USING WATER-POLYMER JET CUTTING OF FROZEN FOOD PRODUCTS

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Complex studying of the process of hydro-cutting of frozen food products is carried out. It has given the chance to offer the most expedient ways for the intensification of the process of hydro-cutting of frozen food products. It is experimentally proved that using polyethyleneoxide water solutions as a working liquid while cutting frozen food products substantially increases efficiency of hydro-cutting process and quality of the cut surface.

The study of polyethyleneoxide concentration effect on cutting performance of food products frozen to -25°C and to the temperature of liquid nitrogen (-195,8° C) with hydro-polymer jet having outflow pressure of 100 MPa and a nozzle diameter of 0,35.10^-3 m showed that cutting speed grew with the increasing concentration of polyethyleneoxide in water and reached its maximum at some optimal value. The optimal concentration equaled 0,007% for polyethyleneoxide molecular weight 4.10^6. The experiments gave an increase of high speed water jet cutting ability due to polyethyleneoxide additives to it by the order of magnitude while cutting meat frozen to -25° C and by 5 times for meat frozen to -195,8° C.

Three-level scale of quality estimation for a cut surface in food products is offered: "fragmentary", "even qualitative" and "high-quality" cuts where quantitative criteria are connected with the roughness and undulation of cut surface in frozen food products.

In converging polymer solution flow macromolecules are forced by a hydrodynamic field to rather strong stretching that causes the field restructuring. The determined regularities of macromolecules behavior in the flow with longitudinal velocity gradient and manifested in this case effects of elastic deformations have paramount importance in understanding the mechanism of anomalously high cutting power of water-polymer jet processing of foodstuffs by cutting.

Understanding the nature of the increased cutting power of water-polymer jet will make it possible to develop recommendations for choosing regimes for water-polymer jet processing of foodstuffs by cutting.

Keywords: polymer solution, foodstuff, polyethyleneoxide, velocity, hydrodynamic field, velocity gradient, deformation effects.