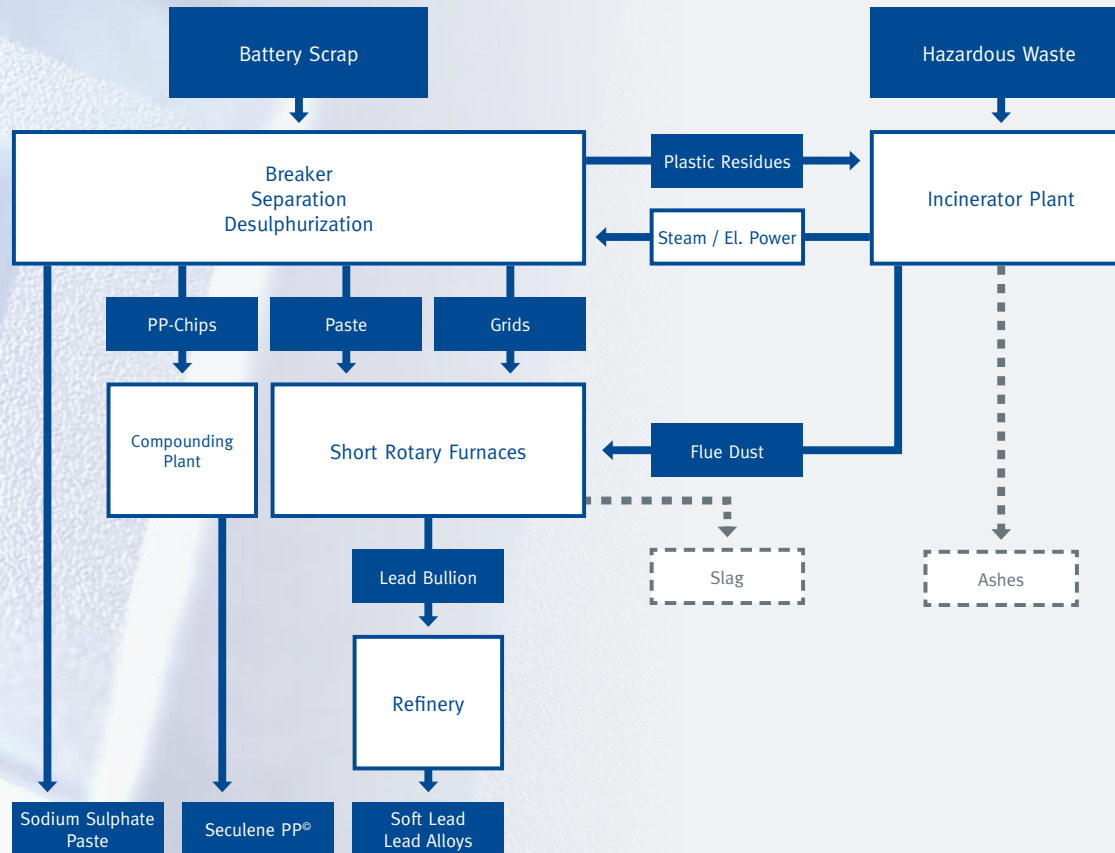


# COMBUSTION OF HAZARDOUS WASTES IN THE JOINTLY INCINERATOR OF THE SECONDARY LEAD SMELTER



# PROFILE



## ROBUST DUO FOR THE ENVIRONMENT

The Muldenhütten Recycling und Umwelttechnik GmbH (MRU) in Freiberg is Germany's third largest secondary lead smelter. It is also the only lead smelter which has a cooperatively used incinerator plant for hazardous wastes. Non-recyclable plastic products, resulting from the processing of accumulator scrap, are incinerated here together with other hazardous wastes.

