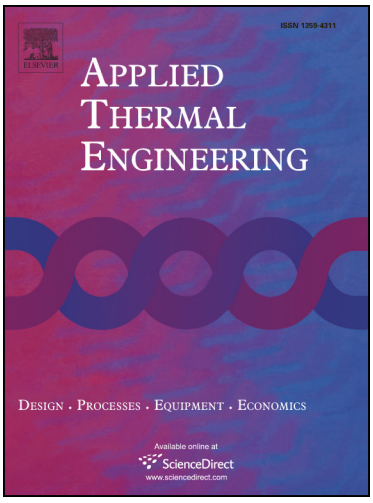

Research Paper

Experimental Study of the Growth Characteristics of Microbial Fouling on Sewage Heat Exchanger Surface

Chen Xiao, Yang Qirong, Wu Ronghua, Zhang Ning, Li Nan

PII: S1359-4311(17)32607-8
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2017.09.035
Reference: ATE 11092

To appear in: *Applied Thermal Engineering*

Received Date: 18 April 2017
Revised Date: 7 August 2017
Accepted Date: 7 September 2017

Please cite this article as: C. Xiao, Y. Qirong, W. Ronghua, Z. Ning, L. Nan, Experimental Study of the Growth Characteristics of Microbial Fouling on Sewage Heat Exchanger Surface, *Applied Thermal Engineering* (2017), doi: http://dx.doi.org/10.1016/j.applthermaleng.2017.09.035

Experimental Study of the Growth Characteristics of Microbial Fouling on Sewage Heat Exchanger Surface

CHEN Xiao，YANG Qirong*，WU Ronghua，ZHANG Ning，LI Nan

(College of Mechanic and Electronic Engineering, Qingdao University, Qingdao 266071，Shandong, China)

Abstract: Urban sewage is widely used as a heat source in the heat pump system. However, the sewage contains large quantity of micro-organisms, which can encourage fouling on heat exchanger surfaces during operation. Microbial fouling can seriously affect the heat transfer efficiency. Iron bacteria (IB) and sulfate-reducing bacteria (SRB) are the main bacteria responsible for forming microbial fouling. This study investigated the fouling growth characteristics in heat exchanger. For this purpose, the IB and SRB from water in urban sewage treatment plants were separated and purified, and the runner state of sewage heat exchanger pipeline was simulated by designing the flow channel model. The wet and dry weights of the fouling formed by IB at different temperatures, fluid flow velocities and bacteria concentrations were analyzed via weighing method. The influence of these factors on the fouling formation by IB was further analyzed. In addition, a comparative study was conducted on the composite fouling after the addition of SRB. The results showed that the fouling formed by IB was composed of iron precipitates and organics. At 20-40℃, the fouling rate of IB was faster, and the fouling generated was higher, when the temperature was higher. With the increase in flow velocity, the rate of fouling reduced, and the fouling gross decreased. The concentration of IB affected the rate of fouling so that the lower the initial concentration was, the faster the fouling rate of IB was. The structure of the composite fouling after adding SRB became more compact.

Keywords: sewage; heat exchanger; iron bacteria; sulfate reducing bacteria; fouling growth characteristics

Fund project: Natural Science Fund of Shandong Province PR China (ZR2015EM003)
***Corresponding Author:** Qirong Yang E-mail address: luyingyi125@163.com