

## Deep Learning Based Prediction of axial turbine performance for Clean Organic Rankine Cycle system driven by low-temperature heat source

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**Abstract** – The big data performances of Organic Rankine Cycle (ORC) system is widely used in a variety of industrial applications. In some processes, the axial flow turbine at the low temperature heat source is crucial. The goal of this work is to increase the high efficiency of a tiny axial turbine powered by an Organic Rankine Cycle (ORC) utilizing numerical studies and deep learning method. To provide the best performance for the Organic Rankine Cycle (ORC) application, various turbine stages are suggested. Three-dimensional RANS computations are recommended for five different rotational speeds and four mass flow rates ranging from 0.2 to 0.5 kg/s with an inlet temperature of 365 K in order to describe the hydrodynamic and thermodynamic capabilities and get a big data. The analysis show that the two-stage turbine with a fixed rotational speed delivers the highest power output value of 10000W, has the highest turbine efficiency of 86%. In a three-stage turbine arrangement operating at steady state, the efficiency of the turbine and its output are 89% and 12000 W, respectively. The maximum values for turbine efficiency and power production are 88% and 12000W, respectively, as a result of the transient computational procedure. These results demonstrate the potential for exchanging low temperature heat sources using micro-three-stage axial turbines in Organic Rankine Cycle (ORC) systems .

**Keywords** – Micro-turbine, Organic Rankine Cycle, Deep Learning and RANS Computations.

### Graphical abstract

