PROCESSING WHEY BY VACUUM EVAPORATION

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Abstract: report deals task of preserve the original quality of the whey, this is possible by using vacuum evaporation. In this paper shows a diagram of the laboratory installation for vacuum thickening whey. The results show the advantage of this method for preliminary processing.

Key words: whey, storage, vacuum evaporation.

Introduction

Continued growth of the attention of researchers and practitioners to the problems of environmental pollution, intensive industrialization of dairy industry is accompanied by increasing of competition processing enterprises for the development of new technology and techniques especially processing of secondary raw materials - whey. Therefore, in recent years, intensive search for new applications of this product, due to the presence therein of components of high nutritional value.

The composition and properties of whey during storage undergo various changes. In addition, whey from the main production temperature goes around 30 ^{0}C, which corresponds to an optimum mode of lactic acid bacteria.

Lactose is the least stable component is subjected to enzymatic hydrolysis, which leads to an increase in acidity, and pH change and optical density (Table 1).

Table 1. Changing the basic indicators of whey during storage.

Index	Fresh	After storage, h				
		10	30	50	70	90
Mass fraction of lactose, %	4,5	4,4	4,3	3,9	3,6	3,5
Acidity						
Titratable (^{0}т)	18,0	26,00	44,00	63,00	77,00	90,00
PH	6,00	5,10	4,20	3,80	3,60	3,50
Turbidity, 1/см	0,17	0,19	0,25	0,31	0,37	0,42

At higher titratable acidity to lactose loss exceeds 20% of the initial content, In addition to reducing the amount of lactose hydrolysis of protein and fat, modified whey flavor indicators. In practice, it can be assumed that the whey during storage without treatment within 12 hours of losing 25% of its energy value.

Thickening of the whey can be regarded as a type of its preservation [1].

Description of the experimental installation for thickening whey

To create a vacuum in the evaporator and its maintenance (required for non-condensable gases) are used: vacuum and steam jet pumps [2].

Are used various vacuum pumps, for example, liquid ring. Usually installed two pumps with the rapid start-up of the evaporator, and in the process one. Steam jet vacuum pump has the same fundamental structure as that of a steam compressor, but it is necessary to take into account the additional steam consumption.

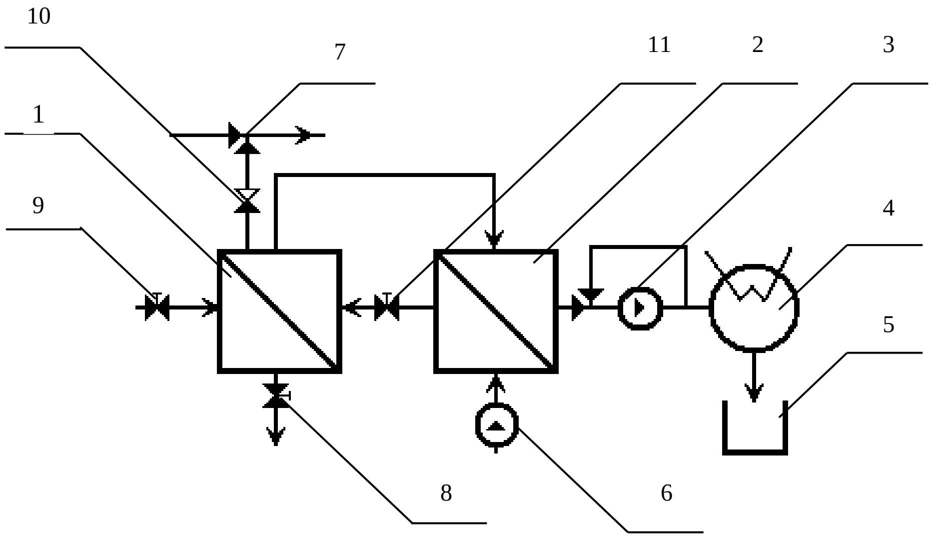

Fig. 1. Scheme vacuum evaporation installation for thickening the whey:
1 - heat exchanger; 2 - surface condenser; 3 - vacuum pump; 4 - condenser cooler vapours;
5 - discharge condense vapour; 6 - whey feed pump; 7 - gas jet vacuum pump; 8 - valve at the outlet of the primary steam condenses; 9 - valve at the inlet of the primary steam;
10 - valve bypass non-condensable gases; 11 - feeding whey regulating valve

Since almost all of the energy is spent in the secondary pair formed by the evaporation of whey (see. Fig. 1), it is obvious that it can be used for pre-heating the whey due to vapour condensation.

This is achieved by the inclusion of another evaporator heating chamber, this is second part of installation, where the temperature is below boiling, which acts as a condenser for the vapour from the first body, and a pair of energy used during its condensation [3].

According to the construction and operation to the surface condenser - this is an ordinary tubular heat exchanger. Its advantage is that the cooling and condensation water vapour is not mixed. Because only be required pumped condense under vacuum, such an apparatus is not mounted on the barometric height, as in the case of the mixing condenser. Surface condensers necessarily apply to installations where the evaporated acidic products such as acid whey, so as not to mix the acidic condense with the cooling water.

In the absence of the necessary water resource problem can be solved by recycling the water, but since the temperature of the water increases with each cycle at 10 - 15 ^{0}C, it becomes problematic to maintain the vacuum. The solution in this case is the use of cooling towers. Due to evaporation in the cooling tower in the system, naturally, it is required to add water, but its consumption is low. When using the mixing condenser make-up water is practically not required, as mixed with water vapour condense. It is recommended to periodically change completely recycled water to avoid bacteria growth [4].

The results of treatment with concentrated whey

Moreover, compared with serum subject experiments, a simple evaporation and the thicken whey, condensed under vacuum. We compared processes electrolysis fermented whey in the electrolysis device type, where the voltage is kept constant - 29B. The cathode chamber of the device was filled with a solution of fermented whey (pH 4.05), the anode chamber - a weak electrolyte solution. Results for changing acidity, current and temperature are presented (table 2, 3).

Table 2. Condensed whey (simple evaporation) during electrolysis

τ, min	I,A	T_1 cathode	T_2 anode	pH cathode	PH anode
5	1	20	20	4.25	7.35
20	1	30	34	4.85	2.8
30	0.8	36	40	5.5	2.4
50	0.5	40	43	10.8	2.35

Table 3. Condensed whey (vacuum evaporation) during electrolysis

τ, min	I,A	T_1 cathode	T_2 anode	pH cathode	PH anode
5	1	20	20	4.2	5.8
20	1.2	40	33	4.7	3.8
30	0.5	42	40	6.0	2.23
50	0.4	42	40	8.06	2.08

The evaporated water was examined for acid content. Thus, the water was removed after concentration always has a pH 4,6-5.

The technology of many dairy drinks considered a preliminary concentration of raw materials [5, 6]. It is necessary to obtain low acidity whey.

These results demonstrate the advantages of the vacuum concentrating whey. In the cathode chamber is maintained longer slightly acidic and neutral medium, which has a positive influence on the concentration of lactic acid in the anode chamber.

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