Effluent Control and Monitoring

Aim of the Guidance Note

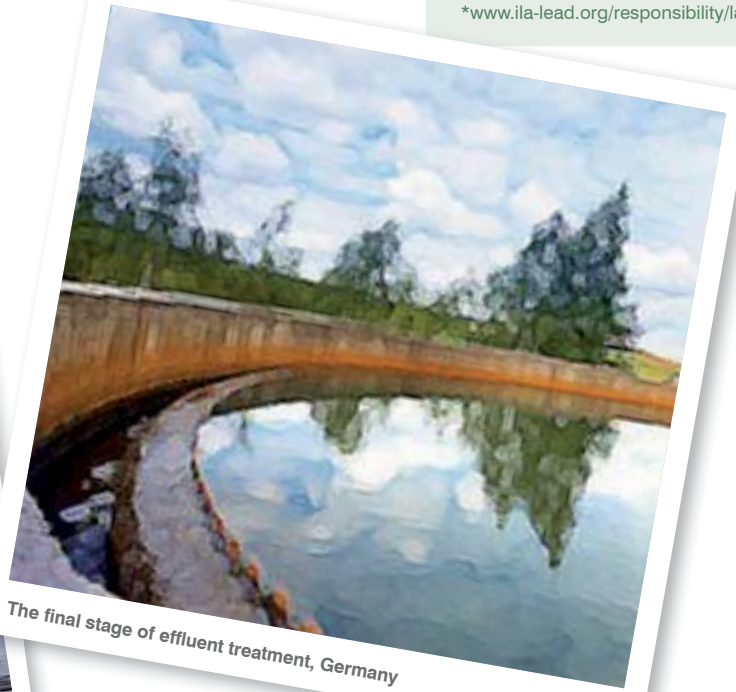
It is vital that lead production and manufacturing plants are designed with effluent control systems that minimise or eliminate effluent discharges and manage water consumption, treatment and re-use in a sustainable closed loop manner.

The lead industry, represented by the International Lead Association (ILA), is committed to the safe production and use of lead, to the benefit of the global economy and society in general, whilst safeguarding human health and minimising the impact of its operations on the environment.

ILA members subscribe to a set of principles embodied in the **Lead Action 21 Charter***. In the spirit of that Charter, a series of Guidance Notes has been produced to help inform employers and workers around the world on how to work safely with lead.

*www.ila-lead.org/responsibility/la21-charter

A vehicle wash, Australia



The final stage of effluent treatment, Germany

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Signage at wheel washing facility, UK

Collecting and containing effluent

It is important to ensure that there are adequate and segregated collection and containment facilities on site for both process effluent and surface water, from snow or rainfall.

Surface water can either be discharged or used to supplement process water requirements. However, surface water should be segregated from process effluent to ensure that it does not have to pass unnecessarily through the entire effluent treatment plant prior to discharge.

Surface water and process effluent should be drained into designated and separate sealed lagoons, concrete bunkers or storage tanks to allow solids to settle prior to any treatment. Time should also be allowed for the small and fine particles suspended in the effluent to settle in a lagoon, and the effluent should be tested to determine the appropriate level of treatment.

If possible, two or three smaller lagoons are preferable to one large one. Such a configuration will enable one to be filling with wastewater, a second to be settling prior to treatment or being filtered and chemically treated, and a third either to be discharging water or being used to top up the process water requirements.

Where possible efforts should be made to either re-use or re-circulate the treated water in a “closed loop” system and thereby reduce the amount of wastewater discharged to the environment and the quantity of fresh water needed for topping up the process water requirements. However, all closed loop process and water cooling systems also need to be monitored for Legionella bacteria and treated if necessary in order to eliminate the bacteria.

The sound management of surface water also ensures that, in the event of a major spillage, the surface water drainage system will contain the spill on site.

The use of water in the lead industry

In the lead industry water is in great demand in many of the processing phases. During initial extraction at mine sites, water is a key feature of many processes such as milling, grinding, and flotation. It is also used at lead concentrate storage facilities to reduce dust levels, particularly for loading and transportation.

Secondary lead smelters require water for certain types of furnaces, battery saws and breakers, and scrubbing towers. Water is also essential for the separation of the metallic, oxide and plastic components of used lead-acid batteries. The effluent produced may be acidic, corrosive and toxic due to the presence of dissolved lead and other heavy metals.

Any on-site lead hygiene programme will also generate process effluent, for example from roadside water sprays, the vehicle wash, the workwear laundry, and the employees’ showers and wash rooms.