The incinerator plant, built in 1983, was renovated in 1997 to conform to the guidelines of the 17th BImSchV (federal immission protection guidelines). This was followed by the commissioning of a tank farm in 2001 and an automated underground feeding bunker for charging the furnace in 2004. 2009, a steam turbine for power generation was put into operation. The incinerator operates continuously for more than 7,800 working hours annually, thereby processing solid, pasty and liquid wastes which include mixed industrial wastes, paint slimes, residues of chemical and pharmaceutical industries, plastics, solvents and contaminated effluent.

20 employees ensure a smooth and safe operation of this state-of-the-art plant, fitted out with efficient off-gas cleaning and process control systems.

# TECHNOLOGY

## THE COMBUSTION PROCESS

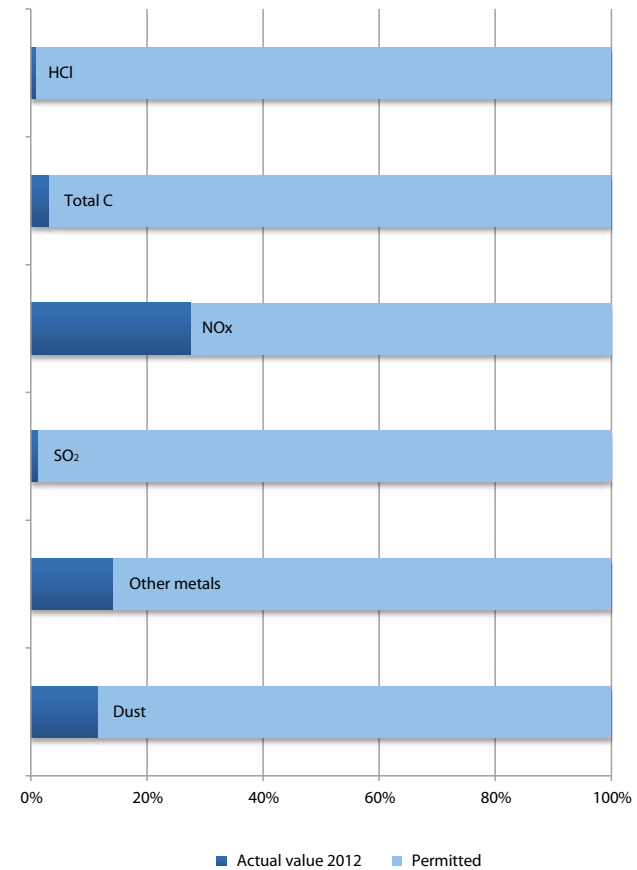
The 10 m long rotary furnace with an inside diameter of 3.60 m is charged alternately with solid wastes from two bunker systems. Additionally, liquid wastes are fed through combined burners or atomising lances into the combustion chamber.

The rotary furnace must be maintained at a temperature of at least 1,050 °C, with the actual incineration process being controlled to run at 1,100 to 1,200 °C. The flue gases are led into an afterburner chamber, where any entrained organic components are destroyed at a minimum temperature of 1,100 °C and a dwell time of at least 2 s.

The heat content of the flue gases is recovered in waste heat boilers, producing steam which is extensively used in the plant for any of the following purposes: reheating the flue gas in heat exchangers, degassing the boiler feed water, evaporating the sodium sulphate solution in the crystallisation plant of the lead smelter, as the driving medium for a feeder water installation, for heating purposes and for preparing warm water. Excess steam is converted into electricity. Ash, resulting from the combustion process, is disposed.



Comparison of emissions in 2012 with accepted emissions according to licensing notice



# TECHNOLOGY



## GAS CLEANING

The MRU Freiberg operates highly advanced multi-stage gas cleaners to fulfil and even surpass the stipulations regarding emissions allowed.

The removal of nitrogen (NO<sub>x</sub>) occurs in first train of boilers for steam generation. For this purpose, the SNCR process using a selective non-catalytic reduction of nitrogen oxides with ammonium hydroxide is employed.

This is followed by electrostatic precipitators for dust removal, an acidic scrubbing stage for the removal of halogens and heavy metals, and an alkaline scrubbing stage for SO<sub>2</sub> elimination.

