# DESIGN OF A SUPERCRITICAL HEAT EXCHANGER FOR AN INTEGRATED CPV/T-RANKINE CYCLE

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## ABSTRACT

The worldwide interest for low grade heat utilization by using Organic Rankine Cycle technologies has increased significantly. Organic Rankine Cycle can be combined with several renewable sources, such as solar energy. Concentrating solar power is a well proven technology and it can be efficiently combined with ORC technology for electricity generation.

This concept was integrated in CPVT-SCORC system in order to improve the performance of the concentrating PV. The goal was achieved by utilizing the excess heat source from PV collectors through a low temperature supercritical heat exchanger in the Organic Rankine Cycle.

The motivation for working at supercritical state in the heat exchanger is the better thermal match between the heat source and the working fluid, leading to better overall cycle efficiency.

In this paper measurements of the supercritical heat exchanger prototype are reported. It is a helical coil heat exchanger with R404a as working fluid flowing in the coil and the heat source fluid in the shell. The design of this heat exchanger was done using heat transfer and pressure drop correlations available from literature. There is uncertainty of using these correlations because they had been derived for working fluids such as water and CO2, more than ten years ago. In order to have good performance and heat transfer rate the heat exchanger was oversized by 20%. The measurements show that the heat exchanger is indeed greater and by reducing the uncertainty of the heat transfer correlations, more compact and cheaper heat exchanger can be designed. A new heat transfer correlation is also suggested in this paper.

## REFERENCES

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