HERNING CHP PLANT

DONG energy

HERNING CHP PLANT
IN BRIEF

Herning CHP Plant is one of DONG Energy's local CHP plants located south-east of the city of Herning. The CHP plant was commissioned in 1982 to cover a specific heat demand in the Herning/Ikast area and was integrated in the existing district heating system. The CHP plant was designed to cover approximately 85 per cent of the expected district heating demand in the area.

Herning CHP Plant was originally designed for coal- and oil-firing, but has in three operations been converted to combustion of biofuels. In 2000, the CHP plant was converted to firing natural gas/oil, but already in 2002, the plant was converted to firing wood chips as the main fuel, supplemented by natural gas. Finally in 2009, the boiler was redesigned to replace the main part of the natural gas share with wood pellets. The change from coal through natural gas to almost 100 per cent biomass has resulted in a considerable improvement of the environmental conditions – the CO_2 emission in particular.

At Herning CHP Plant, 87 per cent of the installed capacity is utilised; 28 per cent for power production, 59 per cent for heat production and only 13 per cent is lost. Co-generation of heat and power provides a better utilisation of the resources.

The power production follows the seasonal fluctuations in the heat consumption as power cannot be produced without producing district heating to the district heating system or small-scale storing the district heating in the accumulator.

Technical key data

- Max continuous power output (net): 89MW
- Max district heating production: 174MJ/s
- Annual wood chip consumption: 280-290,000t
- Annual wood pellet consumption: 70-80,000t
- Consumption for start-up: 3.5 million Nm^3 natural gas/8-10,000t biooil
- Wood chip consumption at full load: 48t/h
- Natural gas consumption at full load: 26,000Nm^3/h
- Boiler max steam production: 425t/h
- Steam pressure: 115 bar
- Steam temperature: 525°C

Process from wood chips and wood pellets

70 per cent of Herning CHP Plant's energy demand is covered by wood chips whereas the remaining 30 per cent is covered by wood pellets. Herning CHP Plant thus predominantly utilises domestic fuels.

Wood chips

Herning CHP Plant is Denmark's largest wood chip-fired plant with an annual combustion of 280-290,000 tonnes of wood chips. The wood chips come from the large central and western Jutland plantations and forests at a distance of up to 120 kilometres from the CHP plant. 75 per cent of the wood chips is chopped directly in the forests whereas the last 25 per cent is stored and supplied in the form of three-metre long logs which are chopped at the CHP plant.

A new, modern reception system, consisting of weighhouse, sampling system, unloading pit and wood chip storage, has been built for receipt of the large number of lorries arriving daily at the CHP plant. In addition, an unloading table and a system for wood chopping have been established.

After receipt and pre-processing, the wood chips are conveyed to the wood chip storage capable of holding 13,000m^3 wood chips, corresponding to approximately 75 hours of operation.

Wood pellets and start-up fuel

Herning CHP Plant uses approximately 70-80,000 tonnes of wood pellets on an annual basis. The wood pellets are supplied to the plant by lorries and from the receipt system they are conveyed to silos. Herning CHP Plant can use oil or natural gas as start-up fuel, but in future they are expected to use biooil and thus obtain a 100 per cent CO_2-neutral fuel combination.

The plant is started by injecting start-up fuel through six burners placed on the rear wall of the 45-metre high boiler. Wood chips are supplied only when the boiler has reached a stable temperature. For fire technical reasons, wood chips are conveyed to a buffer silo prior to being evenly distributed on the 90m^2 large firing grate via six so-called wood chip spreaders. The wood chips are fully burned out on the grate in 10-20 minutes.

