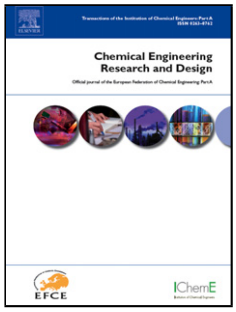

Title: Experimental and Numerical Studies of Residence Time in SK Direct Contact Heat Exchanger for Heat Pump

Authors: Hailing Fu, Lianjie Ma, Haiyan Wang

PII: S0263-8762(18)30244-2
DOI: https://doi.org/10.1016/j.cherd.2018.05.013
Reference: CHERD 3177

To appear in:

Received date: 4-7-2017
Revised date: 18-4-2018
Accepted date: 12-5-2018

Please cite this article as: Fu, Hailing, Ma, Lianjie, Wang, Haiyan, Experimental and Numerical Studies of Residence Time in SK Direct Contact Heat Exchanger for Heat Pump.Chemical Engineering Research and Design https://doi.org/10.1016/j.cherd.2018.05.013

Experimental and Numerical Studies of Residence Time in SK Direct Contact Heat Exchanger for Heat Pump

Hailing Fu[a,*] Lianjie Ma[a], Haiyan Wang[a]

[a] *School of Mechanical Engineering and Automation, Northeastern University, Shenyang, China*

Highlights

- Residence time was measured in direct contact heat exchanger with SK elements.
- CFD and experimental method were used for flow mixing characteristic of DCHE.
- Established a new shifted lognormal distribution mathematical model.
- Flow field was analyzed in SK direct contact heat exchanger.

ABSTRACT

Direct contact heat exchanger (DCHE) was used in energy recovery from low-grade energy resources due to their high thermal efficiency and low cost. In this work, SK elements were used in direct contact heat exchanger to enhance heat transfer due to the improving of mixing performance. It presented the residence time to characterize flow and mixing in SK direct contact heat exchanger both experimentally and numerically. The experimental results showed that the mean residence time (MRT) increased with an increase of elements numbers and it was necessary to use more elements at high flow velocity in order to guarantee the mixing completely. The residence time distribution (RTD) was used to quantify the mixing behavior and describe the mixing features such as the dead zones, channeling and by-passing. The performance of the computational fluid dynamics (CFD) was tested against the experimental data provided, verifying that the CFD model could predict the fluid flow characteristics precisely. A new shifted lognormal distribution (SLD)

*Corresponding author: fuhailing@neuq.edu.cn (Hailing Fu).