DEVELOPMENT UNIT DESIGN OF REAGENTLESS SPRINKLER EVAPORATOR TOWERS

Madyshev I.N.[1], Ph.D. (Engineering), Associate Professor, e-mail: ilnyr_91@mail.ru
Dmitriev A.V.[2], D.Sc. (Engineering), Head of Department, e-mail: ieremiada@gmail.com
Khafizova A.I.[2], Graduate students, e-mail: aliyahi@mail.ru
Dmitrieva O.S.[1], Ph.D. (Engineering), Associate Professor, e-mail: ja_deva@mail.ru

[1]Kazan National Research Technological University, 47 Stroitelei av., Nizhnekamsk, 423578, Russian Federation
[2]Kazan State Power Engineering University, 51 Krasnoselskaya st., Kazan, 420066, Russian Federation

Abstract

The processes of circulating water cooling in reagent-free evaporative cooling towers are considered. The technological scheme and a new design of the cooling tower with non-contact evaporative cooling, which can significantly reduce the amount of chemicals used. The sprinkler unit is a structure consisting of developed jet-film contact elements. The investigated nozzles are able to provide a large phase contact surface with a small number of irrigation points. The device has a minimum percentage of liquid entrainment by gas flow and low hydraulic resistance. Based on the Lewis analogy, an expression for calculating the volume heat transfer coefficient taking into account the ratio of the mass flow of air and water, as well as the density of irrigation is obtained. It is established that the volumetric heat transfer coefficient increases with increasing irrigation density due to the turbulence of the flowing liquid film.

Keywords
Agentless evaporative cooling tower, jet-film contact element, heat and mass transfer, heat transfer coefficient

Acknowledgments
The study was conducted with funding from the grant of RF President № МК-417.2019.8.