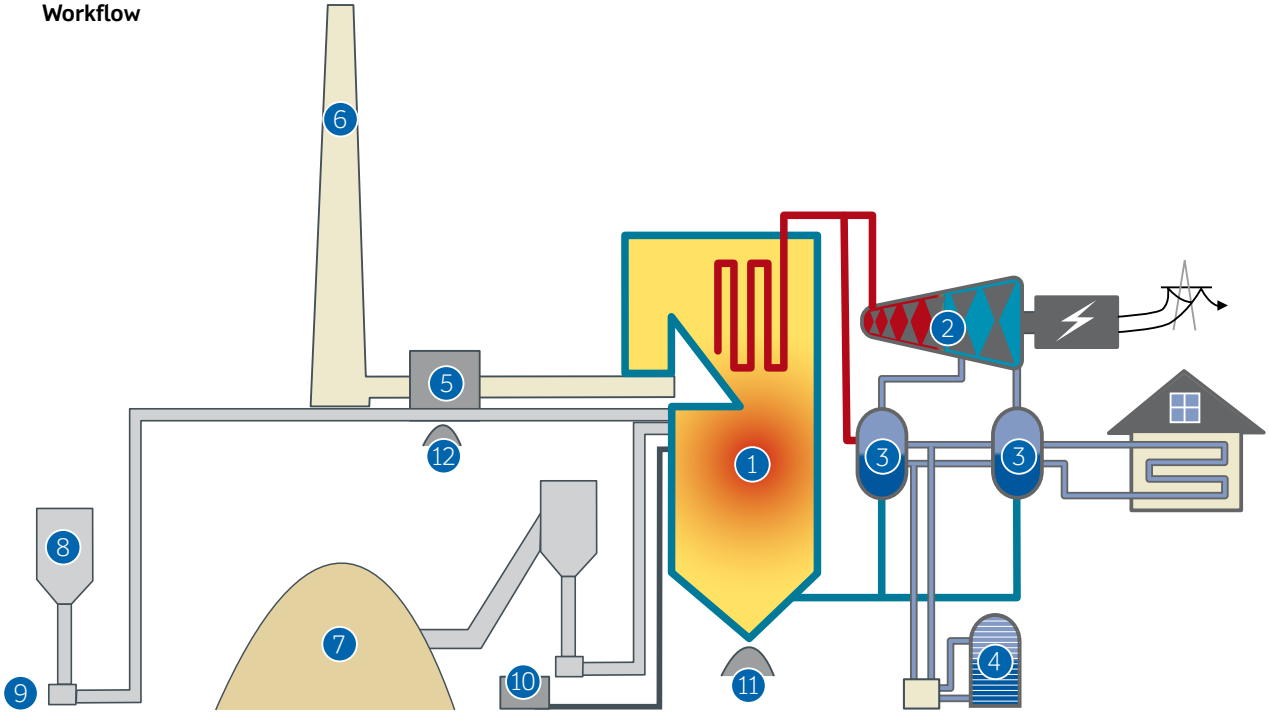
The maximum hourly wood chip share of 48 tonnes is obtained already at 60 per cent boiler load (production capacity). To further increase the production, it is necessary to add wood pellets. From the silos, they are conveyed to grinding mills where they are ground into fine wood dust. From here the wood dust is blown into the boiler through four of the burners and combusts in the furnace.

Heat and power

The temperature in the boiler heats the steam in the boiler pipes to a temperature of up to 525°C, and with a pressure of 115 bar, the steam is lead to the turbine where the steam energy is converted into rotation energy.

The turbine operates the generator and produces electricity. Having passed the turbine, the steam still contains thermal energy which is used to heat the district heating water in the two heat exchangers. The steam is thus cooled and condensed back to water which is returned to the boiler.

Workflow



1 Boiler	4 Accumulator	7 Wood chip storage	10 Natural gas/biooil for start-up
2 Turbine/Generator	5 Electrostatic precipitator	8 Wood pellet silo	11 Bottom ash
3 Heat exchanger	6 Stack	9 Grinding mills	12 Filter ash

HOW TO
PRODUCE ENERGY

Power and district heating

Herning CHP Plant produces approximately 320 million kWh power annually which covers a normal power consumption in approximately 70.000 households. The power produced is sold by DONG Energy on commercial terms at the nordic power exchange Nord Pool.

