Lecture 8: Hazardous waste

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

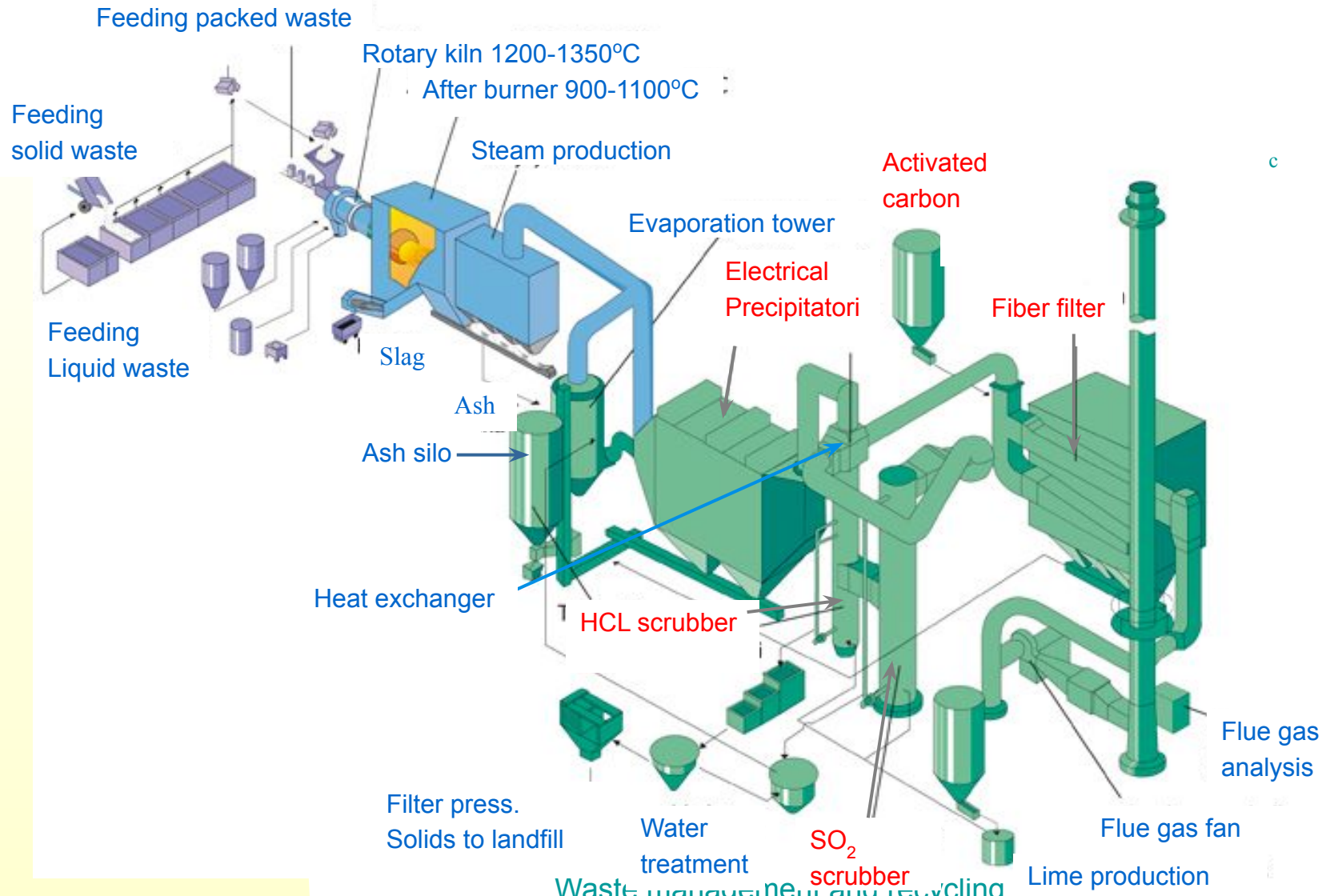
- Sorted and labelled wa
- Waste to energy
- Thermal treatment
- Physico-chemical treatment
- Biological treatment
- Material recovery
- Special treatments
- Final disposal

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^3 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