Refining Pot

with

Air Pollution Control Device

for

Refining and Alloying
Refining Pot with Air Pollution Control Device

About Lead Refining

Lead recycled from used lead acid batteries or other sources (Secondary Smelting) via the Mini Blast Furnace or Rotary Furnace route, contains lot of contamination and undesired components. On the other hand, Lead required for battery manufacturing is either soft Lead with 99.97% purity or hard Lead of varying Antimony compositions. In order to make quality of lead suitable for its different uses, different variations of pot melting processes are employed. These include – “Re-Melting” for removal of slag, “Refining” for attaining required purity levels and “Alloying” for producing various alloys of lead. The equipments used are the same, the consumables and the processes, however, differ.

Description of Melting Pot

The Melting Pot (or Refining Pot or Alloying Pot, as it is variously called), is a mechanical mixing device with a pot and a heating arrangement. The inner pot is made of heavy MS plate with dish end bottom. It is placed within a jacket of refractory bricks, which in turn, are protected by an outer cover of MS plate with reinforcements. The pot is covered at the top with opening for feeding lead ingots and is provided with an electro-mechanical mixer. At the bottom, a heating source, usually an oil fired burner, is provided to heat the pot and to melt the lead.

Once lead melts, impurities are skimmed and removed and any consumables required are added. Lead is then drained from the pot through an outlet pipe and valve.

Capacity of such pots depends upon the requirements of particular units. Standard pot capacities made are from 4.0 TpB to 20.0 TpB. Higher capacity pots are also manufactured as required by any particular establishment.

A typical 10.0 TpB Refining Pot has the following standard sizes and specifications:

- Diameter (ID) : 1150mm
- Height : 1250mm (+ Dish Depth of 200mm)
- Flange Width : 350mm
- Outer Shell Diameter : 1900mm
- Stirrer MoC & Dia : SS-304 & 75mm
- Stirrer M otor : 5.0 HP x 960 RPM
- Outlet Valve Size : 40mm
- Burner : Diesel Fired
- Fuel Consumption Range : 8-18kg/ltr

Melting pots are installed both with and without accessories which may include Ingot Casting Machine, Ball Making Machine (where Ball Mills are installed down the line), Air Pollution Control Systems, Jib Cranes etc.

Production Process

- Melting Processes have been grouped as
  - Re-Melting Process
  - Refining Process
  - Alloying Process

- Re-Melting Process
This process is undertaken for value addition to the recycled lead from furnaces. Lead is melted in the pot and major impurities are skimmed from it to make it saleable in the market.
Refining Process

Lead is melted in the pot, additives such as Sulphur, Wooden Powder and Coke Breeze are added and mixed gently followed by dross removal. Thereafter, Tin is added to remove Copper and temperature is increased to 550-600°C. Further, additives such as Sodium Nitrate & Caustic Soda are added to remove Antimony. This process is repeated to get the desired purity of lead.

Alloying Process

Lead is melted in the pot, additives such as Sulphur, Wooden Powder & Coke Breeze are added and mixed gently followed by dross removal. Thereafter, Tin & Antimony are added to the liquid metal to get the desired grade of Lead.

Section View of Melting Pot

Air Pollution Control Device for Refining Pot

- Melting processes lead to generation of air pollution at the following stages
  - Initial heating and melting generates fumes
  - Drossing with sulphur, wooden powder and coke breeze generates lot of smoke and dust particles
  - Further heating for Refining and Alloying with different chemicals generates fumes and dust particles.

Hence, to meet various goals of maintaining employees' health, factory environments as well as regulatory requirements, it becomes imperative to get high end Air Pollution Control Systems to be installed with the Melting Pots.