District heating

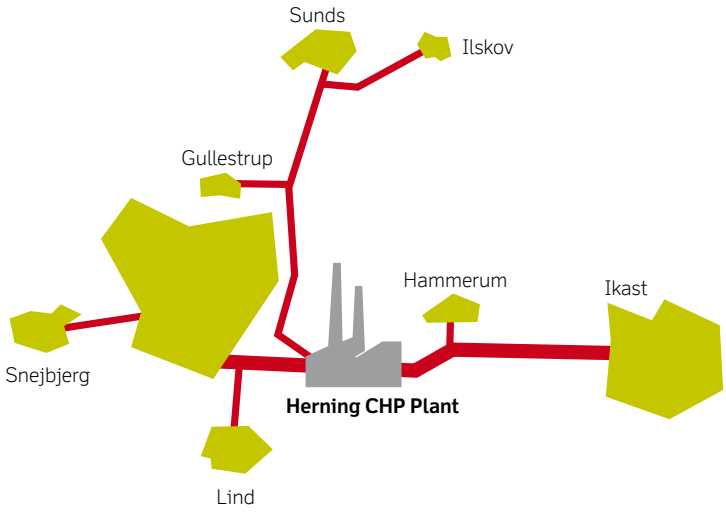
The district heating to the municipalities of Herning and Ikast is supplied at the fence, so to speak. From here the district heating is led through an approximately 35-kilometre long transmission line to district heating stations in Herning and Ikast and further to the consumers.

The flow temperature is 83-90°C and the return temperature is 38-55°C depending on the season. During winter half-year, the total circulating quantity of water may reach 4,400m³/h. Within the established supply area in the municipality of Herning, approximately 27,000 households (99% of all households) are supplied with district heating from the CHP plant and in the municipality of Ikast, approximately 10,000 households (95% of all households) are supplied with district heating.

Accumulator

Surplus district heating can be stored in the accumulator which is basically a large thermos. Surplus heat produced in periods with a large power production can subsequently cover the heat demand in periods with a low power production, for instance at night.

The accumulator holds 35,000m³ district heating water with energy corresponding to 6-7 hours of maximum heat production.



