

## Waste-to-Energy Plant

# I/S Fasan, line 4

# Næstved, Denmark



**I/S FASAN is a union of 14 municipalities in South Zealand, which treats all waste from the municipalities.**

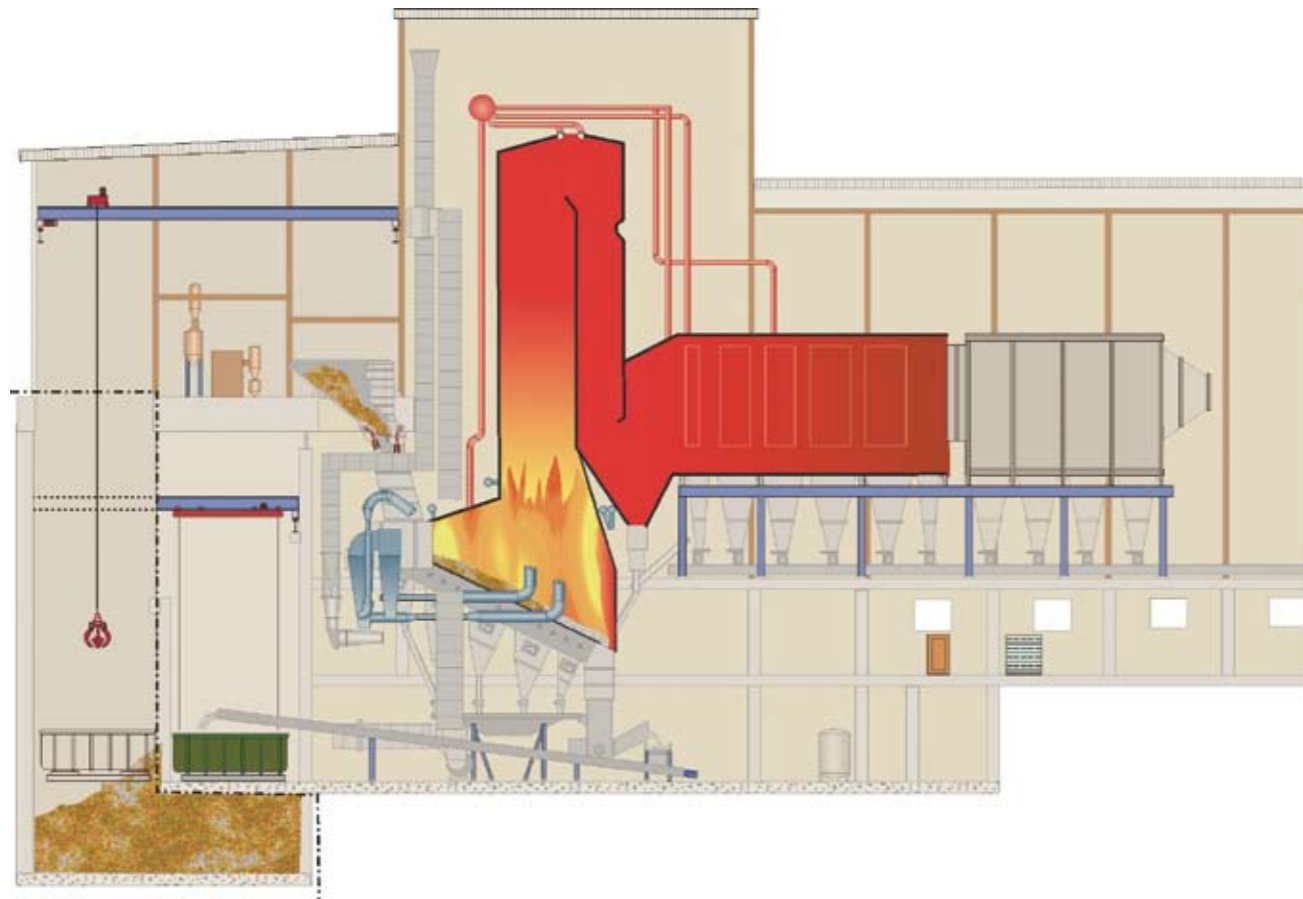
The waste treatment consists partly of the sorting and reuse of waste and partly of the combustion of waste with subsequent supply of heat to Næstved district heating station and generation of electricity for the supply grid. In total, I/S FASAN is presently supplying 200,000 citizens in the area, and in 2006 the waste-to-energy plant treated 115,000 tons of waste, resulting in an annual production of 13 MW of electricity and 50 MW of district heating.



