Flue gas cleaning system with energy recovery and ADIOX® for dioxin memory effect removal

Dåva 1 Waste-to-Energy plant in Umeå, Sweden

In year 2000 Umeå Energi AB commenced the operation of Dåva 1 waste-to-energy plant, one of the world’s most energy efficient and environmentally sound plants with waste as the primary fuel.

Götaverken Miljö supplied the flue gas cleaning as well as flue gas condensation system, heat pump facility and turbine set.
Plant design data:
Supplier: Consortium between Götafverken Miljö/Von Roll
Boiler output: 55 MW heat for district heating

Flue gas cleaning:
Designed and supplied by: Götafverken Miljö AB
Process: Baghouse filter, acid scrubber, SO₂-scrubber and water treatment

Energy recovery:
Designed and supplied by: Götafverken Miljö AB
Process: Flue gas condenser, heat pumps and back pressure steam turbine & condenser
Output, MW:
- Flue gas condenser: 11
- Heat pumps: 2 x 5.7
- Turbine (el): 15
- Turbine condenser: 40

Description

The plant incinerates 175,000 tons of municipal waste annually (20 tons/hour). Simultaneous incineration of bio-fuel is also possible.

As a result of Götafverken Miljö’s extensive energy recovery system, the thermal efficiency of the incineration plant is 100% or more! The technique is based on the fact that the latent heat in flue gas, chiefly in water vapour, is recovered in a condenser connected to a heat pump system. This energy is then transferred into the district heating system of Umeå city. By definition, the energy in the water vapour is not included in calculating the efficient heating value of a fuel, and thus efficiency levels of over 100% can be obtained when recovering this energy!

The Umeå district heating system supplies approximately 750 GWh/year. Däva I waste-to-energy plant has a total heat production of 350 GWh/year, of which 20% originates from the flue gas condenser. In addition, approximately 80 GWh/year of electricity is produced.

The flue gas cleaning takes place in a fabric filter followed by an acid scrubber, a SO₂-scrubber and a gas condenser. Water is also recovered from the gas. Thus, the cleaning process is self-sufficient as regards water.

After some years of operation the plant experienced dioxin memory effect problems. ADIOX® tower packings and droplet separators were installed, enabling the required dioxin emission level to be maintained.