

AN IMMACULATE OPERATION IN GREEN HEAT AND POWER



ANDRITZ recently supplied the very first Bubbling Fluidized Bed (BFB) biomass boiler to the country of Denmark, which will assist in nationwide efforts to reduce CO₂ emissions. The new boiler is installed at Helsingør Kraftvarmeværk's new district heat and power generation plant, which is immaculate in design as well as operation.

The first thing that strikes visitors to the brand-new biomass district heating and power plant at Helsingør Kraftvarmeværk's site in Helsingør is the clean, modern design, both inside and out. Architects, artists, and suppliers alike were commissioned and contracted by the company to create a structure and plant that not only delivers but also fits in well with the local environment.

"As we are operating in the middle of an urban area close to the city center, it is important that the power plant sits well in the community from an aesthetic point of view, but also with regards to noise and emissions," says Jens Steffen Hansen, Project Leader, Forsyning Helsingør. "And in general, the Danish population understands the fact that we need to reduce CO₂ emissions – so the new plant here is welcomed by local people."





ANDRITZ's scope of supply included the boiler island, from fuel silos to boiler outlet, based on its Ecofluid BFB boiler design.

"The plant supplies heat and power for thousands of households around the Helsingør area; so at the same time, of course, our main mission is to produce efficient, low-cost district heating to the local population and have the ability to generate electricity to export to the national grid for extra income."

Hansen is speaking from the offices of Forsyning Helsingør, co-owner of Helsingør Kraftvarmeværk, where the plant

started up in spring 2019. The ANDRITZ scope of supply included the boiler island, from fuel silos to boiler outlet based on its Ecofluid BFB boiler design that combines high efficiency with excellent environmental performance. The boiler burns wood-based biomass, which consists of forest residues, bark, sawdust, and wood chips, and generates 75 t/h of steam to the turbine. The steam temperature is around 500 °C with a steam pressure of 65 bar (a).

STRINGENT EMISSION CONTROLS

The site is around 25 years old and was formerly utilized for district heating and power generation using natural gas as a fuel. "The decision was taken around 2013 to replace the fossil fuel we were using, mainly due to the local and national ambitions to reduce CO₂ emissions, but also to cut down on expensive natural gas costs."

Helsingør Kraftvarmeværk chose ANDRITZ BFB technology because of its ability to



MARKO NATUNEN
Director, Engineering and Project Execution, Power Boilers, ANDRITZ

"Due to the stringent emission controls, our BFB technology is the best available technology on the market for this size of plant."

handle the stringent emission demands. Marko Natunen, Director, Engineering and Project Execution, Power Boilers, ANDRITZ, says, "Our BFB technology is the best available on the market for biofuel processing on the scale needed at the Helsingør Kraftvarmeværk plant. Due to the stringent emission controls laid down, it is difficult to control emissions with the common "grate" technology, which is the type most used in similar-sized power stations in Denmark."

ANDRITZ was able to fulfill the strict requirements regarding emissions for both CO and NO_x with the specified biomass fuels and with combustion air humidification. Grate boiler technology is generally not able to meet these tough parameters. The CO emissions needed to be limited to 50 mg/Nm³ (dry 6% O₂), which is exceptionally low for forest biomass fuels. Also, NO_x emissions needed to be below 150 mg/Nm³ (dry 6% O₂), which is reached with ammonia injection involving selective



JENS STEFFEN HANSEN
Project Leader, Forsyning Helsingør

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non-catalytic reductions in the combustion chamber.

There were other requirements made by Helsingør Kraftvarmeværk, which included a minimum footprint, an inclined wall of the boiler house, special insulation cladding, and specified colors of various equipment for the visual identification of different boiler parts.

"We are very proud of this installation and we have many visitors here, including students from local schools, colleges, and

universities who take part in our "Walk the Science" project, looking at how the physics are applied in the running of a biomass power plant," says Hansen. "It was important that the plant not only looks good but has optimal safety for groups to walk around. We made sure this was taken into account during this project."

THE PROJECT – LOCAL CHALLENGES

ANDRITZ was chosen as the boiler supplier after a tender process in June 2016, which involved other vendors including

those with grate technology. "We looked at a few references, including one in Karlstad, Sweden, and it was clear that ANDRITZ has long experience in boiler design and production, and the BFB technology was the right fit for our operation," says Hansen.

The installation of the boiler island started after contracts were signed in 2016 and went very well according to Hansen, who has a lot of experience in the building of biomass power plants around Denmark. "There are always ups

and downs during the execution phase of projects like this; however, the management of the engineering was very good and the delivery of the parts in sequence was very impressive. The erection of the boiler happened very fast, with enormous parts being delivered and then put up together very quickly.

"We were also very impressed with the ANDRITZ approach to safety during the project; we could clearly see that it's a subject high on the agenda, as it is in our operations, too."