The other stages in gas cleaning include reactors using the LURGI-ZWS process for flue gas treatment with sorbalit in a circulating fluid bed, followed by the removal of fines in filters of the baghouse. The composition of the off-gases leaving the high stack is constantly monitored, recorded and checked with the emissions measuring station, in keeping with the stipulations of the 17<sup>th</sup> BImSchV. An active telecommunication link exists with the surveillance authority.

## EFFLUENT TREATMENT

The scrubbing solutions are cleaned by filtration and by passing them through ion exchanger resins to extract the heavy metals. Effluents containing sulphur are additionally treated in an electro dialysis installation. The concentrated salt solution thus generated, is delivered to the crystallization facility of the lead smelter. The pre-cleaned effluent is fed to the company's effluent treatment shop.

# PROCESS SURVEILLANCE & CONTROL

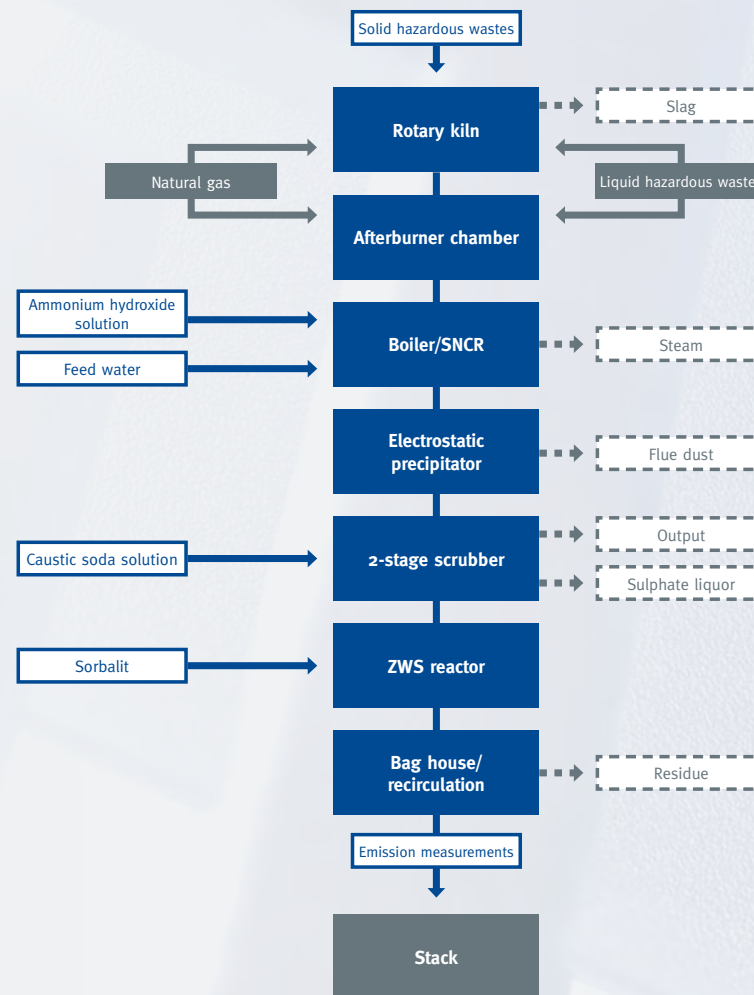
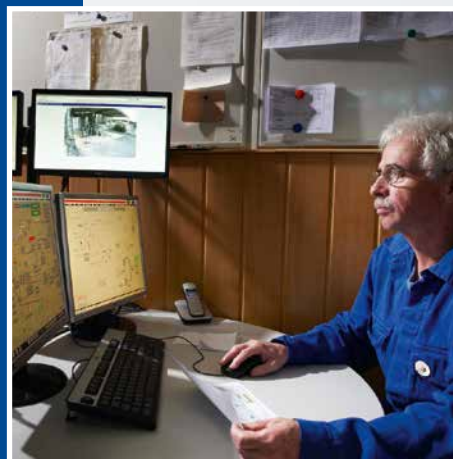
## IN CONSTANT OPERATION

Four persons per shift attend and control the whole plant – around the clock and for 365 days a year. Outside their normal shift times, they also supervise the automated effluent treatment plants as well as other accessory aggregates.

