

MEMBRANE PROCESSES FOR PROCESSING WATER RESOURCES FOR FOOD INDUSTRY NEEDS

Deinychenko G., Dr. of Tech. Sc., Prof.

Guzenko V., PhD in Tech. Sc., Sen. Lect.

Kharkiv State University of Food Technology and Trade

In modern conditions, most industrial enterprises in all sectors of the food industry use water resources for the cooling of technological equipment (return water), its heating (heating water), as well as for the main technological process (technological water).

Today, the water used in the technological process of food production is subject to rather stringent requirements, which are defined by special technological instructions. They have set the maximum permissible amount of those or other substances that may be contained in the liquid. For this reason, water directly used in the technological process of food production is undergoing special treatment.

For the treatment of water in the food industry processes are used for defending, coagulation, softening (thermal, ion exchange, membrane electro dialysis and distillation methods), and for decontamination – chlorination, ozonation, microfiltration, anodic oxidation and other.

Of the existing technologies used to clean water during the production of soft drinks, one of the most effective is the technology of hyperfiltration. This technology is realized due to the installation of treatment systems based on the processes of membrane filtration, and the company receives purified water, which does not contain any harmful, hazardous to human health substances. At the same time different methods of membrane treatment are used for water purification of various types of preparation at enterprises of food production: filtration, microfiltration, ultrafiltration, nanofiltration, reverse osmosis, electro dialysis, and others.

Desalination of seawater is an example that illustrates the problem of membrane separation, which can be used to solve competing processes based on different principles of separation and consuming different amounts of energy.

The classification of some separation processes by the chemical and physical properties of the separated components is given in Table. As we can see from the table, differences in the size of molecules, vapor pressure, affinity, charge, or chemical nature of molecules help to realize the membrane separation of water resources of different levels of pollution.

Table 1

Separation processes based on the molecular properties of water resources to be treated

Molecular properties	Separation processes
Size	Filtration, microfiltration, ultrafiltration, dialysis, gas separation, gel permeation chromatography
Pressure of steam	Distillation, membrane distillation
Freezing point	Crystallization
Affinity	Extraction, adsorption, absorption, reverse osmosis, gas separation, pervaporation
Charge	Ion exchange, electrodialysis, electrophoresis
Density	Centrifugation
Chemical nature	Complex formation, liquid membranes

How can you make a choice between different separation processes for solving a problem? Several common factors may influence this choice, but they cannot be applied to all situations. Therefore, the specific criteria which must be met by a well-founded choice of process can be considered. At the same time, there are two general criteria that can be applied to all dividing processes. These criteria can be deduced by technical and economic factors.

Thus, the first criterion is quite clear, since two basic requirements are put forward to the process of separation of water resources: the need to achieve the required degree of extraction and the quality (purity) of the water received. Sometimes a combination of two or more separation processes is required to meet these requirements. However, the economic feasibility of the process depends to a large extent on the value of the target products.

Thus, the use of membrane processes for the processing of various types of water resources is not only an important technical but also an ecological and social task of development of the food industry.