

RESEARCH OF HYDRODYNAMICS PROCESS IN THE VACUUM APPARATUS WHEN CRYSTALLIZATION MASSECUITE WITH THE PURPOSE OF THEIR INTENSIFICATION

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ABSTRACT

The research in the area of mass crystallization of sucrose are traditional for the National University of Food Technologies, where fundamental researches on heat and mass exchange when boiling sugar massecuite, sugar crystallization kinetics and fluid dynamics in the vacuum apparatus are carried out. The objective of our work is theoretical and experimental study of the recycling process in obtaining sugar massecuite and research of constructive factors on the process.

The purpose of research is to determine the influence of the introduction of water vapor from the outside in sugar solution and massecuite to the process of intensification of mass crystallization.

We have studied the bubble flow steam and massecuite mixtures typical for industrial vacuum apparatus. We used a method of hydrodynamic intensification of massecuite boiling by injecting steam into each tube apparatus. Injected steam flow was maintained in the optimal range for each stage of boiling. It was first used to simulate the movement of massecuite in vacuum apparatus using software system FlowVision. This complex is designed to simulate three-dimensional flows of liquid and gas in the technical and natural objects, as well as the visualization of these flows by computer graphics.

In our case, we consider the problem of modeling of turbulent flow between two media with properties which differ by many times. Massecuite is given to the main entrance canal and steam is supplied from the auxiliary input in the center of the tube.

In this task a model of an incompressible fluid was chosen. In the calculations Navier–Stokes equations are solved for turbulent transfer functions and equations of convectediffusive transport.

On the basis of studies of heat exchange process and hydrodynamics in a vacuum apparatus an upgrading unit batch is proposed. It is equipped with a device for amplification of hydrodynamic circulation in order to intensify the process.

KEY WORDS

massecuite, steam, intensity