ORC STATIONARY ENGINE APPLICATION

E-RATIONAL ORC 10FT PILOT MODEL – 400KWTH – 55KWE

Vanheede Biomass Solutions, BE is an industrial fermentation plant located in Quévy, (Belgium). The plant has three large digesters to ferment organic waste, from different waste sources, into biogas (methane), which is then converted into electricity by applying biogas engines. The plant is equipped with three biogas engines, two engines with a capacity over 700kWe and one with capacity over 1MWe. The green power from the plant is fed into the grid. The heat from the motor jacket cooling and the exhaust air is used to heat multiple parts of the plant, such as the digesters themselves, the offices, the pasteurization process, drying of specific waste streams and other facilities on the site. The digestate of the fermentation process is applied as a soil supplement in agriculture and horticulture.

Besides the heating of the facilities, the plant has a remaining unused amount of heat. To optimise the heat recovery, a small ORC unit, functioning as a pilot installation for E-RATIONAL, was installed to make sure the heat excess isn't dumped. The remaining 400kWth is recovered by an ORC LT 111/55kWe.

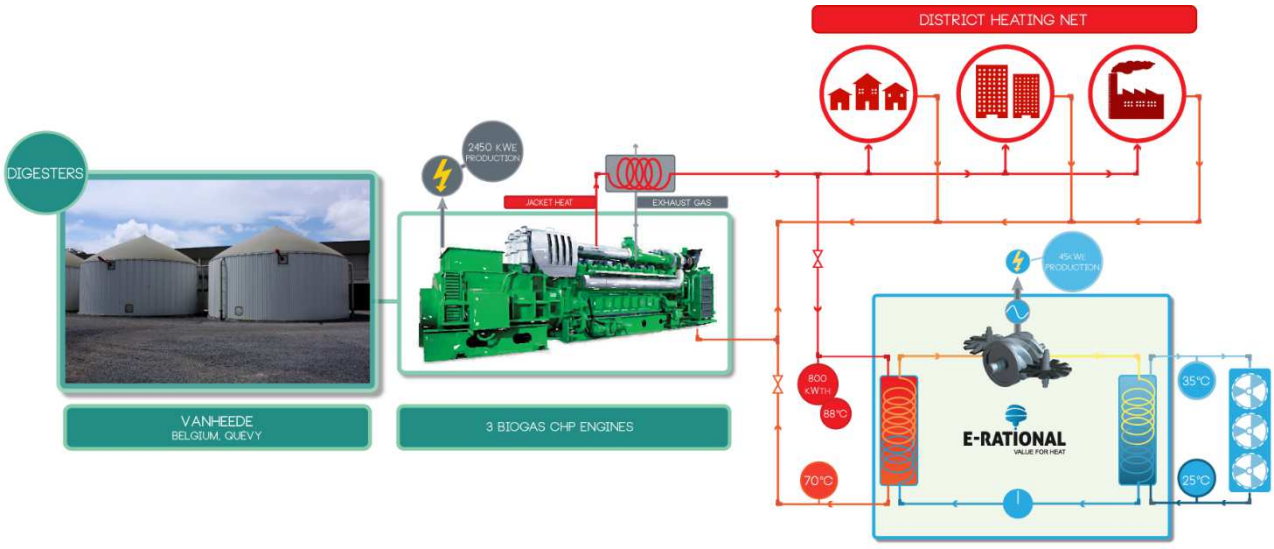
In 2010, BEP EUROPE was looking for a pilot installation for the LT-ORC, to have a proof-of-concept in real life. This site was a perfect opportunity to design a small scaled ORC and finetune it according to the operation of the plant.

This solution made it possible to produce an extra 25kWe net, after taking into the consumption of the dry cooler, which is fed into the grid as well.

Instead of using electricity to dump the heat excess through coolers, the ORC is producing electricity available for consumption on the site.

Working temperature hot side	86°C → 79°C
Thermal load at hot side	± 400kWth
Condenser	15°C → 25°C
Cooling capacity	± 370kWth
Cooling	Dry coolers
Installed generator capacity	55kWe
Average net power production	30kWe
Cooling consumption	5kWe
In operation since	2011 as pilot plant
Running hours per year	± 4.000h

Machine definition Vanheede Biomass Solutions, Quévy



E-RATIONAL is delivering a cost-effective solution to convert low temperature waste heat into clean energy without emissions. Our state-of-the-art **Organic Rankine Cycle (ORC)** technology, with in-house development of the expansion part and the use of industrial grade components, makes E-RATIONAL's ORCs user-friendly, robust and economically viable. The E-RATIONAL ORC has been designed to maximize uptime and efficiency with a minimized operational and maintenance cost. This results in a containerized modular machine, CE-compliant, with plug-and-play connections for easy installation.
The ORC machines can convert heat from various sources, such as:

- Industrial processes, e.g. cooling cycles at chemical plants, glass, steel or food industry, power plants, etc.
- District heating networks (unused excess heat)
- Biomass burners or biogas installations with CHP units
- Low temperature geothermal wells

E-RATIONAL's technology is suitable for heat recovery of feeding temperatures at maximum 170°C (338°F) and minimum 85°C (185°F) at the hot side. Typical temperature difference between inlet and outlet is 20°C. Cooling temperature sent to the machine can be maximum 60°C (140°F), depending on the temperatures at the hot side.

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