

EQUIPMENT FOR THE DAIRY INDUSTRY

Dairy equipment or equipment for the dairy industry is a special technique, equipment and devices used at various dairy enterprises: dairy and dairy canning factories, butter plants, cheese factories, and others. These enterprises combine raw materials; produce milk and dairy products (milk, sour cream, kefir, sour milk, yoghurts, cheese, butter, condensed milk, ice cream, etc.) [1].

Equipment of dairy enterprises can be classified into the following categories: 1) transportation of raw materials and finished products; 2) technological; 3) refrigerating; 4) energy; 5) general.

Technological equipment is classified:

- for receiving and storing milk;
- for the processing and cleaning of milk from mechanical impurities, for neutralization and for obtaining stable products for storage, homogenization;
- for the processing of milk and the production of dairy products with the storage of all dry milk substances – the development of condensed and dry dairy products;
- for the processing of milk and the production of dairy products from individual parts of milk – the production of cream and the separation of mixtures in the production of butter, casein, cheese, curd and ice cream;
- for bottling, dosing and packaging of dairy products;
- for washing containers and equipment.

Technical equipment is divided into general and specialized.

General equipment of enterprises of the dairy industry is independent regardless of the profile of the enterprise, including milk receiving equipment, weights, separators, milk cleaners, reservoirs and pumps.

Specialized equipment is installed at the enterprises depending on the profile: the dairy factory, butter factory, cheese factory, the factory of dry and condensed milk, etc [6].

General requirements to dairy equipment are:

1) Machines and apparatus for dairy industry should be manufactured in such a way that disassembly and assembly before work can be carried out with minimal effort and time.

2) The moving parts of the machine must be protected from water, milk and washing liquids, and machine lubricants should not be released into the product.

3) The machines should be suitable for washing, cleaning and cleanliness control.

4) Parts of machines in contact with milk and dairy products are made from materials that do not have a harmful effect on products and allow cleaning, washing and disinfection of equipment.

5) The location and design of the knots and mechanisms of machines, starting and braking devices should provide free and convenient access to them, safety during installation, operation and repair.

6) Controls are designed to exclude their accidental or random activation and shutdown.

7) All hazardous areas (driving, transfer and executive mechanisms) are fenced. Enclosures should be lightweight, durable, securely fastened, but easy to remove during cleaning, inspection and repair.

8) All machines should at work minimize noise and vibration.

9) All machines and apparatuses for which dust, steam or gases are released shall be equipped with devices for capturing and removing them from the premises.

10) Hot surfaces of machines must be insulated. The insulation must be smooth, resistant to moisture and mechanical influences.

11) Technological equipment must be equipped with control valves and control and measuring devices.

12) Isolation valve (rectifiers, cranes, valves, etc.) should have reliable seals that do not allow the passage of liquid or vapor.

13) All machines must be securely grounded.

14) The external and internal surfaces of machines must be smooth, streamlined, with smooth transitions to depressions and rounded corners, which facilitates their maintenance in the proper sanitary-and-hygienic condition [5].

Complexity of equipment can be different at different enterprises. This is mainly influenced by the organization of production, the processes that must be performed: reception milk, fatness normalization, homogenization, pasteurization, cooling, packaging, transportation, etc. Technological volumes depend on the scale of the plant.

Main equipment is storage tanks for production components, purifiers, centrifugal and degreasing separators, coolers and pasteurizers, packing equipment, sinks, milk receiving plants, refrigerators and other aggregates that require the specifics of a particular production process [2].

And now let's take a closer look at some of the devices that are important in this area.

Recently, reservoirs (tanks and baths) are used for collecting, cooling and storing milk. The milk in the tanks is cooled to a given temperature. At the same time, much less milk loss than when cooled by other methods. Reduced labor costs for cooling, do not require a permanent presence of a person.

Purification is an integral part of the general technology of production of milk and dairy products. The most common way of cleaning is filtering. This requires filters.

At modern milk plants, milk is cleaned in a cleaner mounted directly on the milk pipeline. In the extended part of the milk pipe insert a tube, which is fixed with a rubber stopper. At the end of the tube is attached a nozzle made of metal rods, connected by rings. The nozzle is fitted with a filter cloth cover, which is attached with a rubber ring. The milk first passes through the filter, and then enters the vacuum cooler.

Milk filtration, even with the use of the finest filtering materials, does not ensure its complete purification from mechanical impurities, as the filtered residues are blurred by the flow of milk to small particles passing through the filter's pores into milk.

Centrifugal milk cleaners are more ideal for cleaning milk from mechanical impurities and they are widely used in the dairy industry. The centrifugal milk cleaner is a separator with a modified drum and milk dispensing equipment. The drum has an increased amount of dirt, there is no distributor plate. Its plates without holes. The drum spins at a speed of 6000-8000 rpm.

During cleaning cold milk, which has an increased viscosity, the rate of separation of suspended particles decreases and the quality of cleaning deteriorates. At high temperatures (80-85°C), the particle separation rate increases, but the quality of cleaning does not improve, as part of the contaminants dissolves in hot milk and can not be isolated by the action of centrifugal force. The optimum milk temperature for centrifugal purification is assumed to be 35-45°C.

Separation is a process of separating milk into cream and skim milk by the application of separators. Separators are divided into open, semi-open and closed. In open separators, milk enters the drum, and separated cream and skim milk come out when the mass contacts with air; in semi-open – the milk is fed into the drum with an open stream, and cream and skim milk are in closed pipelines; in closed – milk is fed into a drum, cream and skim milk are diverted into a closed flow. Intended for separation, the milk is heated to a temperature of 40-50°C [3; 4].

Dairy production is a large branch of industry, which is designed to provide consumers with high-quality milk and dairy products. In order to organize this, it is necessary to complete the shops and laboratories with all types of equipment. And here everything is important: from the amount of technology to its quality and functionality.

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