



## » Waste-to-Energy Plant Sysav Malmö, enhancing the overall Energy Efficiency with 2 Unitop® 28C heat pump units

### Client/End user

Sysav AB  
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### The waste issue managed in Sweden

A combination of cutting-edge environmental technology and innovative local initiatives is helping Sweden's municipalities to manage and treat their waste and wastewater. From monitoring waste in large industrial production systems to examining the impact today's lifestyles have on recycling and waste minimization, various methods are used to adapt waste management policy to local situations.

### Sysav, the solid waste company

Sysav is a solid waste company owned by fourteen local authorities in the southernmost part of Sweden. A variety of methods are used for dealing with waste management. As a consequence Sysav is able to take care of every kind of waste in the best possible way: The company has opened a new head office, built entirely from recycled materials. Sysav's success is built on partnerships with local authorities and the producer/consumer within a legal framework.

### Waste-to-energy plants

The Sysav waste management plant, situated just north of Malmö is a good example of how this policy works.

The company treats and recycles domestic and industrial waste every year from a population of 620,000 people.

Combustible waste from both households and industrial sources is collected from the southernmost region of Sweden. The total energy produced through combustion amounts to approx. 1,000 GWh annually. In the new line 3 plant it is used to generate 135,000 MWh electricity and 540,000 MWh hot water for the district heating system. Thus, approximately 40% of the heating requirements of Malmö and its Burlöv suburb (population ~300,000) are covered and electricity for 17,000 households is generated.

The new plant manages some 200,000 tons of combustible household and industrial waste per year. Together with the older Sysav waste-to-energy plant, Sysav manages 400,000 tons of waste per year.

Operating 24 hours a day and almost 365 days a year, incineration temperatures are exceeding 900°C. No additional fuel is necessary to support the process.

### The cleaning process

When incinerating waste, a careful and effective cleaning process of the flue gases is necessary. Therefore an advanced cleaning process has been installed within the system.



### If there is heat, why use a heat pump?

The steam generated by incineration energy is expanded in the turbines, producing electricity. Then it passes through the heat exchanger of the district heating system, where it is heating the water to 80°C–115°C while condensing. In a closed cycle, the water flows back to the incineration heat exchanger and is transformed to steam again.

As the flue gas passes through a series of filter systems, it heats up water in the wet type scrubber. Using this water as source for a heat pump, the district heating return temperature is lifted from 50°C to 59.3°C, thus enhancing the overall efficiency of the entire waste-to-energy plant.





### Plant control system

A Siemens S7 type PLC control system supplied by Friotherm is used for local control and supervision of the heat pump units. It is connected to the central building control system type ABB Avant.

### Service and maintenance

Specialists of Friotherm are maintaining the two Unitop® 28C. They also carry out the regular service works.

### Legend

- 1 View of the two waste-to-energy plants at Sysav, Malmö. © Göran Buhre
- 2 View from the crane cabin into one of the waste silos. © Göran Buhre
- 3 A Sysav employee is controlling the proper operation of the fire grid. © Göran Buhre
- 4 One of the two Unitop® 28C units, in the works of Friotherm. Right the water cooled motor, left the sound cover with the compressor inside. Behind, the heat pump condenser and below the evaporator.
- 5 Sysav staff in the control room of the waste to energy plant. © Göran Buhre
- 6 Principle of the waste-to-energy plant, with district heating and power generation. © Lars Werstam

### Unitop® 28C heat pump

The Unitop® 28C is equipped with shell and tube type heat exchangers for evaporation and condensation of the refrigerant type R134a.

### Main features of the Unitop® 28C

- Open-type single stage compressor
- Refrigerants: halocarbon/hydrocarbon
- Integrated planetary type gears
- Tough industrial design with vertically split casing for easy maintenance
- Suited for all drive systems
- High efficiency over the entire range
- Operating temperatures - 40°C/+80°C
- Multiple compressor units available
- Operation in series or in parallel
- Large capacity, small floor space

### Technical Data

#### Incineration plant

Incineration capacity	25 t/h
Operating time	8,200 h/year
Primary heat exch.	40 bar, 400 °C
Energy equivalent elect. and Energy equivalent heat	16 - 19 MW and 45 - 65 MW

#### Flue gas cleaning steps

1. Separation of solid particles with electrical filter
2. Wet type scrubber for separation of chlorides, SO<sub>2</sub>, heavy metals, etc.
3. Electro-Venturi filter for separation of organic matters
4. Electro-Venturi filter for separation of nonorganic matters
5. Catalytic cleaning from Nitrogen oxides

#### 2 Heat pumps Unitop® 28C, each

Heating capacity	9,500 kW
Power absorbed	1,750 kW
COP	5.43
Heat source temp. in	+34.2 °C
Heat source temp. out	+24.3 °C
Heating water temp. in	+50 °C
Heating water temp. out	+59.2 °C
Capacity control	10 - 100%

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