



The european wood energy road [©]



Hartberg: Steam screw engine at district heating plant

Cogeneration ability added to district heating plant

WBG – Wärmebetriebe Gesellschaft mbH has been operating the Hartberg district heating plant since 1987 with the biggest biomass saturated steam boiler; the plant supplies process heat to a nearby industrial milk and grain drying enterprise via a steam boiler and supplies district heating to most of the town of Hartberg via a steam/water heat exchanger. During construction the planners considered installing a cogeneration system but this

district heating is provided by the condensation system of the cogeneration module (steam screw engine condenser). The rest is (peak and light load) supplied by the existing heating condensers of the saturated steam boiler (with pressure control governed by flue gas temperature and O₂ level).

The cogeneration system is operated on the basis of heat demand and is controlled in such a way that the heat derived from the steam screw engine process can be utilised completely. Thus, the system is achieving a high level of overall efficiency. After passing through the superheater and the downline injection cooler, the steam generated in the biomass water tube boiler enters the screw engine (steam parameters: 255 °C, 25 bar_g), where it is expanded to 0.5 – 1.5 bar (corresponding to 82 to 112 °C) depending on the required flow temperature of the district heating grid.

After leaving the screw engine, the exhaust steam condenses and delivers its useful heat (approx. 4.800 kW at nominal load) to the district heating grid.

The screw engine used at the Hartberg heating plant consists of a smaller high-pressure stage and a larger low-pressure stage, which are connected by a gear unit and drive an asynchronous generator. The nominal electrical capacity of the screw engine unit is 730 kW_{el}.



Biomass CHP plant Hartberg - water tube steam boiler (18 MW_{th}), CHP module (710 kW_{el}), dry electrostatic precipitators

was not economically efficient under the general conditions at the time. The plan was reconsidered in 1999.

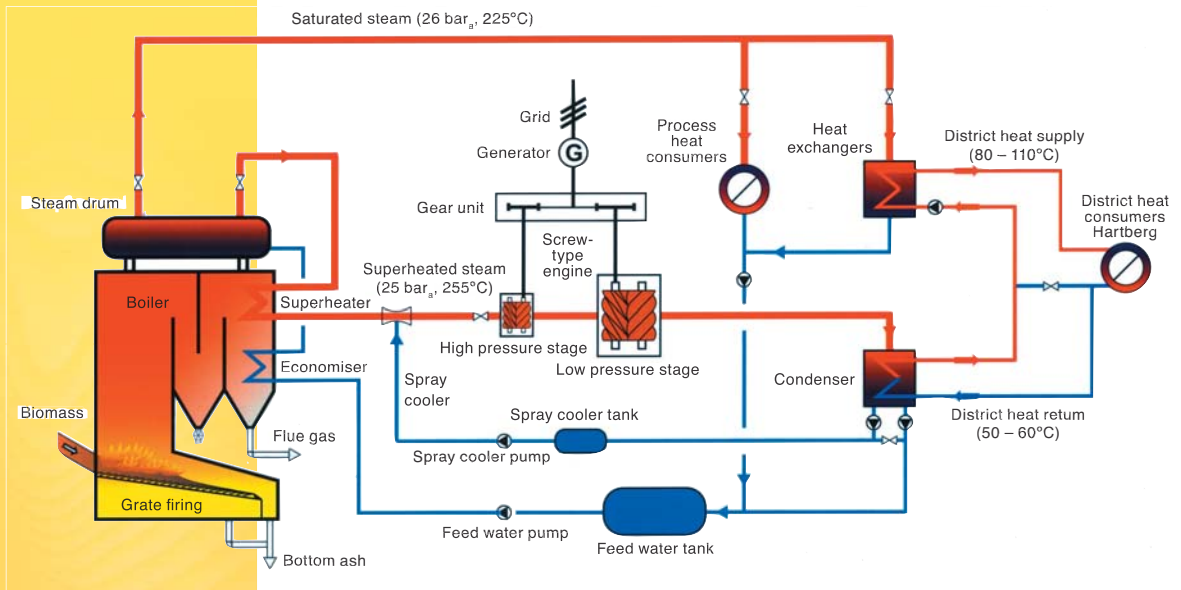
Steam screw engine

For the first time anywhere in the world a steam screw engine (SSE) was installed in a biomass heating plant. Based on the annual load duration curve of heat production for the district heating grid, an optimised cogeneration system was installed with the aim of maximising the energy yield and the number of full-load hours. Around 80% of the heat demand for the

Information about the municipality

Altitude:	365 m
Inhabitants:	6.547
Area:	21,53 km ²
Woodland:	437 ha





Flow diagram of the overall process:

Projecting and heat connection was carried out by WBG. Conception, Integration of the whole system and planning was done by BIOS BIOENERGIESYSTEME GmbH, Graz. EU-Demonstrationsprojekt No. NNE5/2000/467

Fuel supply

The biomass boiler is fired with a variety of fuels – forest chips, industrial chips, bark, sawdust and lopwood – totalling 100.000 bulk cubic metres, with bark making up the largest percentage (60.000 bulk m³). The heat generated totals 60.000 MWh. The cogeneration unit delivers 20.000 MWh excess heat, producing 3.000 MWh of electricity.

Economic and technical specifications

Year of commissioning:	1987
Investment: boiler and heating grid	12.000.000,- Euro
Own capital	11.700.000,- Euro
Province / EU subsidy	1.100.000,- Euro
SSE investment:	2.560.000,- Euro
Number of customers:	220
Connected load:	20.000 kW
Number of boilers:	1 (and 1 backup)
Boiler capacity:	20.000 kW
short term max.	25.000 kW
Flue gas cleaning:	electrostatic precipitator
Fuel / annual fuel volume:	100.000 m ³
Heat generated:	65.000 MWh
Head sold:	60.000 MWh
Total storage size:	19.000 m ³ .
Storage building	6.000 m ³
Energy rate:	
Index linked to Group IV	
Lighting and heating:	4,36 Cent/kWh
Grid length:	18 km

Information / Contact

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Installation of SSE

