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## Lecture 8: Hazardous waste

13.10.2016

Waste management and recycling -  
incineration 2

## Is the list definite?

- If a material is listed in the list of hazardous wastes
  - ◆ It can be classified as non-hazardous if it has none of the listed dangerous properties
- If a material is not listed in the list of hazardous wastes
  - ◆ It can be classified as hazardous if it has even one of the listed dangerous properties

<http://ec.europa.eu/environment/waste/index.htm> (general waste info)

<http://www.environment-agency.gov.uk/business/topics/waste/32180.aspx>  
(classification)

- In companies, records have to be kept and stored for any operations dealing with hazardous waste (collection, transport)
  - ◆ quantity, nature and origin of hazardous waste
  - ◆ transport and treatment method foreseen
- Directive 2008/98/EC provides additional obligations for labeling, record keeping, monitoring and control from the "cradle to the grave", i.e., from the waste producer to the final disposal or recovery.

# Types of hazardous waste

- Solid wastes
- Liquid wastes
- Chemicals
  
- Industrial wastes
  - ◆ Well known; in environmental permits
  - ◆ Mainly taken to and treated by hazardous waste companies
  - ◆ Some can be treated in industrial plants
- Examples of typical industrial hazardous wastes
  - ◆ metal refineries waste
  - ◆ chemical industry waste
  - ◆ waste oils (not edible oils!)
  - ◆ waste from thermal processes
  - ◆ solvents

## Treatment, main aspects

- Sorted and labelled waste
- Waste to energy
- Thermal treatment
- Physico-chemical treatment
- Biological treatment
- Material recovery
- Special treatments
- Final disposal

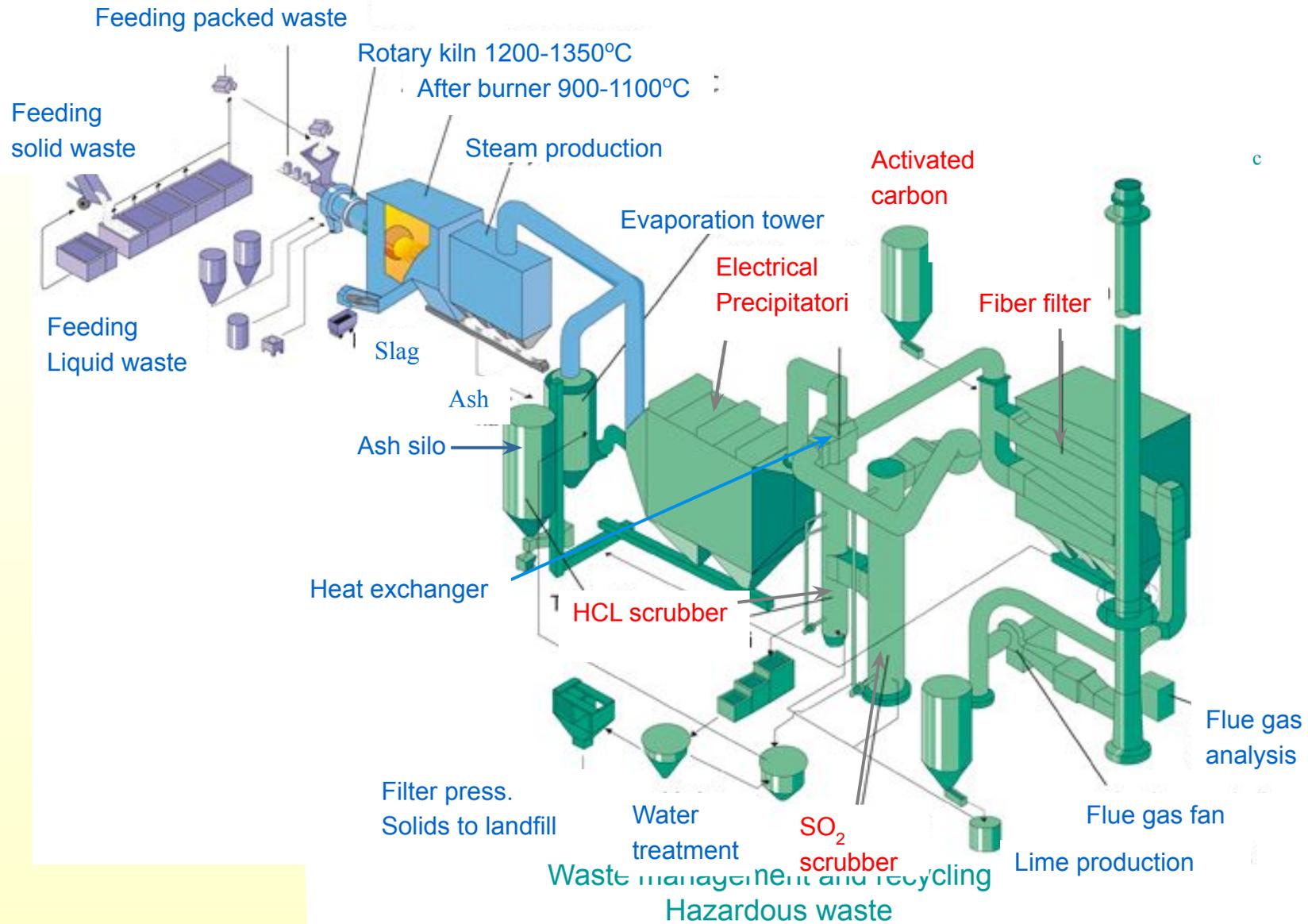


# 1 High temperature incineration

## Process units at Ekokem

- The core unit is a 12-metre rotary kiln
  - ◆ 1 300°C (Directive 2000/76/EU For Hazardous waste >1100 °C for 2 s )
  - ◆ Long delay time in kiln and after-burn □ complete decomposition and burning
  - ◆ Energy is recovered □ electricity and district heat
  - ◆ The slag can be used e.g. in soil construction
  - ◆ Flue gases are cleaned
    - Cooling
    - Acid gases washing by lime
    - Particle removal by electrostatic precipitator
    - Gaseous emissions: further scrubbing
    - Dioxine and mercury removal by activated charcoal
- At Riihimäki, the energy produced comparable to 43 milj. m<sup>3</sup> natural gas.

# High temperature incineration of hazardous waste



## 4 Physico- chemical processes

- Inorganic wastes, such as acids, bases and heavy metal containing liquids are made chemically safe
- Main methods
  - ◆ Neutralization of acid and bases
  - ◆ Precipitation of heavy metals
    - The remaining water is purified for use in processes
  - ◆ Oxidation and reduction reactions
- Notice: one type of waste can be used for processing another type of waste
  - ◆ Acid + base
  - ◆ Precipitating media

# Physico-chemical processes

