

# FLUE GAS CLEANING WITH ENERGY RECOVERY IN THISTED, DENMARK



Götaverken Miljö has installed a wet flue gas cleaning facility to the waste incineration plant at I/S Kraftvarmeværk in Thisted Denmark. The cleaning facility, which is a part of a larger reconstruction project, reduces the emission levels of dust particles, hydrochloric acids, sulphur and heavy metals considerably. The flue gas cleaning plant started operating in May 1991.

## PLANT DATA

### Waste incineration plant:

Steam produced	17 tons/h
Electricity output	3.3 MW
Heat output	10.6 MW

### Annual production:

Waste incinerated	45,000 tons/year
Electricity	22,000 MWh/year
Heat	65,000 MWh/year

### Flue gas cleaning facility:

Type of process:	Wet method
Condenser output:	approx. 1 MW
Technical information:	Flue gas flow 38,000 Nm <sup>3</sup> /h Temperature approx. 150°C

### Emissions:

HCl 4 mg/Nm <sup>3</sup> dg	HF 0.2 mg/Nm <sup>3</sup> dg
SO <sub>2</sub> > 100 mg/Nm <sup>3</sup> dg	Cd 0.007 mg/Nm <sup>3</sup> dg
Pb 0.3 mg/Nm <sup>3</sup> dg	Hg 0.01 mg/Nm <sup>3</sup> dg



## Description of the process

The wet method of flue gas cleaning is applied in this plant, where flue gases are cooled by spraying with water inside the scrubber. During this process dust, hydrogen chloride, hydrogen fluoride, mercury and sulphur as well as heavy metals such as lead and cadmium are extracted from the flue gases. The cleaning process is very efficient, reducing the emission levels at Thisted considerably, for hydrochloric acids, for example, by about 99% and for mercury about 90%.

The pollutants dissolve in the process water and together with dust particles are transferred to the process water treatment plant. The water is then neutralised, the pollutants are precipitated and flocks are formed which are removed producing reasonably solid sludge. The sludge is then mixed with fly ash from the electrostatic precipitator to form a very leach-stable residue which is easily transported. The purified water is discharged to the sewage system.

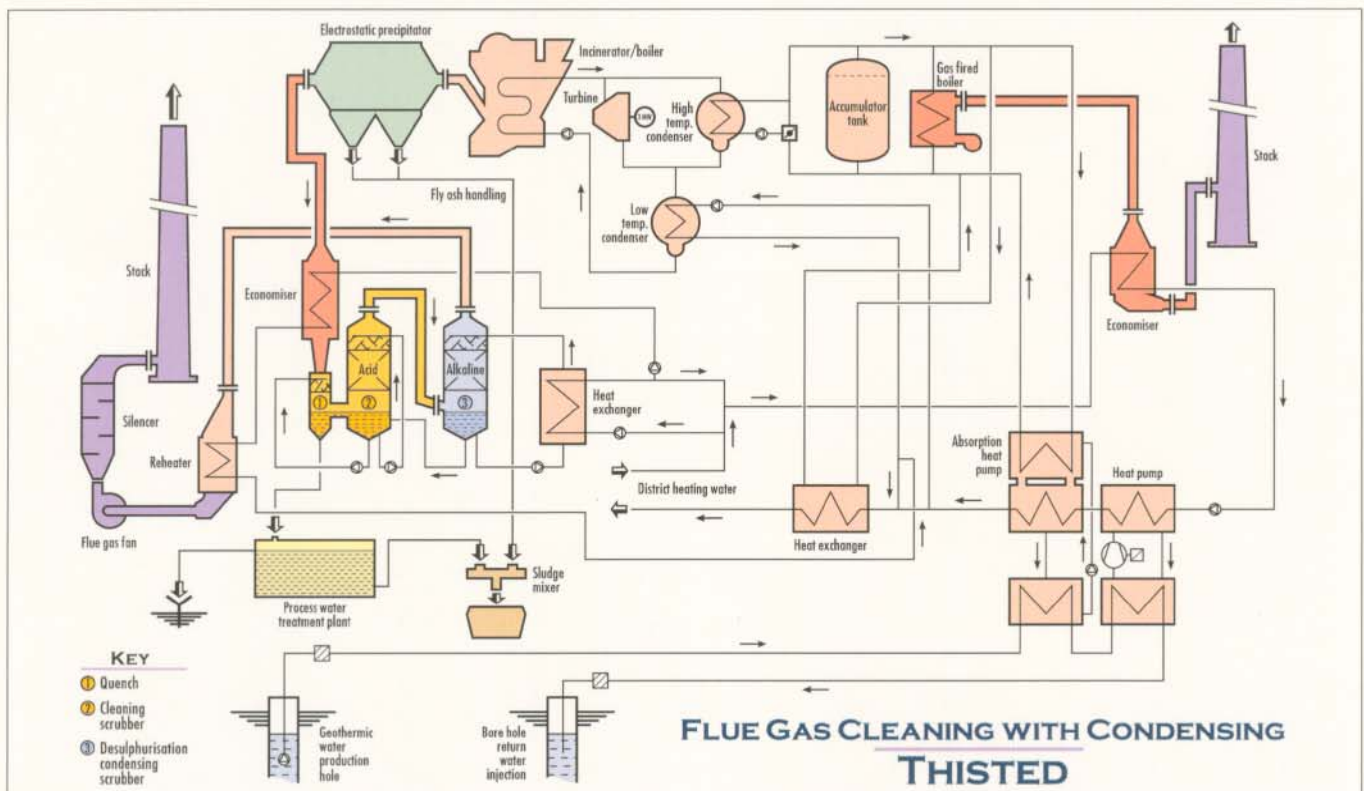
## The condensing process

Sulphur is separated in another scrubber at the same time as heat recovery takes place by condensation of the water-saturated gases, cooling is provided by the recirculated water from the district heating network.

## Geothermic plant

There is a geothermic plant installed adjacent to the power plant where water with a temperature of 45°C is pumped at the rate of 130 m<sup>3</sup> per hour from a bore hole 1250 m deep. The heat from the water is transferred to an absorption heat pump and an electrically driven heat pump. The water then passes to an injection bore hole. The heat pumps release an additional quantity of heat which is transferred to the district heating system. A gas fired boiler is installed adjacent to the geothermic plant so that the temperature in the district heating facility can be increased even further.

The absorption heat pumps provide a heat production totalling 17,000 MWh annually.



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