Natunen adds, "As this was our first boiler delivery to Denmark, there was a lot of work to be done on making sure all the certifications and local regulations were adhered to. All countries have different interpretations of certificates and regulations, and you need to have close contact with the local authorities to ensure that the project complies with them.

"Also, Helsingør Kraftvarmeværk threw us some extra challenges on the design front at the execution stage, which we managed to include, but the project went

smoothly from our point of view and the cooperation was very good.

"We were quite demanding, and there were times when we asked a lot of ANDRITZ in terms of design changes and putting our own ideas to them," adds Hansen.



"If there is an alarm or alert, we simply turn on the iPad and we can manage the whole plant from wherever we are situated, even outside of the plant."

JOACHIM RASMUSSEN
Marine Engineer,
Forsyning Helsingør



LARS FROST
Marine Engineer,
Forsyning Helsingør

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Left to right: Lars Frost, Marine Engineer, Forsyning Helsingør; Jens Steffen Hansen, Project Leader, Forsyning Helsingør; Marko Natunen, Director, Engineering and Project Execution, Power Boilers, ANDRITZ; Joachim Rasmussen, Marine Engineer, Forsyning Helsingør

A 72 HR UNMANNED OPERATION

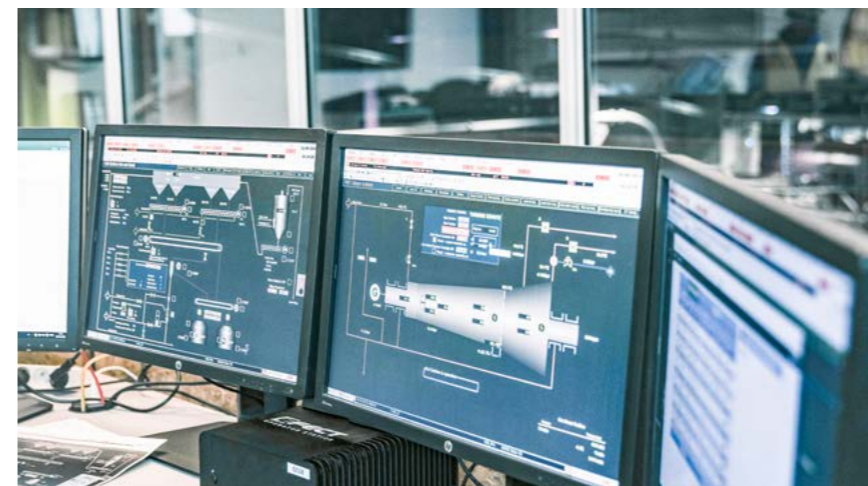
Commissioning and start-up of the plant took place in the period from autumn 2018 to spring 2019 and went well with no major problems. There are now seven people employed to run the power plant, which has been designed and built to operate completely unmanned for up to 72 hours at a time. When the plant is

unmanned, it is remote-controlled from the control room of a waste incineration plant at Norfors, located in Hørsholm, 15 km south of Helsingør.

Lars Frost, Marine Engineer, Forsyning Helsingør, says, "It's actually quite common for a power plant to run unmanned for certain amounts of time, particularly

when fueled by natural gas. In the case of a biomass plant, it is slightly different as the fuel is not as homogenous, with its different shapes and forms. We have been very impressed so far with the plant and it's running very smoothly."

The new power plant is fitted with the very latest in automation and digital



The power plant is designed to run completely unmanned for up to 72 hours at a time.



The plant is now fully operational and ready for its first winter of operation.

technology. Joachim Rasmussen, Marine Engineer, Forsyning Helsingør, adds, "When we are running unmanned, we take it in turns to be on call should anything go wrong at the plant. If there is an alarm or alert, we simply turn on the iPad and we can manage the whole plant from wherever we are situated, even outside of the plant."

The plant is now fully operational and ready to increase to full load for its first winter of operation where it will provide heat to the local residents and also generate valuable extra electricity. "We are really pleased, as we have achieved our aim to lower CO₂ in and around the city, at the same time as give our customers district heating at a favorable price. The

extra bonus for us is that we can now take advantage of the electricity market when prices are high and optimize our earnings capability."

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TIMO KYLLÖNEN
Project Manager,
Power Plant Service, ANDRITZ

ANDRITZ COMPLETE SERVICE FOR BFB AND CFB BOILERS

Operating from Norrköping in Sweden, ANDRITZ provides a dedicated service for BFB and CFB boilers. The center has a complete facility, including design, material storage, and workshop to provide parts and service to our Scandinavian customers.

"Our purpose is to assist customers to extend the life of their BFB and CFB boilers and also to optimize performance," says Timo Kyllönen, Project Manager, Power Plant Service, ANDRITZ. "The center provides services across the board, including upgrading and renewing essential components of bubbling fluidized bed and circulating fluidized bed boilers. The service center also provides expertise in reducing emissions, minimizing corrosion, and integrating challenging fuels."