
5. Do no enter the canteen/eating place with the uniform provided for the working purpose.
6. Exhaust at ground level helps in bringing down the lead dust in the environment.
7. Do not leave the work area without the body shower and after adequately drying up.
8. Do not handle as far as possible any other material such as mobiles, phones, registers, pens or pads, other that the work tools at the shop floor.

9. Do not get into any other area other than the one specified to your nature of work partitioning is of utmost importance.
10. Do not use the floor for resting purpose, as the level of dust is high below the knee level.
11. Do not take any traditional medicines unless you are well informed about its constituents as many of the traditional medicines contain lead.
12. Do not ignore even a small physical discomfort or the health problem. Please go for medical checkup immediately.

Remember that paints could be alternative sources of lead if they are not lead free paints.