



## THERMINOL

Heat Transfer Fluids by Eastman

# Linea Energia brings biomass energy to two Italian communities.

### PROBLEM

Italian energy company seeks new ways to decentralize green energy production with small, green technology plants.

### ANALYSIS

Organic Rankine cycle (ORC) technology delivers one of the best ways to convert biomass into fuel on a local level.

### SOLUTION

Technology needs tried-and-true fluids that extend the life and hence reliability of the ORC heat transfer system while allowing the plant to economize. Eastman Therminol® 66 heat transfer fluid helps new plants run smoothly and efficiently.

### RESULT

Two new plants are successfully creating green energy for Italian towns.

Europeans have always done the “local” thing very well. Now, green energy production has followed that trend with innovative, small decentralized plants delivering energy right to the communities they serve. As evidence, an astounding 349 small energy projects have been created in Europe in less than 20 years.\* Organic Rankine cycle (ORC) technology is ideal for these small plants because it is fueled by locally available resources such as wood or low-grade waste heat. These biomass heater technology plants have one universal element—they use heat transfer fluids (HTF) to operate. And one HTF product—Eastman Therminol 66® heat transfer fluid—has been the product of choice due to its long and reliable record of success.

The ORC process finds its fuel source from waste heat recovery (WHR), the sun (CSP/ORC hybrids), or biomass (wood biomass). Yet many of the elements of the HTF system are different from project to project. These different factors include the process and flow rate, temperature, pressure, and equipment components. Finding the correct HTF is central to a project’s success, no matter what the fuel source.

### Linea Energia leads in clean energy production.

Italian-based Linea Energia is an energy business unit of the multi-utility LGH based in Rovato, Italy. Linea Energia is primarily focused on green energy and operates several hydro plants,

photovoltaic parks, and landfill biogas plants. In addition, Linea Energia is a rising star in the ORC industry and operates two of the most innovative and successful biomass plants in Italy. The company saw the potential of small, decentralized plants that could produce continuous, around-the-clock energy without relying on variable sources like wind and solar. Italy is rich in biomass sources, offering a readily available local fuel source which reduces transportation costs while adding jobs to the local economy.

In 2010, Linea took the plunge into biomass. After studying the available technologies, Linea selected ORC technology coupled with a thermal oil biomass heater. This decision was primarily driven by the overall efficiency (80%–85%) of the technology in the combined heat and power mode. At the time, the Italian government was offering fixed electricity prices to support new green energy projects, making the investment even more attractive.

### Rodengo-Saiano plant selects Therminol 66.

The village of Rodengo-Saiano, Italy, was chosen for the first plant because of its proximity to local infrastructure and biomass availability, plus the possibility to deliver heat power to the nearby city center. Linea Energia chose to work with the Eastman team when the time came to select a reliable heat transfer fluid to be used for the

\*Source: Turboden.com



ORC biomass project. The outstanding performance record and references of Therminol 66 on several applications—including biomass ORC applications—convinced the company's technicians to select this particular formulation for the project.

Linea Energia completed the 1-MWe plant in about 1 year, and by the end of 2012, Linea was producing 8 MWh of electricity every year plus 24 MWh of hot water that could be supplied via a district heating network to the nearby town.

In addition to generating sustainable power from a green source, the project reduces the production of greenhouse gases. This highlights the importance of small, decentralized power plants. ORC technology is ideal for small plants because it derives its success by using locally available resources. This technology is now widely available and considered to be the best solution to turn low-grade waste heat or biomass fuel into clean energy.

"Linea Energia had been working hard to bring this opportunity to fruition," said Davide Alberti, general director of Linea Energia. "This project is a great example of bringing sound economics to an environmentally friendly solution to produce green energy."



### Cremona plant teams up with Therminol.

A second plant in Cremona, Italy, is producing 8 MWh of electricity every year plus 40 MWh of hot water that is supplied via a district heating network to Cremona. The Cremona site uses wood from the local wood recycling collection center to feed a thermal oil biomass heater. The heater is connected via a thermal oil circuit using Therminol 66 as heat transfer media to a 1-MWe ORC.



### TLC: Extending the life of an ORC heat transfer fluid system

One of the best ways to economize at an ORC plant is to maintain the system's heat transfer fluid system. That's why Eastman's TLC Total Lifecycle Care® program is so valued by customers. Matthias Schopf, technical manager at Eastman, says, "In addition to Eastman's commitment to energy efficiency, the Therminol product line offers a TLC program that also supports the success of clean energy projects. The TLC program includes assistance with system design, start-up assistance, a technical support hotline, operational training, and more. The technical support minimizes the volume of fluid required for an initial fill, as well as the quantity of fluid used during maintenance and operation, and extends the life of the fluid."

Marco Di Prima, key account manager at Eastman, concludes, "The more than 50 years of science and technology behind the Therminol brand is a significant benefit that reduces risk for stakeholders in these emerging-technology clean energy projects."

Alberti agrees, "The key factor in selecting Therminol heat transfer fluid for the demanding requirements for both of these projects was the proven experience, technical support, and after-sales service offered by Eastman to ensure success for these emerging technologies."



## Organic Rankine cycle: How it works

With ever-increasing energy costs and a drive to reduce carbon footprints, European governments are seeing the wisdom in changing their electricity production from large centralized power plants to small, decentralized power plants. ORC technology is ideal because it uses local resources that tend to be readily available. This technology is now widely available and considered to be the best solution to turn low-grade waste heat or biomass fuel into clean energy.

A heat source from waste heat or from a furnace that uses wood biomass as fuel is used to heat an HTF in a primary loop. Since precise temperature control and excellent thermal stability and heat transfer coefficients are key for reliable operation in the primary loop, a quality HTF is widely used for ORC systems. In an ORC evaporator, the HTF in the primary loop is used to heat a fluid (a refrigerant, silicon oil, or hydrocarbon) in the secondary loop that becomes the "working fluid." The low-boiling-point

working fluid is vaporized in the heat exchanger and then travels to the turbine, which drives an electrical generator to produce power that can be transmitted to the grid. After the energy is extracted from the working fluid, it is condensed to its liquid state in a condenser (usually water or air cooled) then recirculated by a pump back to the ORC evaporator to continue the cycle.

ORC systems are widely used for the production of electricity from biomass combustion or the safe recovery of thermal energy from exhaust gases from industrial processes such as cement, glass, or metal processing plants. This expanding green technology is helping reduce the global energy footprint. ORC is a process designed to use high- or medium-temperature heat transfer fluids with lower operating pressures and higher partial-load efficiency than steam-driven conventional power plant turbines. ORC hybrid applications, such as combined CSP and biomass, are also finding Therminol products to be excellent heat transfer media.

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