

# WORLD PREMIERE ON NEW BIOMASS TECHNOLOGY WILL ENSURE CHEAP DISTRICT HEATING



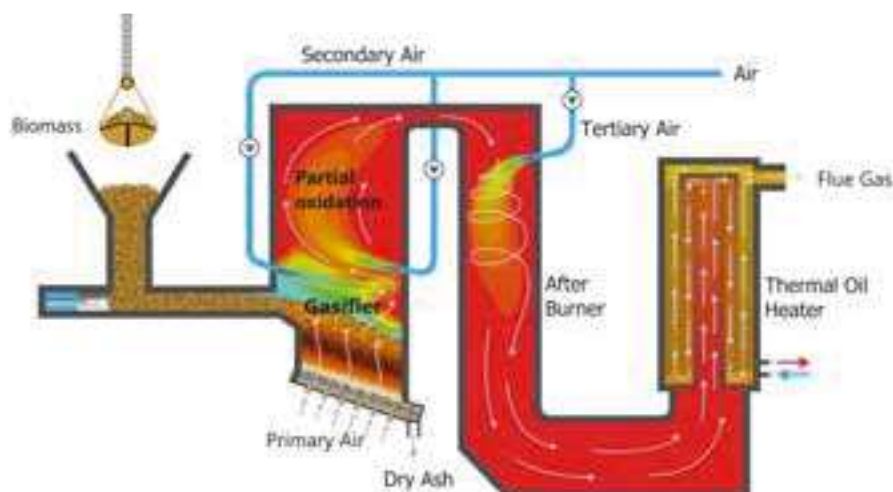
By Jens Dall,  
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Sindal District Heating Company has chosen a new biomass plant, which uses a new gasification technology to achieve fuel flexibility and a very high energy efficiency in order to ensure lower district heating prices in the future for the 1350 homes supplied by district heating.

In the Danish town of Sindal, natural gas is not welcome anymore; and biomass now enters the scene instead. However, the plant chosen is not a traditional burn-biomass-plant. Instead, the choice fell on a plant from Dall Energy, who has developed and built a brand-new type of biomass co-generation plant. The plant uses a newly developed gasification technology that supplies the thermal energy to an Organic Rankine Cycle (ORC) turbine to make both heat and electricity. Actually, this is the first time that such a plant is established ever, so everyone in the project team is very excited. The new plant was commissioned in the summer of 2018 - with official opening on September 15th, 2018 by the Danish Minister for Energy, Utilities and Climate, Lars Christian Lilleholt.

## CLEVER INVESTMENT

The budget of 65 million DKK (9 mio. €) makes the investment the largest investment locally and is one of the reasons why it has attracted a lot of attention in the town in the north of Denmark. However, it is a very sensible investment. The investment will pay back as the heating price can be lowered, since the new biomass plant is both highly energy efficient and fuel flexible. 90% of Sindal's heat demand can be covered by the new plant, so from now on, the district heating company will only use its traditional gas engines or gas boiler at peak load.





### LOW GRADE FUEL AND LOW PRICES

The district heating company had some high demands for the plants, including low content of dust, CO and Nox from the flue gas during the gasification process; fuel flexibility; lower prices; as well as being a plant that looks nice and fit well with the surroundings. With the new plant by Dall Energy, they got all that.

The plant has a very wide operation range. It will operate fully efficient from full load all the way down to 15% load, i.e. the plant can handle both daily and seasonal demand fluctuations.

One of the benefits of the gasification solution is that it is possible to use low grade fuel. The gasification technology can handle fuel with up to 60% moisture content, as well as dry fuel. The plant can use a combination of local and cheap fuels in the form of e.g. garden waste and other residues that cannot normally be used elsewhere,.

Instead of a relatively fast combustion of solid material, the reaction to gas occurs in a slow gasification process, after which the gasification gas is burned. Due to the low speed of gas and a good mix of gas and air are the level of dust, CO and Nox are very low after the gas combustion. Therefore, no flue gas filters are needed, which are often required for other types of biomass plants. The plant does not have cyclones or electric filters. The flue gas condensation unit increases the thermal efficiency by 25% and it also removes the particles of the flue gas without extra cleaning. The very low emissions means that the plant can settle with a short chimney, which can therefore be integrated into the building in a way that appear less dominant.



From the left: Anders Emus, Marc Centhner and Jesper Skrubbeltrang in front of the ORC turbine. KAN IKKE FINDE DET BILLEDE DER ER I WORD ??

### ADVANCED PLANT

The plant consists of a gasifier, a gas burner, a thermo-oil boiler, a flue gas condenser and an ORC-turbine plant. When the flue gas is passed through the heat exchangers of the thermal oil plant, the temperature is about 950 degrees Celsius. After yielding its energy to the thermal oil plant, the temperature is about 185 degrees Celsius. From the thermal oil plant, the heat can be directed to district heat exchangers or to the ORC plants turbine that produces electricity and heat. In the quench, the flue gas is cooled to 60 degrees Celsius, and in the flue gas condenser, the flue gas is cooled further, and the final energy is extracted. When the flue gas is led to the chimney, the temperature is as low as 40 degrees Celsius.



The fuel will be wood chips from Danish forests combined with local garden waste. The plant thus becomes truly CO<sub>2</sub> neutral - while resolving a "waste problem" in the form of garden waste (where a significant part is combusted with household waste in waste facilities).



## CONCLUSION

There is a general demand for new and revolutionary technologies and processes that are friendly to the environment as well as financially feasible. The new gasification process will, ultimately, result in lower heating prices. It is a smart technology, which means that it is not necessary to be making a lot of investments, which makes it a cheaper plant, which again benefits the customers in the form of lower prices. At the same time, the plant is also an example of "circle economy", i.e. the citizens' waste becomes the citizens' heat.

Explanation of the illustration of the combustion process

The combustion process in the plant consists of three steps:

1. Gasification of biomass
2. Partial oxidation where a part of the gas is burned and where tar substances and NOx are reduced
3. Combustion chamber where the gas is burned.

## KEY FIGURES FOR THE NEW PLANT

- Input power: 5.5 MW
- Electricity production: 800 kW
- Heat production: 5.0 MW
- 20-60% moisture in fuel
- NOx : 150 mg/Nm<sup>3</sup>
- Dust <20 mg / Nm<sup>3</sup>
- CO: 0-5 mg / Nm<sup>3</sup>
- 20% -100% load
- Fuel: Wood chips, garden / park waste

The plant is connected to the district heating network with a new 800 meters long pipe.

The existing natural gas-fired work will in the future only be used as a peak load backup.

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