

# WINTER WARMTH

## from the forest

Environmental concern is deeply embedded within Sweden's DNA. ANDRITZ recently added to this environmental commitment by supplying a biomass combined heat-and-power (CHP) plant to keep residents of the town of Mjölby warm in the winter - using renewable fuels from local forests.

With a workforce of just 65, Mjölby-Svartådal Energi (M-SE) is a lean company that supplies district heating and electricity to the people in Östergötland County, Sweden. In addition, the company is impressively green, as exemplified by its slogan "Lokalt producerad energi från skog, vind och vatten" ("Locally produced energy from wood, wind, and water").

Producing energy and heat from renewable sources is a carefully devised strategy. Christer Kjellberg, Head of Projects at M-SE, says, "It is the company mission to produce as much energy, electricity, and district heating from renewables – hydro, wind, and wood – as we can. Last year, over 90% of our output was locally generated from renewables. We are setting records in this region, and even in Sweden."

Kjellberg was talking to SPECTRUM in M-SE's offices overlooking the brand new plant supplied by ANDRITZ. Inside the boiler house is a 35 MW EcoFluid (bubbling fluidized bed) boiler along with all the attendant infrastructure and automation technology.

In the beginning, district heating was supplied to the 26,000 residents of Mjölby by oil-fired boilers. In the mid-1980's, the first biomass-fired boiler (12 MWth) was purchased. Small biomass-fired boilers were also purchased in the late 1990's (9 MWth) and in 2008 (5.5 MWth). The investment in a new boiler was driven not only by the age and relative efficiency of the existing boilers, but also by the desire to reduce dependence on fossil fuels and to lower the overall cost of producing district heating. "Our existing boilers were becoming less efficient, and we needed more capacity," Kjellberg says. "More importantly, by adding CHP capabilities, the income we produce from power production can be used to offset the district heating production cost."

### A decision had to be made

It was 2010 when it became very clear that the existing boilers were at maximum capacity. "With the units being over 30 years old, it was time to look at something new," says Kjellberg. "We have always been able to keep up with local heating requirements thanks to our pipeline link to a CHP plant in Linköping, 35 km away. But the Mjölby plant was clearly being put under more and more pressure."

M-SE's management had already conducted feasibility studies for a biomass CHP plant beginning in 2008 with a pre-study. "We did a lot of work and had many discussions," Kjellberg explains. "It was in 2012 when serious discussions were taking place and then the final decision came in June 2013."

M-SE issued a tender to six companies for a new



biomass power plant that would use wood chips, forest residues, and sawdust as fuel. Design capacity was to be 35 MW for heat, and 10 MW of electricity. "We knew what we wanted from the start," says Kjellberg. "We provided a scaled-down sketch of how we wanted the new plant to look and made a 3D model of the building before we sent out the tender."

During the tender process, M-SE visited two important ANDRITZ references in Sweden (Söderhamn and Bollnäs). ANDRITZ was selected to supply almost the complete plant except for the ground and civil work for the foundation, as well as an HV cubical after the turbine. The contract was signed on September 12, 2013. The ANDRITZ teams in Austria and Finland supplied the boiler and the external fuel systems, and ANDRITZ AUTOMATION in Austria delivered the low voltage equipment and the ABB control system.

"Everything that is visible above the ground in the new plant came from ANDRITZ," says Christian Lackinger, ANDRITZ Project

Manager. "The rest was civil works carried out by a Swedish company. We delivered the EcoFluid BFB boiler, fuel handling system, flue gas cleaning system, steam turbine with auxiliaries, and the electrical systems."

#### Renewable, sustainable fuel

The fuel for the plant comes from within a 30 km radius and is predominantly in the form of waste from the forest, but also includes wood chips, bark, and sawdust. Occasionally logs are bought and a local contractor produces chips from the logs in the CHP plant's woodyard.

The fuel handling system supplied by ANDRITZ includes equipment to receive 400 m<sup>3</sup>/h of biomass, all screening, storage up to 4,000 m<sup>3</sup>, and conveyor systems to feed the boiler.

#### From rock to clay

"The actual construction of the plant was quite a challenge," says Kjellberg. "The ground here ranges from hard rock to bottomless clay, and there was a challenge building a new plant so close to the exist-

ing one. In some places we had to blast out hard rock and in other places we had very soft clay, so we had to insert numerous piles down to 20 meters to support the civil construction."

All challenges were overcome with excellent cooperation, according to Lackinger. We started cold commissioning in May 2015, with hot commissioning following three months later," he says. "The plant was fully taken over by M-SE in July 2016 after good collaboration with our start-up team."

"Our plant operates seven months of the year, and ran at full load for the first time last winter," says Production Manager Anders Ejhed. "Start-up went well. It took us some time to tune and optimize the operations, mostly focused on getting the biomass fuel mix right."

Ejhed explains there were things for his team to learn. "The bubbling fluidized bed boiler was new technology for us," he says. "ANDRITZ people have been here to support us at all times. The downtime during the summer months was a perfect opportunity for us to iron out any problems with the fuel, adjust the boiler, and thoroughly train our team at the site."



◀ Piping system

L to R: Anders Ejhed, Production Manager; Christian Lackinger, ANDRITZ Project Manager; and Christer Kjellberg, Head of Projects. ▼



Mjölby's biomass fuel comes from a 30 km radius. ▶



*By adding CHP capabilities, the income we produce from power can be used to offset the district heating cost."*

Christer Kjellberg  
Head of Projects  
Mjölby-Svartådal Energi



#### Flexibility - a major feature of Mjölby

One of the main features of the new Mjölby plant is the flexibility to adjust the electrical output from the turbine according to where the energy output of the boiler is needed most, or is most economically viable. Lackinger explains, "The main target is to provide district heating, but M-SE installed a turbine to also produce electricity. From the total fuel value of the wood chips, it is possible to produce 23 MW for the district heating network and 10.8 MW of electricity. If you put all the steam to the turbine, the ratio of electricity-to-steam is about 1:2. In

most plants, if you reduce electrical output, you also reduce district heating energy. The Mjölby plant is a bit different. We direct part of the steam to a heat exchanger that converts this steam input directly to district heating energy. So, M-SE can produce down to about 2 MW of electricity and up to about 31 MW of district heating energy at the same time. This allows them to adapt to heating requirements from the community, fuel mixtures, and the need for electrical energy."

So what's next for the Mjölby plant? Kjellberg says, "We should be running at full capacity

after firing up in October for the winter. We expect the plant to operate at around 90% efficiency, and we have plans to improve this even further by installing a flue gas condenser. We already have the infrastructure in place to install it. This will be our next investment, which will take our efficiency to around 98%."

**CONTACT**  
Markus Slotte  
markus.slotte@andritz.com