Control and Monitoring of Atmospheric Emissions

Aim of the Guidance Note
This guidance note looks at effective ways to minimize or eliminate the risks of toxic emissions from plants and metal complexes, using the appropriate control mechanisms for the capture and containment of any lead dust or fume generated or toxic gases produced.
Where can atmospheric releases come from?

- Following the mining of lead ore, dust can be generated during crushing operations.
- Lead and depending on the feedstock, cadmium and arsenic emissions, can be released during sintering (melting at high temperature as part of the primary smelting process). Atmospheric pollution can arise in leaks from the ventilation hooding, or in certain crushing circuits during mixing with new feedstock if the materials are dry.
- The prepared primary or secondary feedstock can generate lead dust during the transportation phase within the plant whether by mobile fleet vehicles, mechanical charger or by conveyor.

What can be done to control emissions?

- Consider the feasibility of these process modifications to eliminate or reduce emissions:
  - Enclose furnace operations to improve the ventilation systems.
  - Where possible lower kettle or crucible temperatures to decrease the rate of dross formation and the generation of surface dust.
  - Furnace metal can either be tapped into moulds/pots under a ventilated shroud or directly into a bath of covered and ventilated molten lead to minimize fugitive emissions.
- At lead smelting plants emissions can occur during furnace charging, smelting and tapping, especially fugitive emissions as the “red” hot molten metal is tapped from a furnace.
- Battery breaking in the secondary industry has the potential to generate a lead contaminated acid mist during the sawing or crushing of whole batteries.
- Some smelters operate more efficiently if the furnace charge can be prepared and blended prior to charging, but this charge preparation will generate leaded dusts.
- Refining in both primary and secondary circuits can generate lead emissions, especially during de-drossing - removing the impurities.

1. Fugitive emissions are any dust or fume which escapes from a process or storage area and not captured by an abatement system.
2. www.osha.gov/SLTC/etools/leadsmelter/popups/batterysaw_popup.html links to an explanation of how to install ventilation to the battery saw to contain acid mist.
Plant layout can be modified to reduce the amount of materials handled and transported from one part of the process to the next.

Lead emissions can be minimised during ingot casting if the temperature is kept below 500°C and the flow rate is controlled in a manner that reduces dross formation.

- Manage the movement of materials to minimize the amount of handling. Blending wet sludges with dry materials can reduce dust levels.
- If possible, utilize mechanical means to perform tasks with a high exposure risk in order to minimize possible exposure pathways.
- Capture dusts and fumes or isolate emission sources in an appropriately sized baghouse filter plant or provide local exhaust ventilation.
- Ensure that the capture velocity of an exhaust hood is great enough to prevent fumes or dust from escaping the airflow into the hood. The face velocity required to accomplish this will vary from application to application, but in general one metre per second is the minimum required.

Risk-assess the process and establish safe procedures by which each task must always be performed, then establish monitoring, inspection and maintenance regimes where engineering controls are provided to minimise or contain lead emissions. Observe service intervals that are either recommended by the manufacturer or comply with a statutory regulation. Keep an up to date record of all inspections and engineering maintenance work.

General measures and procedures to reduce exposure

- Regularly wash down areas with water and keep the working surfaces damp. Operator training, prudent working practices and good housekeeping are key elements in minimizing lead emissions when operating mobile equipment.
- Never dry sweep any process area.
General principles of emission testing & analysis

Regulate air quality and restrict atmospheric emissions and pollutants from point sources in the following ways:

- Monitor occupational exposure and ventilation velocities using in-line telemetry and anemometers and control air quality from smelting, refining and product production operations, including application industries.

- Emission testing and analysis can take a number of forms, but essentially it is important to test for particulates, sulfur dioxide and visible emissions.

- Air samples of the workplace should be taken using calibrated sampling pumps with cassettes containing either mixed cellulose ester (MCE) or polyvinyl chloride (PVC) filters. There may be a number of country specific statutory sampling requirements.

- After any new installation, or modification to the lead process, it is recommended that the lead in air values are determined as soon after commissioning as possible. The sampling should cover the lead exposure of a representative number of employees who are likely to be the most exposed to airborne lead.

- Secondary operations require testing for hydrocarbons and dioxins in the furnace off-gasses and particular attention should be paid to any baghouse leaks using opacity tests or baghouse leak detectors. In-line organic or sulfur dioxide testing equipment is available, but will not function consistently unless installed downstream of the baghouse or dust collection control equipment.

- Static samplers provide information on emission trends in, around and outside the plant. Samplers positioned outside the plant and close to local housing or amenities provide an essential guide to the lead levels in the community.

Always visually check the stack for any dust emissions

Additional information

For more information and guidance on how to establish a monitoring regime for atmospheric emissions visit www.ilmc.org

Environment Canada
(Guidance Document for Reporting of Releases from the Base Metals Smelting Sector) www.ec.gc.ca

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