HAZARDOUS WASTE INCINERATION SYSTEMS

HAZARDOUS WASTE

- A hazardous waste is waste that causes substantial or potential threats to public health or the environment.
- Hazardous wastes fall into two major categories: characteristic wastes and listed wastes.
- Characteristic hazardous wastes are materials that are known or tested to exhibit a hazardous trait such as:
  - Ignitability (i.e., flammable).
  - Reactivity,
  - Corrosivity,
  - Toxicity.

Listed hazardous waste are materials specifically listed by the Regulations as a hazardous waste.

Hazardous wastes fall into two major categories:
- Process wastes from general activities and from specific industrial processes.
- Unused or off-specification chemicals, container residues and spill cleanup residues of acute hazardous waste chemicals and other chemicals.

Incineration of hazardous waste

The parameters of waste influencing incineration process:
- High calorific value (> 20 MJ/kg), high air supply needed.
- Possible high content of volatile matter – not all air should be introduced in one place.
- High corrosivity – material for refractory lining.
- High combustion temperatures (> 1400 C).
INCINERATION

The best way of hazardous waste incineration is use of rotary kilns. Sometimes the grate type boilers are used. Sometimes the co-combustion in the municipal solid waste incineration system is used.

- Capacity 300 – 3000 kg/h waste.
- Temperature in postcombustion chamber 1100°C.
- A system for preventing the temperature fall below certain level – additional burners.
- Ash and slag must be stabilized or stored in the special landfilling place.
- Gas cleaning system must be very effective.

ROTARY KILN

- Good mixing of waste.
- Operation temperature 800 – 1400°C.
- Temperature resistant refractory lining.
- Possible incineration of solid, paste and liquid waste and mixtures.
- Possible incineration of medical waste, chemical waste, waste oil, contaminated soil etc.
- Possible incineration waste with boxes, drums etc.
The advantages of rotary kilns are:

- Good air access to the material.
- Uniform temperature in the kiln.
- High heat capacity of the kiln (steady thermal parameters).
- Good pyrolysis and incineration process.
- Long time of residence of material (>1 hour).
- Pyrolysis in the kiln and final burning of gases after the kiln (post combustion chamber).

SYSTEM SEILER

- Mainly for chemical waste: pesticides, fungicides, fertilizers.
- Petrochemical waste.
- Medical waste.
- Capacity from 300 kg/h.

A system consists of following elements:

- Waste input system.
- Rotary kiln.
- Burner for starting and special periods.
- Post combustion chamber (thermoreaktor).
- Heat recovery system.
- Gas cleaning system:
  - Scrubbers HCl, SO₂.
  - Dust and liquid droplets removal filter.
  - Dioxines removal system (activated carbon reactor or in stream injection).
- Monitoring system and control system.
- Slag and ash treatment installation.

SEILER incineration plant - technology
SEILER incineration plant - view

SEILER - rotary kiln

WINDERICKX incineration system

Types of waste incinerated:
- Hazardous waste.
- Medical and hospital waste.
- Chemical waste.
- Sewage sludge, industrial waste, petrochemical waste.
- Capacity 100 – 3000 kg/h depends on the calorific value of waste.

WINDERICKX – technology
WINDERICKX – rotary kiln

WINDERICKX – inside view of the rotary kiln

WINDERICKX – dust removing filters

SARPI – hazardous waste incineration plant

SARPI Dąbrowa Górska Sp. z o.o. Belongs to French group SARP Industries S.A., from Veolia Environment concern.

The hazardous and special waste from industry is incinerated, with heat recovery and effective gas cleaning system.

The solid products of the process are safely disposed off.
Types of waste thermally treated

Solid waste acceptance:
• in bulk in the waste preparation building,
• in containers of shredded waste,
• in special leakproof containers.

Paste and sludge-type waste:
• in special tank (container),
• in cone-shaped container located on a leak-sealed tray.

Liquid waste:
• in two cone-shaped containers located on a leak-sealed tray.
• in leak-proof drums, containers.

Special type waste

Liquid waste containing PCB
• in leak-proof drums.

Pesticides and waste containing Hg:
• in leak-proof drums.

Medical, veterinary waste and other chemical waste:
• in leak-proof specialized expendable containers (one use),
  with no possibility of opening, in a cooled container.

SARPI – hazardous waste incineration plant

Ash and slag from the kiln and gas cleaning system are cooled down using water, broke down to small size and stored in the container.
Gas from the ash preparing installation goes to the kiln.
Gypsum from the desulfurization process is dewatered and stored in the container.
The solid products are immobilized with cement and gypsum and stored in the landfill place.
Waste water is cleaned in the water recirculation system.

EXPERIMENT PARAMETERS OF INSTALLATION

- Max. yearly capacity 20 000 Mg/y
- Max. hourly capacity 3 000 kg/h
- Working hours/year 7,200 h
- LHV of waste 13 - 30 MJ/kg, av. 16 MJ/kg
- Max. Temperature in rotary kiln 1250 °C
- Temperature in post-combustion chamber 850 do 1250 °C
- Residence time in post-combustion ch. min 2 s
Gas and dust emission sources

• the incineration installation – gas products of incineration, and gas cleaning systems
• The additional systems like: various material containers (lime, dust, cement ...), chemical substances containers, lime hydrate container, mixing installations etc.
• dust and slag immobilization installation.

Gas cleaning system

• Dust removing system of effectiveness $\eta > 98\%$
• Mercury Hg removing system with $\text{Na}_2\text{S}_4$ as sorbent.
• Various salts removing from the wet circulation systems by spray-drying system (suszarni rozpyłowej).
• Dust removing in the bag filter system.
• $\text{SO}_2$, $\text{HCl}$ i $\text{HF}$ removing in lime scrubber.
• End-cleaning of flue gas in the activated coal bed reactor.
• Catalytic NOx removal system with ammonia as reagent (DENOX).
• Final emission by the steel chimney of the height $h = 50$ m and diameter $d = 1.2$ m.
DOPUSZCZALNA WIELKOŚĆ EMISJI SUBSTANCJI DO POWIETRZA NIE MOŻE PRZEKRÓCZYĆ NIŻEJ PODANYCH WARTOŚCI:

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<th>Nr</th>
<th>Nazwa substancji</th>
<th>Dopuszczalna ilość emisji (mg/m3)</th>
<th>Emisja logh</th>
<th>Emisja mg/m3</th>
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</table>

Monitoring system

The parameters and amount of incoming and outgoing waste.

Monitoring of parameters of incineration process.

Water balance monitoring.

Amount and quality of sewage water.

Dust and gas emission monitoring.

Ground-water monitoring (piezometric wells).

Soil monitoring.
b) Periodical measurements (every half-year)

- Emission of PCDDs/PCDFs (dioxysyn i furanów) – by hand made sample taking and chromatographic analyse.
- Cd, Tl Hg, Sb, As, Pb, Cr, Cd, Cu, Mn, Ni, V and Sn and their compounds (kadmu, talu i ich związków, rtęci i jej związków, antymonu, arsenu, ołowiu, chromu, kobaltu, miedzi, manganu, niklu, wanadu i cyny oraz ich związków).

The results are kept in archive system by 5 years.
PIEC OBROTOWY

SPALARNIA