



Reduction in  
Greenhouse  
Gas Emissions



Best Available  
Technique

## USING HOUSEHOLD WASTE FOR HEAT AND POWER

**In Kotka, Finland, a waste-to-energy plant has been constructed that incinerates household waste and produces district heat, process steam and electricity without releasing hazardous emissions into the atmosphere. The plant operation replaces the use of fossil fuels and at the same time takes care of waste that would otherwise have gone to landfill. ÅF has been involved throughout the project, from start to finish.**

Household waste contains a great deal of energy. This energy can be used for a variety of purposes, instead of just leaving the waste as landfill as is common practice in many cities throughout the world. Combustion

**ÅF was assigned by Kotka Energy OY throughout the project to construct a waste-to-energy plant that will reduce carbon dioxide emissions by 80,000 tonnes per year.**

tion of waste generates heat that can be used for the production of district heat and process steam for industry, as well as to generate electricity. This can replace fossil fuels and thereby reduce emissions of greenhouse gases.

### Environmental benefits

Apart from making the scenery more pleasant, avoiding landfill heaps also has environmental benefits: it reduces the potential leakage of toxic substances into the surrounding soil and water. It also avoids emissions of methane, which is a greenhouse gas with a global warming potential 25 times greater than that of carbon dioxide, seen over a 100-year perspective.

### Energy from household waste

Kotka is a small town located in southern Finland, on the Gulf of Finland and less than 30 kilometres from the Russian border. The city has fewer than 60,000 inhabitants. The household waste generated in Kotka used to be placed in landfills. Now, since the construction of a 34 MW fuel waste-to-energy plant, the waste is dealt with in a much more sustainable way. ÅF has taken part in this work from an early stage and followed it right through until the plant was commissioned.

### Energy from industrial waste

The Kotka plant collects waste not only from Kotka but from right across south-eastern Finland, an area with about 540,000 inhabitants. In addition to household waste, which constitutes about 94 percent of the total by weight, some industrial waste is used in the plant. The industrial waste is mostly taken from a cardboard factory located close to the plant, and consists of waste products from production that the factory is not able to utilise in its processes. Before the plant was built, the cardboard factory delivered its waste products to landfill.

In the waste-to-energy plant between 85,000 and 100,000 tonnes of waste is incinerated each year. The capacity of the grate boiler is 10.6 tonnes per hour at full load, and it works at a steam temperature of 400°C and a pressure of 41 bar. The actual capacity of the boiler depends on the heat value of the waste, which can vary between 8 and 14 MJ per kilogram. If the heat value of the waste is low, a larger amount of waste is needed to achieve the desired heat output.

### ÅF involved all the way

ÅF came in at an early stage and performed a feasibility study. Later on ÅF made an environmental impact assessment (EIA) and worked out the environmental permits that were needed for the project to be approved. This was followed by pre-engineering, inquiries, tender evaluations and the preparation of contracts for main equipment. Later, when the project implementation phase started, ÅF was employed as an EPCM (Engineering Procurement Construction Management) consultant for Kotka Energy. The consultancy work included overall project management, design, procurement, delivery control, various site activities, plant commissioning and much more.



Between 85,000 and 100,000 tonnes of waste will be incinerated each year in the Kotka waste-to-energy plant.

**Steam and district heat**

Out of the total fuel load of 34 MWf, 10–20 MW is generated as process steam, 4–20 MWth is district heat, 4–8.5 MWe is electricity. The process steam is used by the cardboard factory and two other industrial customers located nearby, who use the steam in their production processes. Before the Kotka waste-to-energy plant was constructed, the cardboard factory used a natural gas fired boiler. The greenhouse gas emissions have thereby been reduced substantially. Currently the natural gas boiler is needed only during the maintenance outages of the waste to energy plant. The district heat is delivered to the town of Kotka, which can now reduce its use of natural gas.



Handling household waste in the Kotka waste-to-energy plant.

**Less fossil fuel needed**

The electricity generated is supplied to the national electricity grid. According to IEA (International Energy Agency), about 40 percent of the electricity generated in Finland originates from fossil fuels. By supplying electricity generated from burning waste products, the share of fossil fuel is reduced in the national electricity mix.

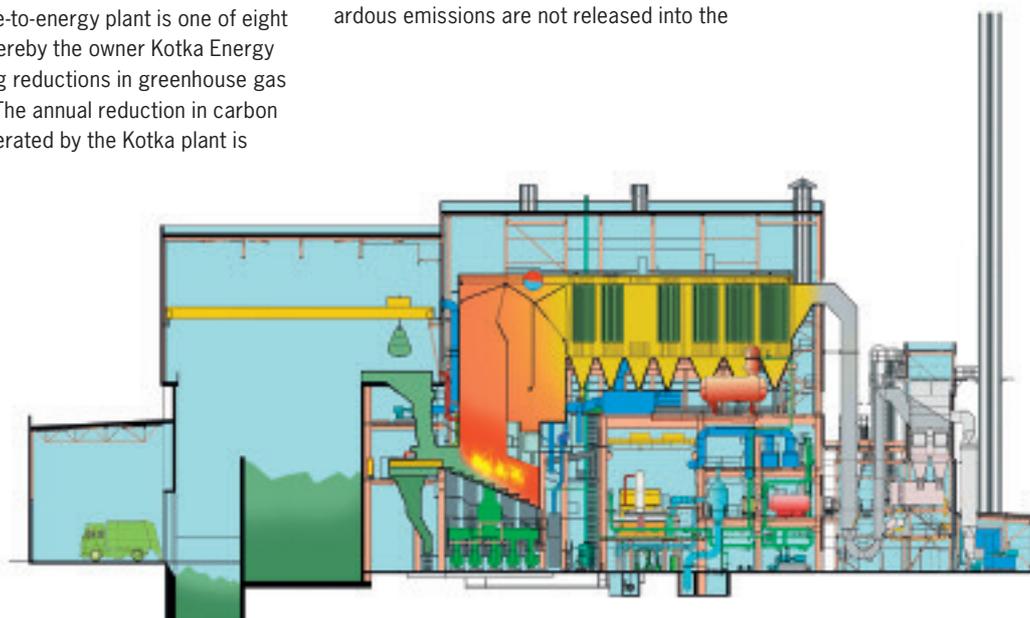
The waste-to-energy plant is one of eight projects whereby the owner Kotka Energy OY is making reductions in greenhouse gas emissions. The annual reduction in carbon dioxide generated by the Kotka plant is

estimated to be 55,000 tonnes for year 2009 and from then on 80,000 tonnes per year. The reduction reflects higher system efficiency thanks to combustion and fuel change.

**State-of-the-art flue gas cleaning**

When burning waste there are strict environmental regulations to make sure that hazardous emissions are not released into the

atmosphere. The plant is constructed using the Best Available Technology and the flue gas cleaning is state of the art. The flue gas is monitored thoroughly and continuously and shows that emissions of toxic substances are well below the accepted threshold limit values.



A cross-section of the Kotka waste-to-energy-plant.