

## Performance Analysis of a Shell and Tube Heat Exchanger in the Organic Rankine Cycle Power Plant

**Authors :** Yogi Sirodz Gaos, Irvan Wiradinata

**Abstract :** In the 500 kW Organic Rankine Cycle (ORC) power plant in Indonesia, an AFT (according to the Tubular Exchanger Manufacturers Association - TEMA) type shell and tube heat exchanger device is used as a pre-heating system for the ORC's hot water circulation system. The pre-heating source is a waste heat recovery of the brine water, which is tapped from a geothermal power plant. The brine water itself has 5 MW<sub>th</sub> capacities, with average temperature of 170°C, and 7 barg working pressure. The aim of this research is to examine the performance of the heat exchanger in the ORC system in a 500 kW ORC power plant. The data for this research were collected during the commissioning on the middle of December 2016. During the commissioning, the inlet temperature and working pressure of the brine water to the shell and tube type heat exchanger was 149°C, and 4.4 barg respectively. Furthermore, the  $\Delta T$  for the hot water circulation of the ORC system to the heat exchanger was 27°C, with the inlet temperature of 140°C. The pressure in the hot circulation system was dropped slightly from 7.4°C to 7.1°C. The flow rate of the hot water circulation was 80.5 m<sup>3</sup>/h. The presentation and discussion of a case study on the performance of the heat exchanger on the 500 kW ORC system is presented as follows: (1) the heat exchange duty is 2,572 kW; (2) log mean temperature of the heat exchanger is 13.2°C; (3) the actual overall thermal conductivity is 1,020.6 W/m<sup>2</sup>.K (4) the required overall thermal conductivity is 316.76 W/m<sup>2</sup>.K; and (5) the over design for this heat exchange performance is 222.2%. An analysis of the heat exchanger detailed engineering design (DED) is briefly discussed. To sum up, this research concludes that the shell and tube heat exchangers technology demonstrated a good performance as pre-heating system for the ORC's hot water circulation system. Further research need to be conducted to examine the performance of heat exchanger system on the ORC's hot water circulation system.

**Keywords :** shell and tube, heat exchanger, organic Rankine cycle, performance, commissioning

**Conference Title :** ICHTA 2018 : International Conference on Heat Transfer and Applications

**Conference Location :** Amsterdam, Netherlands

**Conference Dates :** August 06-07, 2018