

ORC turbine design

Authors: Klonowicz P., Lampart P., Surwilo J.

Affiliation: Institute of Fluid Flow Machinery, Polish Academy of Sciences in Gdańsk, Poland

Keywords: Organic Rankine Cycle, cogeneration

Summary:

Organic Rankine Cycle (ORC) is a promising technology for small scale cogeneration systems. It offers a possibility to apply low temperature heat sources, allows utilisation of different types of fuels, and also a modular construction which facilitates adaptation of the CHP unit to the required power range. One can think of micro CHP units dedicated for individual households of total heat capacity up to 20kWt and electric power up to 4kWe as well as small CHP modules dedicated for communal energy centres of total heat capacity 500kWt and electric power 100kWe (maximum up to 5 MWt and 1 MWe, respectively).

The main component of an ORC cycle is an expander, usually a turbine working on a special organic/synthetic medium, carefully selected to assure a high efficiency of the thermodynamic cycle.

The paper describes the process of design of blading systems for ORC turbines. Several turbine variants are considered, including an axial flow turbine, radial turbine and radial/axial turbine. The radial and radial/axial turbine have a slightly lower aerodynamic efficiency than the axial turbine, however they consists only of a single stage as compared to the multi-stage axial turbine design.