

COOLING TECHNOLOGIES FOR ORC POWER PLANTS

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ABSTRACT

With the development of binary conversion technologies, power generation from geothermal sources with temperatures down to 150°C has become technically feasible.

However, a power plant working with low geothermal sources requires large volumes of water for cooling. Considering the limited water resources for human consumption and the fact that cooling water for energy production accounts for 45% of total water abstraction in European Union, new technologies in the cooling section of power plants are vital. In order to maintain large thermal outputs (>10 MW), new design strategies for the ORC cooling are necessary [3].

Overall, three types of cooling are traditionally considered for Low-T geothermal power plants; air cooled condensers (ACC), direct water cooling (WC) and mechanical-draft wet cooling towers (WCT). ACC and WCT are the most widely used [1]. Essentially, ACC can be applied everywhere, but the auxiliary power consumption is about twice as high as that for a WCT [2] resulting in 50% higher overall power plant costs. Besides, ACC perform poorly when the climate is hot and humid, e.g. in summer.

The collaborative project MATCHING, which stands for “Materials and Technologies for performance improvement of Cooling Systems in Power Plants” funded by the European Commission in the H2020 programme focusses on integration of new technologies such as new coatings based on the innovative nano-technologies, Hybrid Cooling Systems with advanced CT filling, use of alternative water sources and different cooling approaches in order to reduce water consumption in power plants. The Unit Energy Technology at VITO/EnergyVille focusses on new hybrid cooling systems for low temperature geothermal power production.

References:

- [1]. Walraven D., et al., Minimizing the levelized cost of electricity production from Low-T geothermal heat sources: water or air cooled?, Applied Energy.
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- [3]. D. Mendrinis, et al., Geothermal binary plants: water or air cooled? Proceedings of the ENGINE 2nd WorkpackageMeeting, Strasbourg, 2006