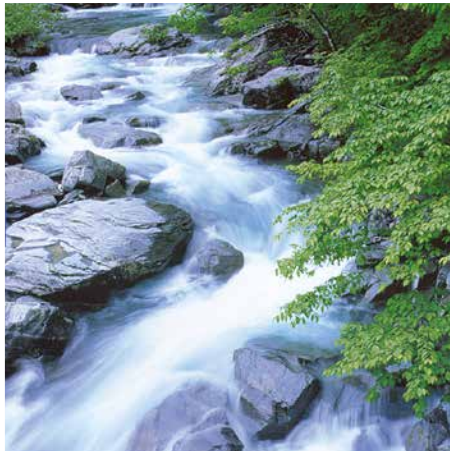
A modern process control system for incineration, based on FUZZY logic, regulates the operating schedule reliably and ensures smooth running.

### Summary of technical data:

- Throughput: up to 20,000 t/a
- Thermal rating: 13 MW
- Flue gas volume: 32,000 Nm<sup>3</sup>/h(f)
- Boiler output: 10 MW (13 bar, 260 °C)
- Operating hours: 7,800 h/a



# TECHNOLOGY & ENVIRONMENT



## LIVE RESPONSIBILITY

Together with the incinerator plant, the MRU Freiberg directly accepts the officially granted responsibility for disposal and re-utilisation. A comprehensive environment and quality management system, not limited to the process alone, ensures safety for processes and environment.

Since 1993, the Muldenhütten Recycling und Umwelttechnik has invested more than 8.0 million Euros for plant safety. The technological integration of the secondary lead smelter and incinerator plant is unique.

Constant safety, a sense of responsibility together with a production designed to meet requirements precisely and on schedule, are maxims of MRU's dealings, making the enterprise a reliable business partner and exemplary for the processing and disposal of hazardous wastes.

## CERTIFICATION

- DIN EN ISO 14001
- DIN EN ISO 50001
- Specialists for disposal
- Umweltallianz Sachsen



# ACCEPTANCE TABLES

The values given serve as guidelines (no official starting parameters are available). Following deliveries in a loose form are not acceptable: chemicals, pesticides and peroxides. In general, following deliveries are not acceptable: materials which are infectious or represent bacterial or mycotoxin hazards, explosive, radioactive substances and weapons.

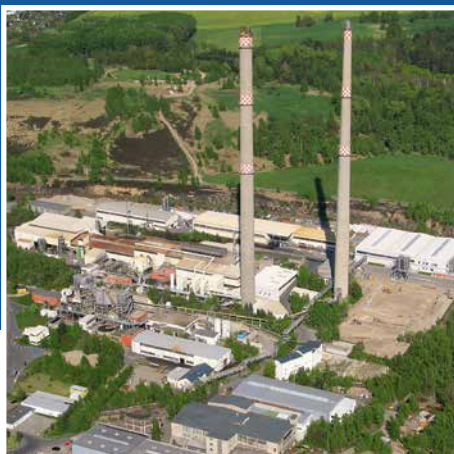
<b>Solids:</b> E.g., mixed wastes, plastics, sludges, shredder wastes	
Delivery form: Lumps not larger than 0.4 x 0.4 x 0.4 m, homogenised, no dangerous dust-building tendency, low exudation of liquids, no toxic or highly toxic materials, no generation of explosive gas mixtures, no corrosive properties (acc. to GefStoffV), no filled packagings > 2 l, general exclusion of highly and easily inflammable materials, delivery temperature < 35 °C	
Material parameters:	Calorific value 0 – 35 MJ/kg
	Moisture content < 50 %
	Ash content < 85 %
	Ignition temperature > 55 °C
Toxic matter content:	Chlorine (Cl) < 3 %
	Lead (Pb) < 1 %
1000 mg/kg = 0,1 %	Alkaline metals < 2 %
	Sulphur (S) < 3 %
	Arsenic (As) < 50mg/kg
	Chromium (Cr) < 0.2 %
	Cadmium (Cd) < 200mg/kg
	Fluorine (F) < 1 %
	Iodine (I) < 0.2 %
	Bromine (Br) < 0.2 %
	Selenium (Se) < 50 mg/kg
	Mercury (Hg) < 50mg/kg

