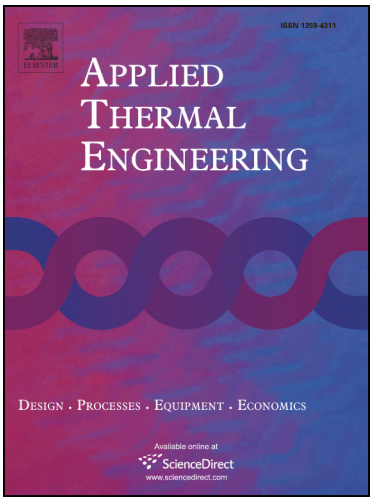

Effect analysis on flow and boiling heat transfer performance of cooling water-jacket of bearing in the gasoline engine turbocharger

E. Jiaqiang, Zhiqing Zhang, Zhengfang Tu, Wei Zuo, Wenyu Hu, Dandan Han, Yu Jin

PII: S1359-4311(17)36132-X
DOI: https://doi.org/10.1016/j.applthermaleng.2017.11.070
Reference: ATE 11440

To appear in: *Applied Thermal Engineering*

Received Date: 22 September 2017
Revised Date: 10 October 2017
Accepted Date: 14 November 2017

Please cite this article as: E. Jiaqiang, Z. Zhang, Z. Tu, W. Zuo, W. Hu, D. Han, Y. Jin, Effect analysis on flow and boiling heat transfer performance of cooling water-jacket of bearing in the gasoline engine turbocharger, *Applied Thermal Engineering* (2017), doi: https://doi.org/10.1016/j.applthermaleng.2017.11.070

Effect analysis on flow and boiling heat transfer performance of cooling water-jacket of bearing in the gasoline engine turbocharger

Jiaqiang E[a, b, c, *], Zhiqing Zhang[a, b, *], Zhengfang Tu[a, b], Wei Zuo[a, b], Wenyu Hu[a, b], Dandan Han[a, b], Yu Jin[a, b]

a. State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body, Hunan University, Changsha 410082, China;

b. College of Mechanical and Vehicle Engineering, Hunan University, Changsha, 410082, China;

c. Institute of New Energy and Energy-Saving & Emission-Reduction Technology, Hunan University, Changsha 410082, China

*ejiaqiang@126.com; zhangzhiqing64@163.com

Abstract: A liquid-solid coupling numerical model of water-cooled bearing in gasoline engine turbocharger is established in STAR CCM+ environment. By adapting two-phase flow boiling model based on VOF method, the cooling water flow field, temperature field and the magnitude and distribution of heat transfer coefficient in the solid-fluid interaction interface have been simulated and studied. And the differences of the simulation results with considering boiling and without considering boiling were compared and verified by use of the experimental values. The results reveal that the boiling heat transfer occurs, especially in the high temperature area near the turbine side. The calculation results with considering of the boiling heat transfer are very close to the experimental results. The boiling heat transfer can not be ignored. Thus, in order to better evaluate the boiling heat transfer state, the mean void fraction is proposed based on the cross section located from the wall to the perpendicular height of 4mm. The critical mean void fraction can be obtained from simulations. If the mean void fraction is less than the critical mean void fraction, the boiling heat transfer is controlled within nucleate boiling state. Due to its reasonable