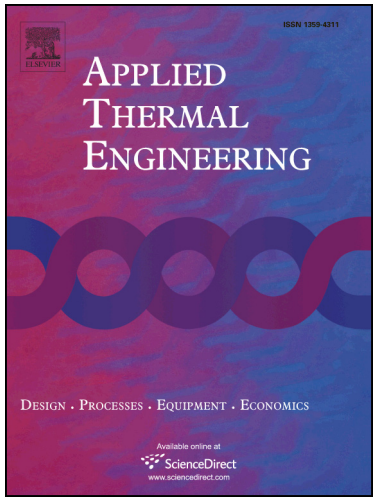

Research Paper

Prediction of gas-liquid two-phase heat transfer coefficient

Ting Ren, Huaiping Mu, Sha Liu, Yang Sun, Jingyin Zhang, Shi Liu

PII: S1359-4311(17)30030-3
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2017.01.005
Reference: ATE 9769

To appear in: *Applied Thermal Engineering*

Received Date: 15 May 2016
Revised Date: 2 December 2016
Accepted Date: 3 January 2017

Please cite this article as: T. Ren, H. Mu, S. Liu, Y. Sun, J. Zhang, S. Liu, Prediction of gas-liquid two-phase heat transfer coefficient, *Applied Thermal Engineering* (2017), doi: http://dx.doi.org/10.1016/j.applthermaleng.2017.01.005

Prediction of gas-liquid two-phase heat transfer coefficient

Ting Ren [a], Huaiping Mu [a], Sha Liu [b], Yang Sun [a], Jingyin Zhang [a], Shi Liu [a]

[a] School of Energy, Power and Mechanical Engineering, North China Electric Power University, Changping District, Beijing 102206, China;

[b] School of Control and computer Engineering, North China Electric Power University, Changping District, Beijing 102206, China.

E-mail address: renting0203@126.com(T. Ren), woodengoal@126.com(HP. Mu)

liusha031@163.com(S. Liu), sunyang@ncepu.edu.cn (Y. Sun), jingyin_zhang@126.com(JY. Zhang)

lssubmission@126.com(S. Liu),

Abstract: Two-phase flow occurs frequently in the field of thermal engineering. The heat transfer performances of gas-liquid two-phase flows play a crucial role in the structure design, material selection and optimization operation of equipments. It is highly desired to acquire the convective heat transfer coefficient of gas-liquid two-phase flows. Different from common experimental technologies and numerical computation methods, in this paper the least square support vector machine (LSSVM) method is developed to predict the heat transfer coefficient of two-phase flows from the limited number of experiment data. The group search optimizer (GSO) algorithm is employed to find the optimal hyper-parameters in the LSSVM method to improve the prediction quality. Numerical experiment results validate that the LSSVM method has a good generalization ability, and can deal with the complicated nonlinear problems with small samples and high accuracy. Furthermore, the use of the LSSVM method to predict the heat transfer coefficients of two-phase flows can significantly reduce the experiment period and test materials, and decrease the cost. As a result, an efficient method is introduced for the prediction of the heat transfer coefficient of gas-liquid two-phase flows.

Key words: Two-phase flow; Heat transfer efficient; Least square support vector machine; Forecast method

1. Introduction

Two-phase flows, e.g., gas-liquid, gas-solid, liquid-solid, etc., occur frequently in the process of