

Organic Rankine Cycle - Drawing the last drop of energy from heat

February 25 2016, by Luc De Smet

Organic Rankine Cycle uses heat in water or exhaust gasses to produce electricity. Often it uses waste heat. Most engineering companies implementing ORC-solutions do so for large systems at high temperatures and pressures.

The technology is now in the making to also exploit less powerful resources at lower temperatures.

"We produce electricity starting at [water temperatures](#) of 75°C but that is not very economical. Real economic viability starts at 90°C and gets even better at 100°C", says Jose Pascual Martí Mata, Environmental Engineer and spokesperson for Rank, a young engineering company in the Spanish province of Castellón.

"Using exhaust gasses require temperatures that are even some 50% higher -at 140°C- before ORC becomes cost effective." Within the low temperature and low power segment, Rank's equipment now covers a range from 3 kWe to a maximum of 130 kWe.

The ORC unit is a co-generation technology, which runs a turbine on an organic fluid. The motion produced can then be converted into [electricity](#).

Different liquids can be used for the heat transfer. "We prefer thermal oils. Pressurized water is theoretically more effective but entails security considerations. We tend to work at atmospheric pressures, i.e. 1 bar",

Martí Mata explains.

Until recently, Rank's ORC unit reached an electrical efficiency of some 14%, and 79% to 81% in the heat generation.

The combined installation thus transforms 93% to 95% -the sum of 14% plus 79% to 81%- of the thermal power input into the ORC's thermal oil, into 'electrical energy' and 'heat'.

"By slightly increasing the water temperature we've enhanced the electrical efficiency of our ORC-solution to between 16 and 18%." Basically the cycle remained the same but, to obtain the new levels, the company adapted its materials and components -bearings, joints etc. to withstand the higher temperatures. This has been achieved within the Bricker project.

Rank will install its ORC-technology in three demo buildings. In early March they will implement its solution at the Haute Ecole of the Liège Province in Belgium, where it is linked to a biomass -wooden pellet- fed boiler.

Virtually at the same time, the firm will also install another ORC cogeneration unit in the hospital of the Adnan Menderes University (ADU), in Turkey's Aydin province. There the installation will be mostly fed by a solar field.

The third one is the installation planned for an administrative building managed by the government of Extremadura, in the Spanish city of Cáceres.

ORC-technology struggles with three major challenges, Martí Mata indicates.

In Spain, and elsewhere in Europe, alternative power solutions have suffered because of changing legislations.

"The lack of stability makes people doubtful and they now refrain from investing in these technologies." Also the economic crisis now dictates extremely short payback times on investments. "All that makes it very difficult for us to adjust our pricing."

Rank's installation has a small footprint and requires relatively small components. "Often we cannot find components in the sizes we need. Larger components are more expensive", Martí Mata concludes.

"But also there is a serious lack of knowledge about these technologies", he says. "Many do not believe there can be such a thing as an ORC that operates at less than 200°C."

After all, that's the flip side of being a pioneer.

Provided by Youris.com

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