*The combustion system is based on the latest state-of-the-art technology, a combination of the BS and Vølund Systems.*



# Combined Heat and Power Plant



Since 1982 Babcock & Wilcox Vølund A/S (BWV) have been main suppliers of the combustion systems at FASAN. In 2003 FASAN and BWV signed a contract for the construction of combustion line 4, which has a nominal capacity of 8 t/h and generates steam for an existing turbine.

### Plant hand-over ahead of schedule

The new line was handed over to the customer in 2006 – three weeks ahead of schedule. The project is a great example of excellent project management and good cooperation. All guarantee data were observed without any problems.

### New generation of combustion technology

The combustion system is based on the latest state-of-the-art technology from Babcock & Wilcox Vølund; a combination of the very best technologies from the BS and Vølund systems and the latest results from a number of research and development projects within control, CFD and combustion technologies.

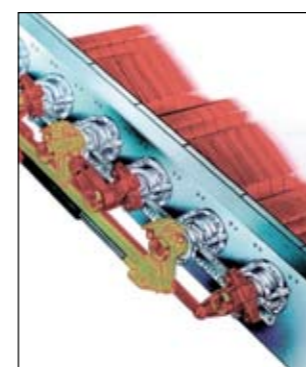
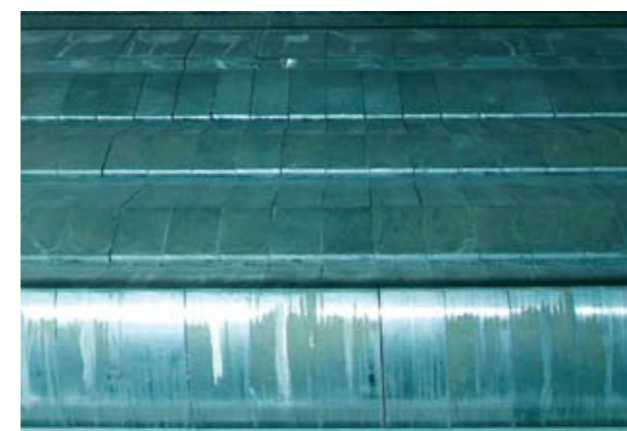
### The BS waste grate – high efficiency combustion and energy utilization

The BS-W mark 5 grate is the result of 40 years of development. The air-cooled grate is ideal for the incineration of both domestic and industrial waste because of the high efficiency combustion, excellent utilization of energy and good bottom ash quality.

The grate for line 4 is a single-lane grate, which is prepared for conversion into a water-cooled system if this should become necessary some time in the future. The BS grate system is capable of handling all sorts of unsorted solid waste and can be used for co-combustion with biomass.

### Grate design

In order to control the thickness of the fuel bed, the grate is made up of a number of individually controlled sections. Each grate section has a complete drive mechanism consisting of double-action hydraulic cylinders and control valves.



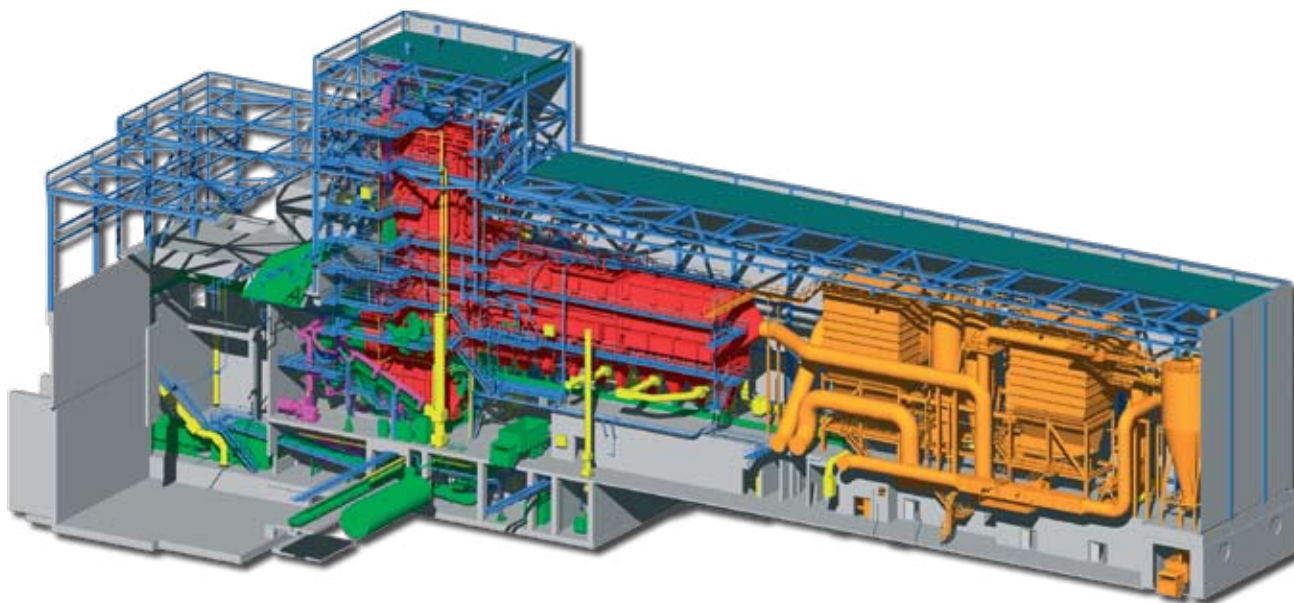
During grate operation the shafts will alternately turn to their respective extreme positions. The grate bed forms a step-shaped surface where the steps change places, which provides a wave-like movement with a breaking and stirring effect. At the same time the

