

Accepted Manuscript

Preliminary Design and Performance Analysis of a Radial Inflow Turbine for Organic Rankine Cycles

Do-Yeop Kim, You-Taek Kim

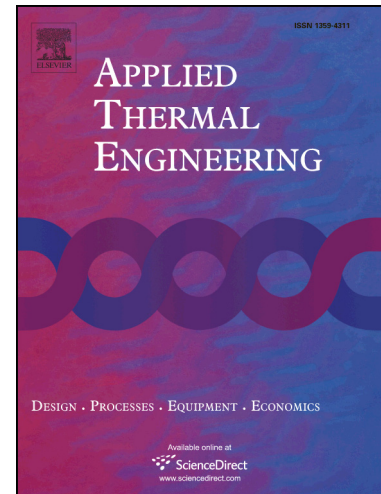
PII: S1359-4311(17)32297-4
DOI: <http://dx.doi.org/10.1016/j.applthermaleng.2017.04.020>
Reference: ATE 10168

To appear in: *Applied Thermal Engineering*

Received Date: 30 August 2016
Revised Date: 2 April 2017
Accepted Date: 5 April 2017

Please cite this article as: D-Y. Kim, Y-T. Kim, Preliminary Design and Performance Analysis of a Radial Inflow Turbine for Organic Rankine Cycles, *Applied Thermal Engineering* (2017), doi: <http://dx.doi.org/10.1016/j.applthermaleng.2017.04.020>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Preliminary Design and Performance Analysis of a Radial Inflow Turbine for Organic Rankine Cycles

Do-Yeop Kim¹⁾, You-Taek Kim^{2)*}

1) Nuclear Power Equipment Research Center, Korea Maritime and Ocean University, 727 Taejong-ro, Yeongdo-Gu, Busan, Republic of Korea

2) Division of Marine System Engineering, Korea Maritime and Ocean University, 727 Taejong-ro, Yeongdo-Gu, Busan, Republic of Korea

*Corresponding author : kimyt@kmou.ac.kr, Tel. : +82-51-410-4258

Abstract

Although the turbine among the components of organic Rankine cycle (ORC) has a significant impact on the cycle efficiency, only a handful studies have been conducted so far on the turbine design. The first step in the development of radial inflow turbines is the preliminary design, and the rigorous preliminary design can simplify the turbine optimization process. This study proposes a new design method to develop radial inflow turbines for ORC. The proposed method does not deal with the ideal gas equation and average state properties. In addition, the performance chart for gas turbines was not used. These improvements are the advantages of the proposed method. Applying the proposed method, we designed a trans-critical radial inflow turbine for geothermal power systems and used CFD analysis to evaluate the performance of the designed turbine. For the CFD analysis, grids independent on the turbine output and suitable for y^+ criterion were used. And, the numerical models suitable for the flow conditions were also applied. The CFD results showed that the radial inflow turbine designed in this study more closely approximated design conditions than one of Sauret and Gu [25]. A turbine performance analysis in off-design conditions was also conducted using CFD. The results showed that the incidence angle to rotor blades as well as RPM had a great impact on the efficiency and output of the turbine. And, these variables could be suitably determined using the proposed design method.

Keywords : Radial-inflow turbine, Preliminary design, Organic Rankine cycle, Performance analysis, CFD

Download English Version:

<https://daneshyari.com/en/article/4991032>

Download Persian Version:

<https://daneshyari.com/article/4991032>

[Daneshyari.com](https://daneshyari.com)