HERNING CHP PLANT
FROM ABOVE

1 Wood chip silo

2 Wood chip storage

3 Boiler building

4 Wood pellet conveyor

5 Administration/workshop

6 District heating accumulator

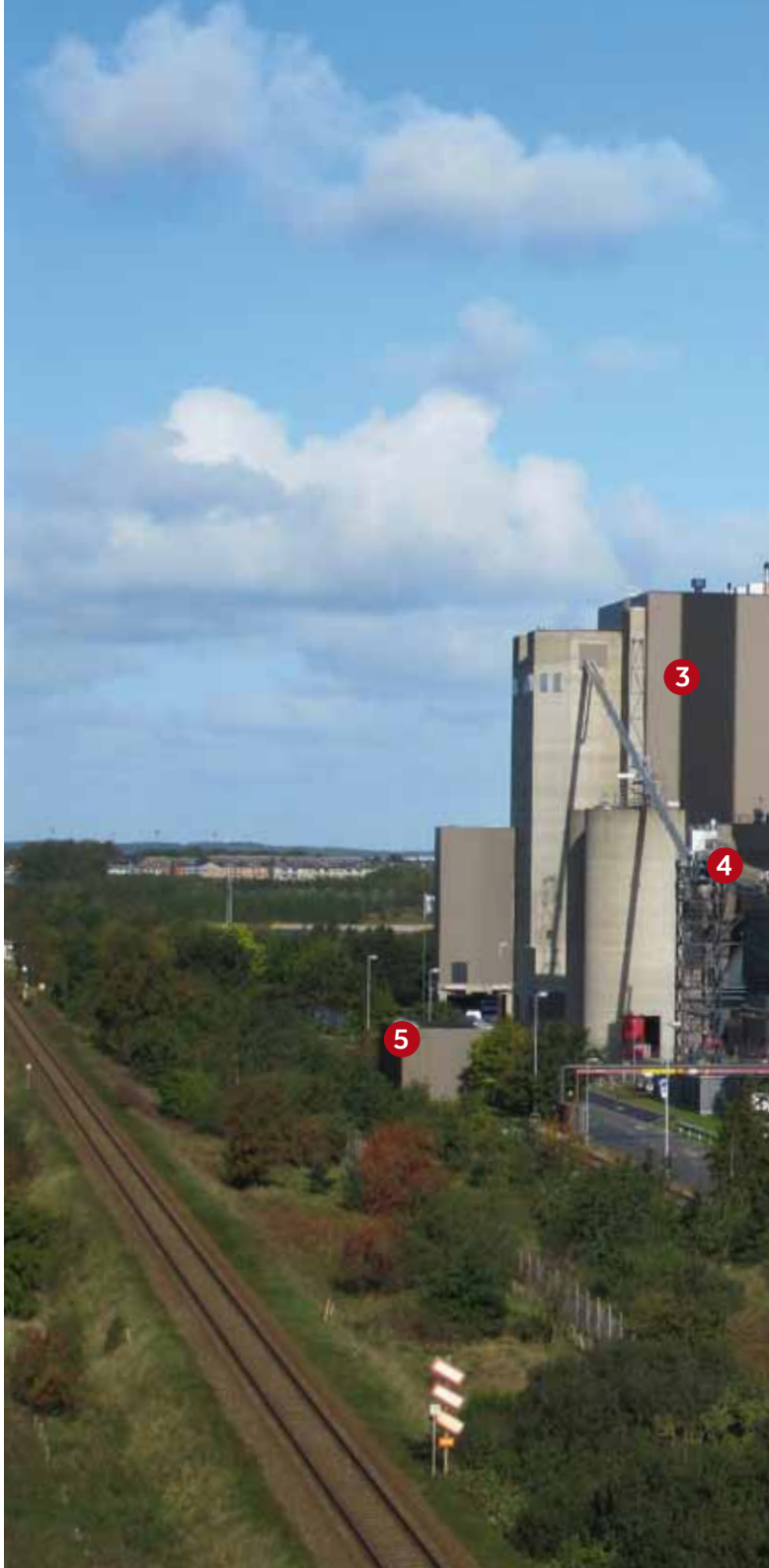
7 Turbine building

8 Oil tank

9 Wood chip conveyor

10 Stack

11 Unloading pit for wood pellets

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HERNING CHP PLANT
AND THE ENVIRONMENT

The combined heat and power production at Herning CHP Plant provides a better utilisation of the resources than separate heat and power production. A production on eco-friendly and CO_2-neutral fuels such as wood chips and wood pellets ensures a resource and ecologically conscious production based on DONG Energy's vision to reduce the use of fossil fuels.

Environmental impact

With the conversion of Herning CHP Plant to wood chips and wood pellets, the emission of hazardous substances in the form of carbon dioxide (CO_2), sulphur dioxide (SO_2) and nitrogen oxide (NO_x) has been reduced considerably.

The combustion of biofuels like wood chips is CO_2-neutral as the amount of CO_2 emitted during the combustion process corresponds to the CO_2 consumed by the plants during growth.

Emissions to the air through stack

The forests

Using wood chips as fuel, the forest districts get the opportunity to supply thinning wood, thus contributing to advance the silviculture procedure.

