

RESEARCH OF THE PROCESS OF ULTRAFILTRATION CONCENTRATION CURDY WHEY

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Whey is a liquid by-product of the dairy industry produced during the manufacture of cheese and casein. As a raw material, it has many applications in food technology due to the functional and nutritional properties of its proteins.

Researches of scientists concerning the application of UF-treatment process of raw milk nowadays have episodic character. They are devoted to a narrow range of issues concerning the use of UF in the processing of skimmed milk and milk whey with a receipt of dry and liquid UF-concentrates. Almost no sanctify development is devoted to the research of UF curdy whey processing, which is a valuable protein-carbohydrate addition in the production of many foods.

Therefore, improvement of the line for manufacturing of dry protein concentrate curdy whey is an actual and timely task.

The purpose of the work is experimental development of the process of ultrafiltration concentration of curdy whey and improvement of the line for manufacturing of curdy whey protein concentrate.

It is known that during the UF of biological liquids, in particular milk raw materials on the membrane surface are formed by gel layer, which significantly reduces performance UF-plants. To combat the gel layer on the membrane surface proposed using a pulsating supply of raw liquid.

The results researches of the influence of technological parameters (duration, temperature and pressure) on the productivity ultrafiltration plant with a pulsating supply of curdy whey are obtained.

Dependence of the nature of the change productivity as the pressure increases for two modes is identical. Intensive increase performance of membranes in dead-end mode and pulsating mode of supply of raw materials is carried with increasing pressure to 0,4–0,5 MPa. In the future, with increasing pressure the productivity of the membranes increases insignificantly. The use of pulsating mode of supply of raw materials increases productivity of the membranes by 60–62% for GR81PP and 40–44% for GR61PP.

The dependence of the influence of temperature on the efficiency of the UF process of curdy whey shows that temperature increase to 40...50 C

leads to a significant raise of the productivity of the semi-penetrable membranes. Within 50 °C to 80 °C the productivity of membranes also increase, but insignificantly. It can be explained by hidden protein coagulation, whereupon it is deposited on a surface of the membrane sealing a polarizing layer. The use of pulsating supply of raw materials in UF of curdy whey for different temperatures increases productivity of the semi-penetrable membranes average by 1,3–1,5 times.

Dependence of the duration of the UF process of curdy whey productivity with GR membrane for different modes of ultrafiltration shows that the regime deadlock during the first two hours is a significant reduction of membrane performance – 36–40% for GR81PP membrane and 28–33% for GR61PP membrane. It can be explained by the formation on the surface of a polarizing layer of macromolecular substances. In this case, the pulsating mode of raw materials supply in membrane performance decrease, but to a much lesser degree –18–19%.

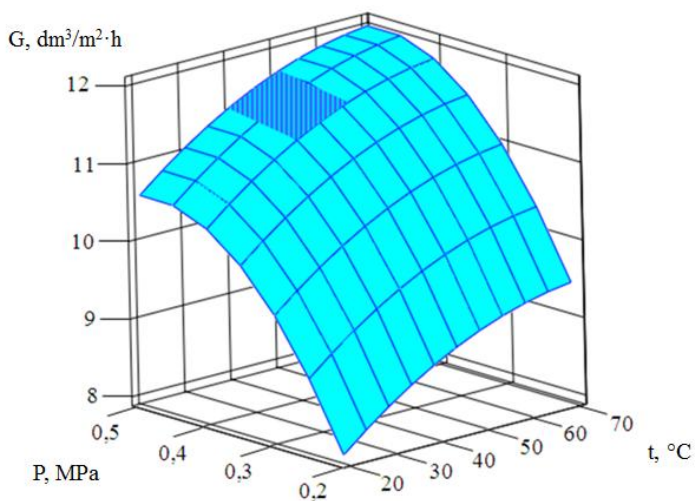
The intensity of both membranes productivity happens with increasing frequency of pulsating supply to the values 90–100 minutes⁻¹. After this, the productivity indexes stabilize. The increasing productivity of the membrane in case of the pulsating supply of raw materials can be explained by periodic discharge pressure in the chamber and water hammer of liquid on the surface of the membrane. It leads to a partial removal of polarizing layer from the membrane surface and, consequently, to increase productivity.

Optimization of technological modes of UF-separation of buttermilk process in the dead-end mode and pulsating mode of raw materials supply – the volume graphical dependence is characterizing the indicated process. The most suitable modes of UF process are marked on graphical dependence by the corresponding shading are shown on the fig.

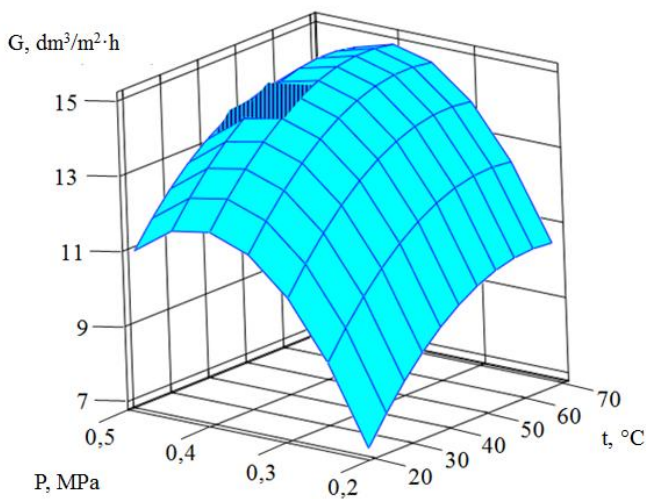
Dependency of physicochemical properties showed that increasing dry matter content in the concentrate as well as permeate has a linear character. In the concentrate at the expense, the output of liquid low molecular substances and fat and protein concentration increase. In permeate at the expense it happens due to lactose, minerals, vitamins, and a small number of individual fractions of protein milk passage. From the dependence dynamics of solids in permeate and concentrate, we can observe that the intensity of solids in the concentrate is increasing.

Economic efficiency of scientific researches is 160,48 thousand UAH for a year.

Based on the research findings an industrial ultrafiltration module with a pulsating supply of raw materials and schematic diagram of an improved production line of dry concentrate curdy whey.



a – dead end mode



b – pulsating mode of supply of raw materials

Fig. Optimization technological parameters of the ultrafiltration process curdy whey