A settlement lagoon at a lead refinery, UK

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Segregate, separate and/or filter

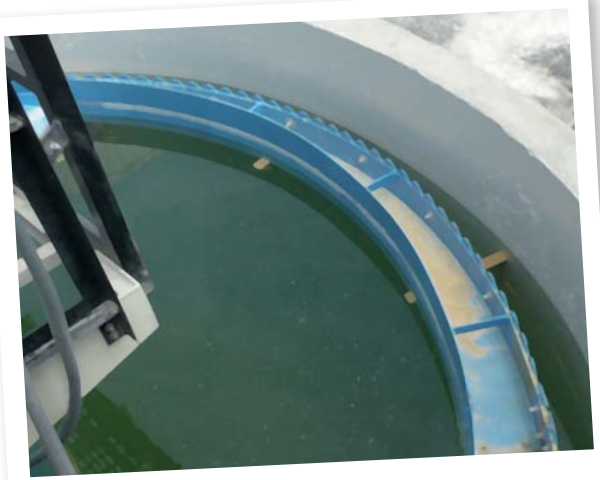
Settlement and/or filtration is usually all that is required for most of the rain water and effluent collected from a vehicle wheel wash prior to re-circulation or discharge. A period to allow suspended solids to separate and chemical treatments to be effective is required prior to any discharge to the environment.

Effluent treatment plants, in countries that experience heavy rains, or annual monsoon rains, need sufficient elevation or high bund walls to avoid flooding. Channels and barriers around the perimeter of the plant should also be used to direct any flood-waters away from the process areas.

Treat, test and recycle

Once the segregated wastewater has been collected, the suspended solids should be removed by filtration, or settlement, and the wastewater chemically treated to remove any heavy metal contamination. It should then be neutralised and any wastewater that cannot be recycled should be allowed to evaporate – either by using waste heat from the furnace operation or via natural evaporation in lagoons.

Any wastewater that cannot be evaporated should be sampled and analysed prior to discharge, to ensure that the treatment process has produced an effluent that complies with all local and national standards for the discharge of industrial effluent to the environment. Most modern plants are designed to eliminate effluent discharges, even treated effluent.



Treated effluent, Costa Rica

The elevated tanks at an effluent treatment plant, Costa Rica

Although some tests might be site specific depending on the industry, effluent should be tested for:

- Suspended lead
- Dissolved lead
- Acidity/Alkalinity, i.e. the pH value
- Other metals such as antimony, copper, zinc, arsenic, cadmium and mercury
- Oil, grease and dissolved salts, particularly if the process requires the use of caustic soda or other reagents that produce soluble heavy metal salts.

Discharge points, and the rates of discharge to any freshwater river, should be licensed and chosen with eco-sustainability in mind to ensure that large volumes of oxygen deficient water are not released into the aquatic environment.

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Use or recycle

Secondary lead processing plants should ensure that any effluent from the battery breaking process is contained on-site – or store the battery electrolyte during the initial breaking stage – for either neutralisation or reprocessing. Several options are available for recycling waste battery acid:

- Filtered battery acid can be recovered and, following an appropriate chemical treatment, re-used in new batteries.
- Filtered recovered battery acid can also be used in the effluent treatment plant, during some of the specific chemical treatment processes, to neutralise the effluent after precipitation of other metals such as cadmium at higher pH.
- Neutralisation with calcium salts will produce 'gypsum', which can be used in the manufacture of cement and plaster board.
- Neutralisation with sodium salts will produce a salt which is often used by the detergent industry and sometimes by the glass industry.

Mining flotation process effluent can be returned to the plant after the metal concentrates are filtered and the tailings are settled in a pond.

For more information about the management of Tailings Dams, please refer to the ICMM/NNEP guide www.icmm.com/page/1243/icmm/unep-explaining-apell-for-mining.

Gypsum produced at an effluent treatment plant, Colombia

Additional information

For additional information on best practice visit these websites:

European Commission, Integrated Pollution Prevention and Control www.eippcb.jrc.es

Environment Canada (Pollution and Waste section)
www.ec.gc.ca

International Lead Management Center
www.ila-lead.org/responsibility

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The International Lead Management Center (ILMC) was created in 1996 by the international lead industry, in conjunction with the OECD. The ILMC offers hands-on advice and assistance from its experts to developing countries across the globe. It works with the lead industry, the Basel Secretariat (SBC), government environment agencies and intergovernmental bodies, such as the UN International Lead Zinc Study Group (ILZSG) and NGOs such as the Blacksmith Institute. The ILMC assists with the management of the risks associated with lead and its impact on the environment and human health across all aspects of the lead industry from mining, smelting, refining and product recycling. For more information on the work of the ILMC please contact info@ilmc.org

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