<b>Liquids in IBC:</b> Non-combustible liquids, e.g. effluents, salt solutions (up to WGK3)	
Delivery form:	Standardised 1000 l small containers on transport palettes, secure base outflow, screw cap on topside of container, packagings filled to max. 90%
Acceptance criteria:	No liquids T/T+, no solutions and emulsions which dissociate easily, no exudation of toxic or combustible gases, low content of solids
Material parameters:	Caloric value < 5 MJ/kg
	Moisture content > 90 %
	pH value > 5; < 11, Viscosity < 10 cSt (20 °C)
	Solids < 2 mm
Toxic matter content:	Chlorine (Cl) < 3 %
	Sulphur (S) < 3 %
	Others according to agreement

<b>Liquids in IBC:</b> Combustible liquids, e.g. solvents (up to WGK3 , allowable F+)	
Delivery form: Labelled, leak-proof, standard 1000 l small tank containers, on transport palettes, with construction approved according to TRbF142, labelling, characterization, equipment of STC acc. to guidelines for hazardous materials, secure base utflow, screw cap on topside of container, packaging filled to max. 90%	
Acceptance criteria:	No easily dissociable solutions and emulsions, no exudation of toxic gases, low content of solids, exclusion of liquids T+
Material parameters:	Caloric value 15 – 30 MJ/kg
	pH value > 5; < 9, Viscosity < 20 cSt (20 °C)
	Solids < 1 mm
Toxic matter content:	Chlorine (Cl) < 3 % (no free Chlorine)
	Sulphur (S) < 3 %
	Others according to agreement

<b>Liquids:</b> Combustible/non-combustible sludges, special charges (up to WGK3, allowable F+)	
Delivery form:	Storage container up to max. 15 m³
Acceptance criteria:	Conveyable (pressurized nitrogen or pumps), liquid T+ excluded
Material parameters:	Caloric value < 30 MJ/kg
	pH value > 5; < 9
	Viscosity < 45 cSt (20° C)
Toxic matter content:	Solids < 5 mm
	Chlorine (Cl) < 3 % (no free Chlorine)
	Sulphur (S) < 3 %
Others according to agreement	

<b>Liquids Tank:</b> Combustible liquids (hot, cold), e.g. creosotes, process oils, mother liquor, distillation residues, solvents (up to WGK3 , allowable F+)	
Delivery form: Explosion-proof storehouse (nitrogen inertisation), tank material stainless steel 1.4571, transfer from TKW up to max. 25 m³, transfer pump available at location, "Gaspindel" (vapour equalisation) process stipulated, TKW pressure release through active coal filter possible	
Acceptance criteria:	Pumpable, exclusion of liquids T+
Material parameters:	Caloric value 10 – 30 MJ/kg (adjustment possible)
	Moisture content < 30 %
	pH value > 3, < 9, Viscosity < 20 cSt (20 °C)
Toxic matter content:	Solids ca. 5 % < 1mm (based on delivery amount)
	Solids ca. 1 % < 5mm (based on delivery amount)
	Chlorine (Cl) < 6% (no free Chlorine)
Sulphur (S) < 6%	
Others according to agreement	



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