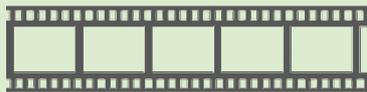
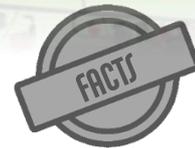


A Danish town supplements heat from solar panels using a straw boiler and almost phases out natural gas in the district heating system

Ørnhøj (Herning Municipality), Denmark  
2,000 tons of straw / year  
Started 2017  
District heating to around 500 consumers



### THE STORY

Ørnhøj is a town of 738 inhabitants (as of 2022), belonging to the Herning Municipality in Central Jutland Region of Denmark. Until recently, the district heating network of the town (serving 474 customers) was operated primarily with natural gas. In 2015, the district heating plant was acquired by Vildbjerg Tekniske Værker (Technical Works) which embarked on a process of modernizing and improving the overall operation.

Already in 2012, a new solar panel installation covering an area of 5,000 m<sup>2</sup> were installed. Solar energy can provide part of the heat demand of the municipality, but they are not sufficient for the winter months. Therefore, a decision to substitute natural gas by a new straw-fired boiler was made.

Construction of the new straw boiler was finished in summer 2017, with the plant entering operation for the first time in the 2017 -2018 heating season. A large, 2,500 m<sup>3</sup> storage facility was built next to the solar panels. The storage can house around 600 large square straw bales, which are equivalent to 25 days of heat production. In total, the plant is consuming around 4,000 straw bales per heating season. Straw is supplied in competitive prices by various local providers.

The main equipment for the straw heating plant was provided by Danish manufacturer LINKA, a company with significant expertise in straw combustion. A double shredder is installed in the straw storage area and the shredded straw is transferred with a 30 meter conveyor to the boiler. The boiler itself is fully automatic, with 5-passes ensuring high efficiency and complete burnout. An automatic ash extraction system to an ash storage room is installed, while a bag house filter ensures very low dust emissions to the atmosphere.

Through the installation of the straw-fired boiler, the inhabitants of Ørnhøj now get 70 % of their heat from carbon-neutral biomass; around 20 % is supplied by the solar panels and only the remaining 10 % by natural gas.



Challenger

- No major challenges reported; straw-fired district heating is a well-established practice in Denmark



Keys of success

- Cheaper fuel with more stable prices, which means more competitive heat prices for the consumers
- Appropriate choice of technology, allowing utilization of straw with high efficiency
- Installation of appropriate filters for keeping emissions within the limits of the Medium Combustion Plant Directive



Technology

- 2 MW automatic boiler by Danish manufacturer LINKA ([www.linkaenergy.com](http://www.linkaenergy.com)), designed for straw combustion
- Double straw shredder in fuel storage and 30 meter conveyor line
- Bag house filter for control of particle emissions



Economics

- Investment slightly over 12 mil. DKK (1.6 mil €)
- Straw price around 550 – 700 DKK/ton (75 – 94 €/t) in 2021
- Large annual fuel cost savings compared to natural gas



Community

- District heating plant is own by consumers
- Decision to switch to straw heating was made by general assembly
- Heat prices are much lower which means that the community is very happy with the solution

