

## Energy-efficient CHP plant

The Dava combined heat and power (CHP) plant in Sweden, which utilizes municipal waste and forestry residues as fuel, is reported to be the world's most energy-efficient plant. Of its 65 MW output, 10 MW is supplied as electricity to the local grid. For the first time in a plant of this kind, compressor heat pumps are being used to recycle heat contained in the flue gas. Excess heat from electricity production is also recovered.

The plant incorporates Sweden's third largest boiler for waste incineration. At full capacity, it can combust 20 t/h of waste at temperatures of 850°-1,000°C. Most of the primary air for incineration comes from below the moveable, water-cooled grate. Above the fuel bed, secondary air as well as recycled exhaust gas are drawn in through holes in the walls of the boiler. The air helps to maximize combustion while the exhaust gas, which comes from the first stage of flue gas cleaning, reduces the formation of nitric oxide. Ammonia, injected into the boiler, above the fire, also helps minimize the formation of this polluting gas, while active carbon (finely-powdered coal dust) binds dioxins and heavy metals.

The boiler heats water to produce high-pressure steam at 400°C. This steam drives a turbine to produce electricity, before passing through heat exchangers. Here, cool return water from the district heating network is heated to between 80° and 120°C. A flue gas boiler cools exhaust gas from the main boiler to 150°C. Excess heat is recovered and used to preheat water for the main boiler and to reheat the flue gas during the final stage of the cleaning process. Ash is knocked off the tubes of the boiler by large mechanical hammers and collected in a silo. Slag and larger ash particles are quenched in a water bath. After dewatering, any iron present in the slag is separated and sold.

Steam produced by the boiler drives a turbine (6,500 rpm) connected to a generator, through a gearbox that gears down the rotation to 1,500 rpm. The generator produces about 70 GWh/y of high-voltage electricity (10 kV), which is fed to the national grid. The Dava facility itself uses a third of the electricity produced. *Contact: Mr. Michael Rantil, FORMAS, P.O. Box 1206, S-111 82 Stockholm, Sweden. Tel: +46 (8) 7754 067; Fax: +46 (8) 7754 010; E-mail: info@formas.se.*