Focus on the use of by-products

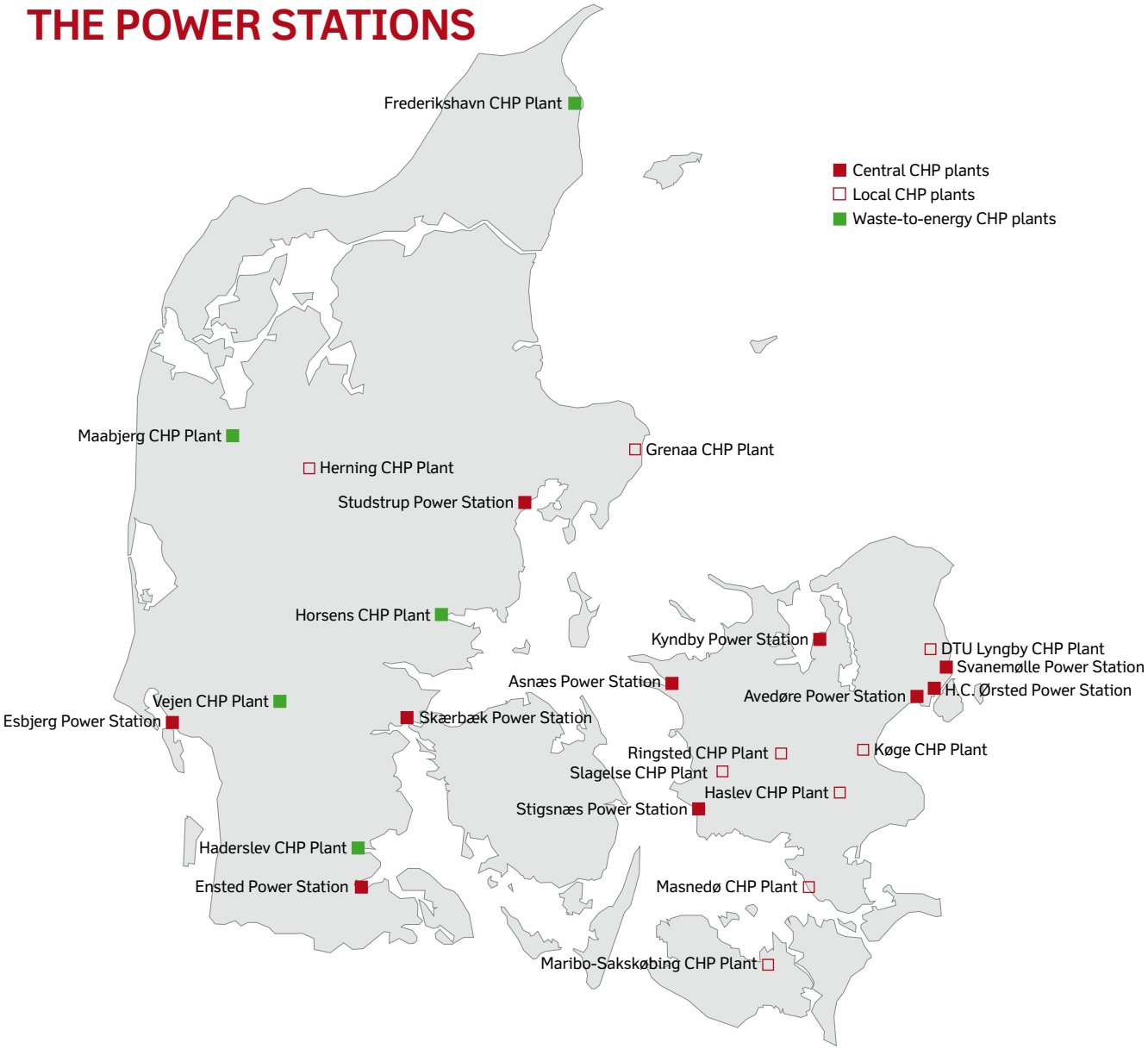
The by-products in the form of ash from the combustion of wood chips and wood pellets make out 1-1½% of the installed capacity of wood chips and wood pellets. The ash consists partly of fine ash particles collected in an electrostatic precipitator in connection with flue gas cleaning and partly of coarse bottom ash which remains in the slag collector under the boiler grate. The bottom ash is utilised for composting and in the cement industry.

