

## Bioenergy Success Stories

IEA Bioenergy: 02 2018

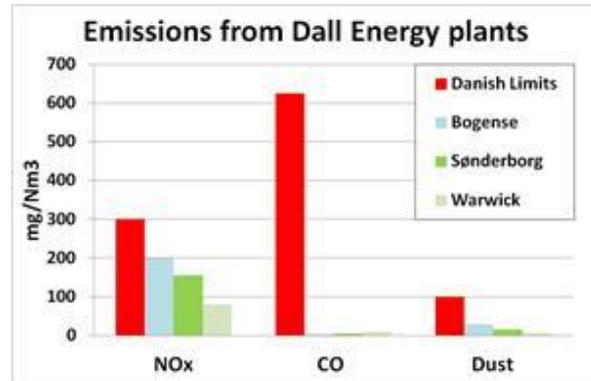
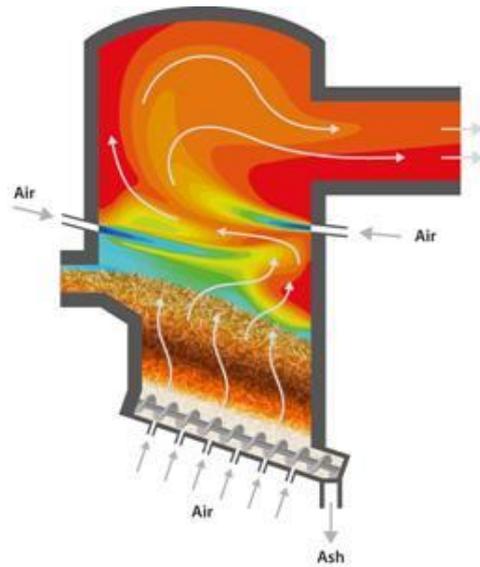
<b>Year of implementation:</b>	2015
<b>Location:</b>	Sønderborg district, Denmark
<b>Technology:</b>	Updraft gasification and gas combustion
<b>Principle feedstocks:</b>	Residues/wastes in forestry & Residential or industrial organic wastes.  During 2016-2017, various fuels including spent grain from Carlsberg, and fibers from biogas plants were tested
<b>Products/markets:</b>	Heat and Power
<b>Technology Readiness Level (TRL):</b>	TRL 8 – system complete and qualified

### DESCRIPTION

The Dall Energy biomass furnace combines updraft gasification and gas combustion into one unit, which offers advantages to operation and maintenance, emissions reduction, and turn-down ratio. Evidence for this comes from a pilot plant, a demonstration project, a 2 MW plant and a 9 MW plant in Denmark. Next-generation heat and power production plants represent the next steps in this technology and several of these projects are now at the planning stage.

The technology can use multiple fuels, including wood chips, garden waste, spent grain or manure fibres. The Dall Energy biomass furnace combines updraft gasification and gas combustion. There is no need to include a particulate filter, because of the extremely low dust from the biomass furnace. The technology includes a two-stage gas combustion for low NO<sub>x</sub> emissions, and a two-stage flue gas condenser for high efficiency.

During 2013-2014, a 9 MW plant was planned and built in Sønderborg, Denmark, for the local district heating company. The Dall Energy heating plant supplies the towns of Vollerup and Hørup Hav with district heating with the purpose to supply cheap and renewable heat with low emissions. The cost of the total project was 8 million Euro, of which 2.2 million Euro for the biomass plant (0.8 million Euro for the Dall Energy Furnace). The plant was started up in January 2015. Emission tests were carried out in March 2015. The plant has been in unmanned operation since October 2015. The low emissions of the plant were verified.



Dall Energy biomass furnace (left) - Emissions from Dall Energy plants (2015) (right)

<p><b>Stakeholders involved</b></p>	<p>Dall Energy          Sønderborg District Heating Company (client)          FORCE technology (CFD analysis)          COWI (consultant)          Markedsmodningsfonden (grant of 0.8 million €)</p>
<p><b>Contribution to Sustainable Development Goals</b></p>	<p>The projects contribute sustainably to improved air quality (SDG 3), affordable local energy (SDG 7), economic development in the region (SDG 8), sustainable industrialization (SDG 9), sustainable consumption patterns (SDG 12) and reduced GHG emissions (SDG 13).</p>
<p><b>Employment:</b></p>	<p><i>No information available</i></p>
<p><b>Replicability and scale-up potential:</b></p>	<p>The technology has medium replicability and scale-up potential at local level (depending on district heating infrastructure), and medium to high at regional, national and international level.</p>
<p><b>Success factors:</b></p>	<p>Multiple fuel capability: wood chips, garden waste, spent grain, manure fibres;          Low emissions of NO<sub>x</sub> (&lt;180 mg/Nm<sup>3</sup>), CO (&lt;5 mg/Nm<sup>3</sup>) and particulates (&lt;20 mg/Nm<sup>3</sup>);          Unmanned operation;          Low power consumption (10,3 kW<sub>el</sub>/MWh heat);          Clean ash (0,5% carbon in ash);          High efficiency (110% based on Lower Heating Value);          Turn-down ratio of 10-100% load</p>
<p><b>Constraints:</b></p>	<p>...</p>



*9 MW Dall Energy biomass plant in Sønderborg*

**Info provided by:**

Jens Dall Bentzen, Managing director of Dall Energy

**More information:**

<http://www.dallenergy.com/>

[https://www.nytimes.com/2015/12/06/world/europe/denmark-a-green-energy-leader-slows-pace-of-its-spending.html?\\_r=0](https://www.nytimes.com/2015/12/06/world/europe/denmark-a-green-energy-leader-slows-pace-of-its-spending.html?_r=0)

<https://energyhub.theiet.org/users/57022-jens-dall-bentzen/posts/18661-fuel-flexibility-and-low-emissions-in-biomass-fired-power-plants>

[http://www.dallenergy.com/media/151007\\_Paper\\_IT3\\_Houston.pdf](http://www.dallenergy.com/media/151007_Paper_IT3_Houston.pdf)