waste is moved forward, and an optimal supply of combustion air is achieved.

- As there is no physical contact between moving grate parts, wear and tear will be limited, and grate exposure to mechanical influence will be minimal.
- Because of the effective mechanical breaking of the waste on the grate, all parts of the waste will be exposed to the heat radiation from the furnace and to the combustion air.

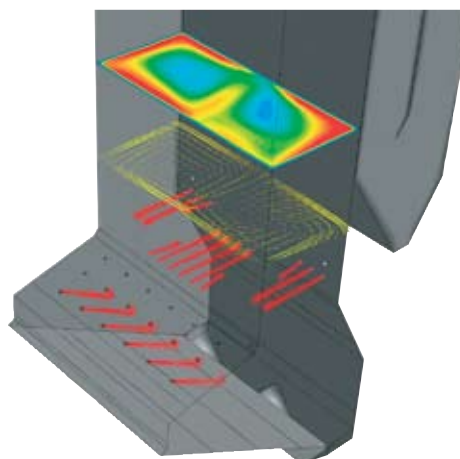
- This, in combination with the effective distribution of air, ensures controlled and effective combustion and stable energy production.

The combustion on the grate is sub-stoichiometric – i.e. with reduced air supply. In this way low temperatures are obtained in the waste bed on the grate, and the melting of the ash into large lumps and the confinement of combustible components are reduced to a minimum. This results in high efficiency combustion and fine-grained ash. The guarantee measurements made at FASAN show a typical content of organic matter in the ash of 1/4 to 1/2 % TOC. The slow, continuous movement of the grate produces very little dust and fly ash in the gas flow, resulting in reduced filter load.



**VoluMix™**

A VoluMix™ system is installed at the inlet of the 1st pass, consisting of a nozzle arrangement that ‘pushes’ the flue gas to make it move in two, spiral resembling lines. The purpose of the VoluMix™ is to ensure good, turbulent mixing of the flue gases and consequently a better combustion process and burnout as well as proper filling of the 1st pass with flue gas. This results in better heat absorption in the boiler. Furthermore, VoluMix™ may also prevent recycling zones in the 1st pass.



The whole plant has been designed on the basis of the results of detailed CFD calculations and analyses, which have also been applied in the development of the VoluMix™ system.

The impact of the VoluMix™ is obvious because of the extremely low content of CO and TOC in the flue gas, as these substances are indicators of the completeness of the combustion process.

The principle of the plant design is a midstream furnace followed by a boiler with 2 1/2 empty radiation passes and a horizontal convection part and economiser. The boiler radiation passes are protected against corrosion with refractory lining and Inconel®.

Process parameters	Unit	Process values
Waste capacity	t/h	8
Heat value, lower	MJ/kg	12
Steam output	t/h	30 1/2
Steam temperature	°C	405
Steam pressure	bar	54
Energy input	MW	26.6
Heat efficiency	%	85,7
TOC, bottom ash	%	1/4
Flue gas temp. before SH	°C	620
Exit temp. boiler	°C	180
NOx	mg/Nm <sup>3</sup>	137
CO	mg/Nm <sup>3</sup>	~ 0
TOC, gas	mg/Nm <sup>3</sup>	~ 0

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