

## **USE OF ENERGY-EFFICIENT EQUIPMENT IN DRINKING MILK TECHNOLOGICAL LINE**

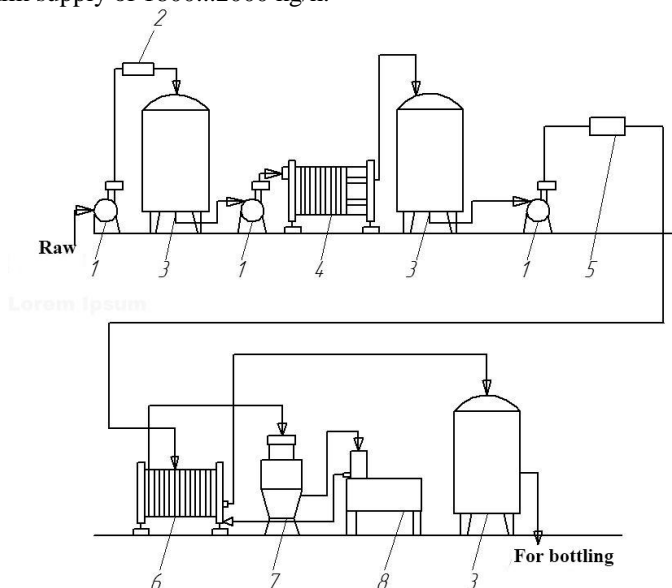
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**Purpose of the research:** Today, the question of using energy-efficient equipment in various industries, including the processing and food industries, is quite relevant [1]. Homogenization is one of the most important and energy-consuming operations at milk processing plants. Homogenization is used in the production of drinking sterilized and pasteurized milk, fermented milk products, ice cream, milk preserves, and cheese production. The quality of products using homogenized milk is much higher. The use of homogenization in the production of drinking milk helps to improve organoleptic indicators, increase stability and viscosity, the absence of fat residues on the walls of the apparatus, and improve the digestibility of the product by reducing the size of milk fat particles. However, valve homogenizers, which are most often used at enterprises, can hardly be called energy-efficient, since they consume quite a lot of electricity (more than 7 kW/t) to obtain high-quality milk. Therefore, the development of new, more effective methods of homogenization or the improvement of already existing ones, with the aim of reducing the energy consumption of the homogenization process and increasing the degree of dispersion of milk fat and researching their effectiveness in the technological line of drinking milk production, is a very relevant issue today.

**The main research materials:** A large number of works are aimed at reducing the size of the dispersible particles of the dispersed phase by improving the existing equipment for homogenization [2]. However, technical and technological solutions for improving homogenizers have reached their limits. The most promising in this sense is the pulse homogenizer, which allows you to obtain high-quality homogenized milk with much lower energy consumption for the process.

In fig. 1 presents a diagram of the technological process of production of drinking milk using a pulse homogenizer. In this designed variant, the drinking milk production technology remained unchanged, except for the operating modes of the pulse homogenizer. The rational temperature of milk for pulsed homogenization is 65...70 °C; the frequency and amplitude of oscillation of the impactor pistons of the impulse homogenizer for drinking milk are 55...59 Hz and 10...12 mm, respectively, at a milk supply of 1800...2000 kg/h.



1 – pumps for milk; 2 – milk counter; 3 – balance tanks for milk; 4 – plate cooling unit; 5 – normalizer; 6 – plate pasteurization and cooling unit; 7 – separator-milk purifier; 8 – pulse homogenizer.

Fig. 1. Scheme of the technological process of production of drinking milk using a pulse homogenizer.

The scheme for the production of drinking milk using a pulse homogenizer is as follows [1,3]. The milk enters balance tank 3, from where the pump 1 supplies it to plate cooling unit 4, where it is pre-cooled. Next, the cooled milk is directed by pump 1 to normalization 5, which takes place in the flow. The normalized mixture is fed to the plate pasteurization-cooling unit 6 for heating before entering the separator-milk purifier 7.

After cleaning, homogenization is carried out in the pulse

homogenizer 8. From here, the milk is again fed to the plate pasteurization-cooling unit 6, where the milk is first pasteurized, then cooled, and directed to bottling and packaging.

In order to verify the effectiveness of using the pulse homogenizer in industrial conditions, production tests of the device were conducted on the basis of the private enterprise "Milk-fat plant "Pivdenny" in the technological line for the production of drinking pasteurized milk.

Ready pasteurized milk, which was produced using a pulse homogenizer, was sent to the laboratory for examination. The conclusion of the testing laboratory of food products of food raw materials and building materials of the Melitopol branch of the testing center "ZAPORIZHZHYASTANDARTMETROLOGIA" testifies to the compliance of drinking pasteurized milk, which has undergone homogenization in an impulse homogenizer, with the requirements of DSTU 2661-94, which were approved and put into effect by the order of the State Standard of Ukraine No. 79 of 02.08.1999.

**Conclusions:** Therefore, the issue of researching technological equipment for dispersing milk fat with the aim of identifying the most effective one, which will allow obtaining a high-quality finished product with minimal energy costs for the process and introducing an industrial sample into the technological line of milk processing, does not lose its relevance. The conducted theoretical and experimental studies showed that the impulse milk homogenizer is promising in this sense. Tests of an industrial sample of the homogenizer under production conditions in the drinking pasteurized milk production line showed that the use of a pulse homogenizer allows obtaining a high degree of dispersion of milk fat  $H_m = 4...5$  and reducing the power per drive from 18,5 kW to 2 kW.

### **References:**

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