

INTENSIFICATION OF THE BOILING PROCESS WHEN CHANGING THE GEOMETRY OF HEATING PIPES IN THE EVAPORATOR

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In the modern world, there are about 100 different designs of evaporators (EV). Depending on the substance and the method of concentration, the appropriate design is used. First of all, EV must meet a number of general requirements, namely: have a high intensity of heat transfer and ensure high performance with the smallest possible volume of the device; the cost of metal for its manufacture – minimal; simplicity of construction and reliability in operation [1].

For the lysine concentration process, it was proposed to improve the design of the EV by replacing the heat exchange tube. In order to intensify the heat transfer process in EV, it is proposed to use corrugated pipes, which, in comparison with smooth pipes, have a larger heat transfer surface per unit length. The study was conducted in the ANSYS program.

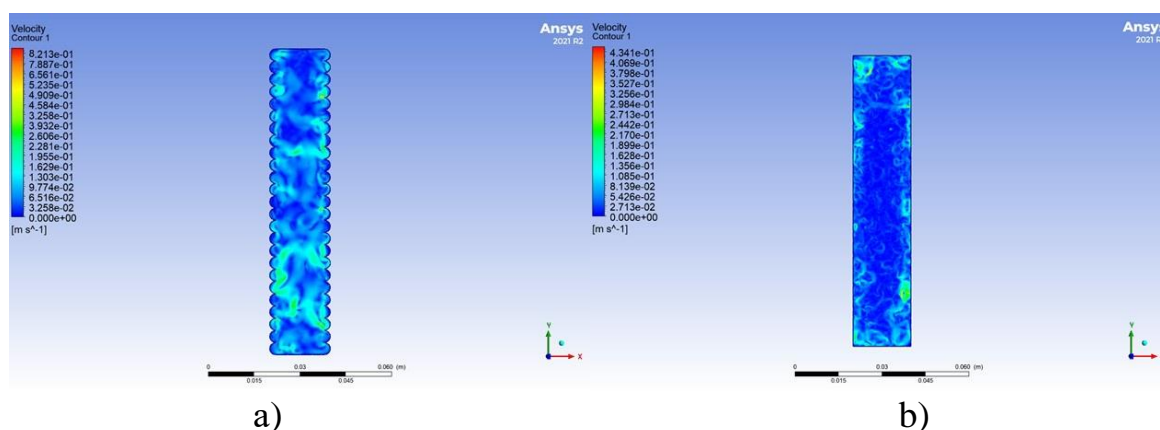


Fig. 1 Speed diagram a) in corrugated; b) in a smooth pipe

Figure 1 a, b simulates the boiling process, with the establishment of the following limit and initial conditions: initial wall temperature – 150 °C, initial liquid temperature – 98 °C, phase transition temperature – 100 °C. As can be seen from the diagram, the heat transfer rate in the corrugated pipe – 0.82 m/s⁻¹, which is almost twice as high as in the smooth 0.43 m/s⁻¹. Accordingly, the turbulence of the fluid flow increases and the surface is updated faster to supply a new portion of the solution. It should be noted that the rate of circulation of the solution in the corrugated pipe is higher than in the smooth, which has a positive effect on reducing deposits on the surface of the pipes.

References:

1. Технологічне обладнання фармацевтичної та біотехнологічної промисловості / М. Стасевич та ін. Львів : Новий Світ-2000, 2020. 410 с.