



THERMINOL

Heat Transfer Fluids by Eastman

Little country, big accomplishments

Therminol experts help launch a dual fuel project in Denmark.

PROBLEM

Working its way toward complete energy independence, Denmark seeks to make progress in solar powered energy despite the country's northern geography.

ANALYSIS

A hybrid plant combining concentrated solar power with a biomass-fueled organic Rankine cycle (ORC) makes energy independence possible—even when Denmark experiences short days.

SOLUTION

The heating plant's success depends on balancing the heat produced from the energy sources. Eastman Therminol® 66 heat transfer fluid provides high thermal stability and low vapor pressure with the ability to control both the CSP and biomass heat.

RESULT

Aalborg CSP's hybrid plant becomes fully operational in 2018, heating and powering Brønderslev, Denmark.

Defying many experts, Denmark continues to take bold steps toward its 2050 goal of complete energy independence.* The tiny country is already a global leader in wind power, but it has made some important forays into solar-powered energy systems despite Denmark's northern geography. Funded by a government grant, the Danish renewable energy specialist Aalborg CSP developed a concentrated solar power (CSP) plant coupled with a biomass-fueled ORC system that will power the Danish city of Brønderslev. This sophisticated hybrid plant, which will become fully operational in 2018, is the first of its kind anywhere to deliver solar and biomass power through one ORC system in a commercial setting.

The CSP system has been operational since the end of 2016. The 16.6 MWth solar energy system supplies heat to the district heating network, and it was exceeding expectations in its first year of operations, according to Aalborg CSP's Project and Engineering Director Jacob Juul.

The solar energy plant is based on the CSP parabolic trough technology consisting of 40 rows of 125-m parabolic mirrors with an aperture area of 26,929 m². These mirrors collect the sun's rays throughout the day and reflect them onto a receiver pipe which sums

up to 5-km receiver tubes. This receiver pipe is surrounded by a special glass vacuum tube, and inside this runs—only heated by the sun—heat transfer fluid that can maintain temperatures up to 330°C. This high temperature drives an ORC turbine to produce electricity, and heated water from the process is used to feed the heating network of a district of over 12,000 people. The solar heating system can thus alternate between providing combined heat and power at peak price periods or exclusively delivering heat. On sunny days, the solar-thermal system is set to reach 16.6 MWth capacity.

One key challenge for the district heating plant, Brønderslev Forsyning, was to balance the heat coming from two sources (solar and biomass) that each have very different dynamic and timing requirements and channel them both through one ORC system. For assistance, they turned to the team at Eastman, the manufacturers of the Therminol heat transfer fluids that were ultimately selected for the project.

The combination plant needed a high-thermal-stability, low-vapor-pressure fluid that could accommodate heat from both the CSP and biomass. Therminol 66 is standard for the biomass industry, but the design team found it would also meet the demanding requirements

*Source: <http://denmark.dk/en/green-living/strategies-and-policies/independent-from-fossil-fuels-by-2050>



for solar heat production. As the project was a global first, Therminol's 50-plus-year track record of high performance and reliability provided a reassuring component for the start-up project's design team. The plant management team also utilizes Eastman's TLC Total Lifecycle Care® program, which provides ongoing testing and maintenance assistance to ensure the heat transfer fluids are continuously performing at their highest levels. "A high quality, high performance heat transfer fluid was essential to this project, and the Eastman experience and expertise in this area helped launch this project successfully," says Poul Vestergaard Jensen, plant manager at Brønderslev Forsyning.

Aalborg CSP was awarded the contract to develop and deliver the solar energy plant by Brønderslev Forsyning in February 2016. Construction and installation of the system set records as it reached completion in just 6 months. With the beginning of the Danish solar season, the CSP plant harvests the sun for district heating purposes.

However, when the biomass operation comes online in early 2018, it will also enable electricity production.

Aalborg CSP is a leading developer and supplier of innovative renewable technologies aiming to change the way energy is produced today. Relying on extensive experience from some of the most efficient CSP projects around the world, the company designs and delivers green technologies and integrated energy systems to lower the cost of energy for industries and power plants worldwide.

"This is one of the most clever ways to combine two natural resources—both carbon neutral and widely available," said Marco Di Prima, global key account manager for renewable energies on the Therminol team. "Hybridization and decentralization are the future of energy networks, and I am proud Therminol contributed to the success of this new concept, supporting the project with its expertise, a superior product, and its market know-how gained from more than 30 years of experience with references on hundreds of ORC plants worldwide."



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