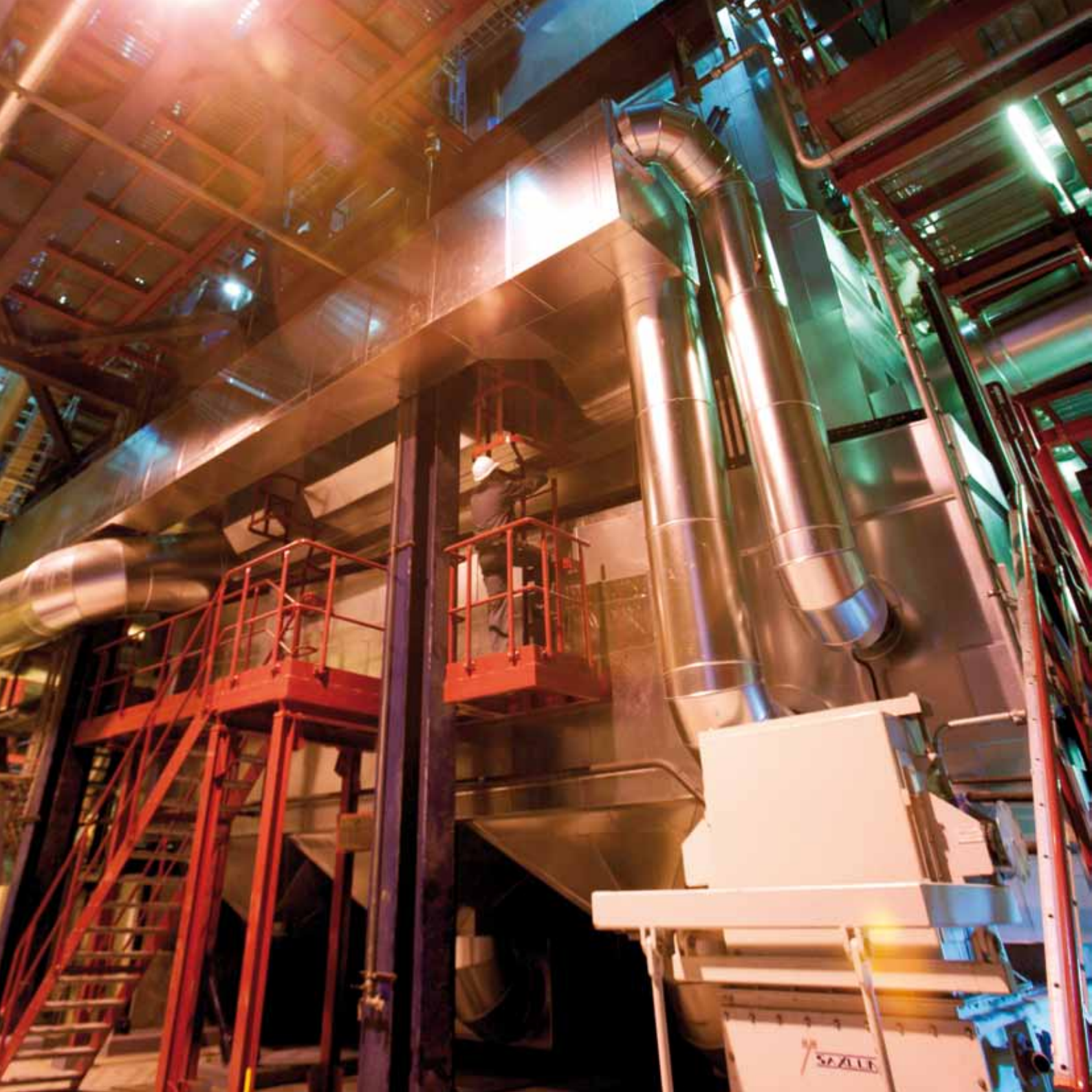
The fine ash particles are presently reused in a project in Norway. We are focusing on other reusabilities.

Waste water and noise

During many years, Herning CHP Plant has been focusing on reducing the water consumption by collecting, purifying and reusing the water used in the auxiliary processes. Furthermore, Herning CHP Plant has focused on reducing the noise exposure by making the buildings and installations soundproof.

THE POWER STATIONS




SAZILLE

DENMARK'S NEW
ENERGY COMPANY

DONG Energy is active in all phases of the energy supply chain – from offshore oil rigs in the North Sea, power stations producing heat and power, and wind farms, until we market the energy and transport it all the way to our customers' doorsteps in Denmark and abroad.

This ensures a highly reliable supply of energy and gives us the necessary expertise to develop our company for the future.

Innovation is a natural part of how we work. For more than 25 years, we have been involved in the extraction of oil and natural reserves in the North Sea, and our power stations are among the most efficient and eco-friendly in the world.

We are also at the cutting edge in the development of renewable energy, not least in the establishment of offshore wind farms.

DONG Energy has many years of experience. For more than a hundred years, we have been supplying heat and power to our consumers in Denmark and abroad – and since the beginning of the 1980s we have also been supplying oil and natural gas.

DONG Energy has increased its international activities significantly and is now an international energy company focusing on the North European energy markets. Today, the customers are free to choose their energy suppliers, and DONG Energy competes every day against other energy companies to be the customers' preferred supplier.

Yet still being a small player on an international scale, DONG Energy is developing its activities in all parts of energy supply to be well positioned for future competition on the energy market.

www.dongenergy.com

Pay a visit to Herning CHP Plant

Herning CHP Plant is pleased to arrange visits for groups and schools for a tour of our heat and power producing facilities.

If you would like to have further information about the visits, please contact Herning CHP Plant on telephone +45 99 55 16 60.

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