

# Thermodynamic study of ORC at different working and peripheral conditions

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## ABSTRACT

Organic Rankine cycles (ORC) are suitable for conversion of low temperature heat to electric power. Operation of ORC is based on the same principles as that of a steam Rankine cycle, but, differs from the latter in the usage of low-boiling-point organic fluids as a working fluid [1].

Furthermore, different environmental conditions beside hot source changes affect ORC performance. Thus, off-design analysis is necessary to find performance of the cycle at various peripheral conditions.

This project is conducted based on a previous study [2] in which the on-design results of ORC were obtained for pure and mixture working fluids. Besides, pool boiler was, suggested as a new approach to evaporator for the binary mixture, however, it is not the subject of this study at off-design conditions. Therefore, referring to the on-design results of low temperature ORC from previous model [2], off-design analysis of the cycle with shell and tube evaporator is conducted in ASPEN PLUS environment.

The goal of this study was to provide a system design that meets the process requirements at various peripheral conditions while providing reliable operation. Overall, results showed that higher hot source duty and heat rejection lead to better performance of the cycle. Moreover, some possible defects of working fluid showed great effects on the performance of the studied cycle.

To sum up, although a proper selection of mixtures of working fluid can help cycle performance, the heat exchanger type, peripheral conditions and the properties of working fluid can, strongly, affect performance of the ORC.

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## References

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2. T. Rajabloo, et al., Applied Thermal Engineering, 2016. 98: 1-9.