- Characteristics of Air Pollution generated in Melting Pot

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>500-600 mg/Nm³</td>
</tr>
<tr>
<td>Temperature</td>
<td>60-80°C</td>
</tr>
<tr>
<td>Gases</td>
<td>Fumes and Dust</td>
</tr>
</tbody>
</table>
Discharge Characteristics required as per Norms

- Dust : Less than 50 mg/Nm³
- Lead (Pb) : Less than 10 mg/Nm³
- Temperature : 50-60° C
- Gases : Not Detectable

Selection of Technology for Air Pollution Control

Based on the Parameters and the Standards mentioned, the following technology is adopted for Air Pollution Control System in Melting Pot:
- Pulse Jet based Bag House Filtration System

Details of Air Pollution Control Device with functions

- Suction Hood
  Aerodynamically designed suction hoods are provided to capture flue gases generated at source itself.

- Duct & Bends
  Ducts and bends are required to convey flue gases from point of suction to final top of the chimney and connect various equipments like suction hood, bag house, ID fan and chimney. All bends and reducers are aerodynamically designed and have provision of manhole cleaning mechanism.

- Bag Filtration System:
  It is used for final filtration of flue gases to remove fine dust particulate matter using Pulse Jet Technology. Treated gases from all the bags are collected at top of bag house and passed through ID Fan to exhaust the same to chimney. The dust is collected at bottom of hopper and is discharged through Rotary Air Lock Valve.

- ID Fan
  ID Fan provides necessary driving force to convey flue gases from top of furnace to top of the chimney. The volume sucked overcome the total resistance offered by equipment and duct with the help of fluid horse power provided by ID Fan driven by suitable motor.

- Stack (Chimney)
  The generated gases are passed into atmosphere after treatment through chimney of suitable height and diameter.

Ingot Casting Machine

An Ingot Casting Machine (Continuous Ingot Caster) is a chain conveyor based mechanical arrangement which is used for easier handling of molten lead from Melting Pots. It leads to hassle-free casting of lead into ingots with minimum human contact and keeps this process safe, clean and fast.

It is a custom made device suited for particular capacity required by user. The size of ingot to be casted can also be varied. Further, in special cases, even subdivision of ingots into smaller shapes is possible for suitability of usage.

The output of a Melting Pot needs to be synchronized with the speed of the conveyor. A rotary distributor drum continuously receives the molten metal and pours it into ingot moulds below it. The ingot moulds are fastened on a chain conveyor that continuously moves in a loop. A robust frame of MS is provided for fitting of this conveyor along with sprockets, shafts and geared motor based drive. There is a water jet based cooling arrangement mounted on the frame itself which helps cooling down of the metal in the mould. It is provided with a mechanical knocking arrangement at the end of line for 100% knocking of ingot from the mould.

These can be further supplemented with provision of multiple cooling lines, water re-circulation system, gas burners for drying up moulds, fumes collection hoods and discharge end conveyors.

Note: Due to continuous up-gradation in technology, specified & projected values may differ in actual products.
Flow Sheet - Refining Pot and its Air Pollution Control Device

Components:
- Burner
- Exhaust Stack
- Inlet
- Outlet
- MELTING POT
- G.L.
- Air Compressor
- Fine Dust Particles
- BAG HOUSE
- ID FAN
- AIR STACK
- Port Hole
EROS ENVIROTECH PRIVATE LTD.
(Formerly Eros Consultant)

Regd. Office:
109-110, Ist Floor, Savitri Complex-1
Dada Motors Building, Kalsi Nagar, G.T. Road
Ludhiana-3, Punjab, INDIA
Tel: +91-161-2542109, 2542110

Works:
Sidwan Bet Road, VPO Hamran
Ludhiana, Punjab, INDIA
Telefax: +91-161-2871334, 2871335

Trade Enquiry: Capt. Anil Kumar Verma, Director Marketing
Email: directormarketing@erosenvirotech.com
Alt. mail: capt.anilverma@yahoo.com
Mob: + 91-98554-60000, 98784-00088

Email: sales@erosenvirotech.com, info@erosenvirotech.com
Web: www.erosenvirotech.com