Alexander Shevchenko, Inna Vinnichenko, Jelyzaveta Smirnova
National University of Food Technologies, Kiev, Ukraine

Introduction. Important components transformation processes of cyclic energy and mass streams are industrial fermentation processes on the basis of which the synthesis of organic products occurs.

Materials and methods. On the basis of power and material support for these technologies is the synthesis of sugars, starch or other biopolymers, which are the result of the interaction of the well-known triad – water, carbon dioxide and sunlight. A continuous cycle of these components with other substances ensures the synthesis of organic compounds, the final breakdown of which ends with the formation of carbon dioxide and water. Anaerobic and aerobic fermentation technology is an important part of the overall cycle, though partly unfinished with useful consequence to humans, as the fermentation is completed by obtaining of targeted substances, characterized for the production of bread, wine, beer, kvass, etc., that provide energy, taste and interaction by consumption.

Results. The indicator of transformation is the change of sugars concentrations, accumulated ethanol and carbon dioxide. Changes in the ratios of these substances correspond to the equation of Gay-Lussac, which allows determining the effectiveness of the technology used. These ratios refer to all anaerobic fermentation technologies and indicate the presence of losses: $C_6H_{12}O_6=2C_2H_5OH+2CO_2$ (1)

If we neglect losses associated with the synthesis of yeast biomass, carbon losses will account for one third of the input quantity and oxygen losses to two-thirds. In most fermentation technologies these losses in the form of carbon dioxide are indeed losses with the exception of those parts which provide the saturation of beer, kvass or the operation of a carbon dioxide plant.

Provided that the sugar in the process is specified in the crease, the drop in its concentration will change from maximum to zero, and concentrations of ethanol and carbon dioxide increase from zero to maximum values. In accordance with them osmotic pressure is changing. By its structure, biochemical reactions in cultural settings are closer to the first-order reactions and their progress is displayed by the dynamics of digestion, which is influenced by the natural properties of microorganisms. In the general case graphical interpretation reflects the components of changes in osmotic pressure in Fig. 1.

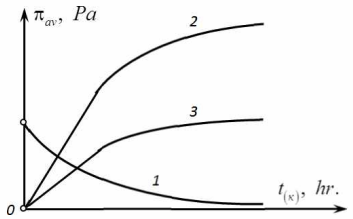

Fig. 1. Graphs of osmotic pressure change the components of the solutions: 1 – sugar; 2 – ethanol; 3 – carbon dioxide

Conclusions. In the existing technologies of fermentative productions of ethanol its maximum concentrations are approaching to 12 %, which obviously refers to the negative phenomenon, because such concentrations might cause bacteriostatic effect and fermentation stops.