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Tasks of modeling the process of processing raw materials for livestock products

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Abstract
The article describes the tasks of creating a mathematical model for the production of semi-finished products in a centralized manner on the basis of cooperation between food enterprises and meat industry enterprises

Keywords: Mathematical model, technological process, balanced, nutritional value, material flow, input current, output current

Introduction
In a number of resolutions of the President of Uzbekistan on the development of livestock, poultry, establishment of enterprises for processing of agricultural raw materials and others, special attention is paid to providing the population with high quality, high biological value, wide range of food products.

One of the main tasks of specialists in the livestock processing industry is the production of high quality food products.

One of the main tasks of meat industry professionals is to produce high quality food products. To solve this problem, it is necessary to reduce the amount of waste at all stages of production and increase the amount of products produced from raw materials.

To do this, it is necessary to optimize existing technological schemes and processes, rational use of reserve raw materials, technological equipment, vehicles, energy and other resources, find the optimal way to achieve the goal with less time, effort and money.

Literature review
The range of products produced in the meat industry is very diverse, so the supply of raw materials is not the same at different times of the year, so it is necessary to organize stocks of raw materials.

To solve the above-mentioned problems depends only on the experience and intuition of the technologist, that is, the ability to anticipate. The optimal solution for the design of technological processes of meat processing can be performed on the basis of mathematical calculations - mathematical models. A mathematical model of technological operations and mathematical flows shows production situations that cannot be directly solved by experimental or analytical research taking place using standard and practical applications in computers. In this mode it is possible to determine the rational - waste-free and low-waste regimes of products, flows, processes, use of raw materials and distribution of resources. The application of the model of technological processes and equipment on the computer allows the engineer-technologist to make operational modes, organizational, constructive and design decisions quickly and reasonably.

Hence, mathematical and simulation modeling of the technological process on the basis of exposure will remain the main methodological tool for the technologist, providing optimized, compact automated production based on accepted measurements and constraints of production.

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Research Methodology

The type and shape of the mathematical model of the technological process is determined based on the nature of the object of research and the task of the research. Therefore, the modeling process is determined by an in-depth analysis of the technological process.

When modeling the technological process of the meat industry, it is necessary to take into account the specifics of the raw materials and technological environment to be processed, the changes in physical and chemical properties to some extent during the technological process.

The main indicators that determine the nutritional value of meat products are the specific characteristics of the composition y part and their optimal ratio (balanced) in the product composition. The appearance, taste, aroma, color, consistency and other characteristics of the product also play an important role. Therefore, special attention is paid to subjective, organoleptic methods that determine the quality indicators and control of the product.

Meat industry consists of a combination of technological processes and devices of interconnected material flows of raw materials and finished products. This system should ensure the optimal use of raw materials and production resources and ensure production in the required range, quantity and quality.

The complexity of making an optimal decision is the lack of raw materials to produce the required product, not always delivering the raw material at the same time, the absence or lack of certain components to produce the required product, lack of energy limit, lack of cooling rooms and warehouses in production, as a result of some restrictions on the shelf life and distribution of raw materials and products, the task may not be performed.

Meat processing plants can be divided into two parts: natural meat products and combined meat products.

Natural meat products are products that are divided into parts (neck, thighs, breasts, kidneys, semi-finished products, etc.), processed in a simple technological way and prepared and distributed in the same condition.

Sausage products made from different raw materials and using different methods, semi-finished products made from minced meat (cutlets, minced meat, pate, dumplings and other culinary products) are combined meat products.

It is possible to use intermediate products in different directions, using different types of efficient technologies, changing recipes and processes in a technological mode of mixing different products.

The technologist should use the above-mentioned opportunities to determine the optimal variant of the scheme and the whole system of economic technological processes of production.

The technological system of meat production can be compared to a technological scheme in a certain direction. Its nodes can be thought of as technological operations and processes, and its branches as the direction of raw materials and products. In this case, the input current is the raw material, and the output current is the product. The intermediate nodes of the process circuit can have multiple output currents in a single input and distributed currents. For example, when the bodies of cattle are processed, there will be one inlet and several outputs (body, skin, head, legs, skin, etc.). When meat products are prepared in a combined method, there are multiple inputs and one outlet flow due to the multi-component recipe. The technological process at each node is described by a mathematical model, such as a system of equations that combines the description of the input and output currents of that node. The description of the node also indicates the apparatus and technological equipment that can be used, its operational and design parameters, technological parameters of the process, the cost norms of other resources.

It is possible to create a mathematical model of the technological system based on the technological graph and parametric description of the input and output currents, products and processes of each node. In the form of a mathematical model it is possible to create a parametric model of various complex structure in a compact and systematized state.

Solving the problem of optimal (convenient) management of meat production, the existing technical means and technology of the enterprise, the rational use of raw materials and high satisfaction of consumers with high quality products, solving random problems of raw materials and orders on the day of launch, structural optimization of the system performed on the basis of. As a result, depending on the resource of raw materials and the composition of the components, the composition, range of material flows and the technological scheme established at the enterprise will be improved. When choosing the optimal composition of the technological system of meat processing plants, it is possible to optimize the range of products, recipe, material balance of the technological system and the optimal range of material flow direction and processing, depending on the required range of raw materials. The stage of structural optimization of the system, which determines the description of the composition and quantity of the branches of the technological graph, is based on this.

Product recipes and combined product preparation are the structural basis for determining the rational composition of the entire technological system of the meat processing complex, the scheme of processing and distribution of material flows (streams).

Analysis and Results

However, it should be noted that one of the main tasks in modeling the process of processing meat raw materials is the centralized production of semi-finished products on an industrial scale on the basis of cooperation between catering establishments, semi-finished products outlets and the meat industry.

One of the main issues in solving the problem of industrialization of the industry is the creation of fundamentally new progressive methods of production technology of semi-finished products, their engineering-design orientation.

The interdependence of these industries solves the multifaceted problems of industrialization of the industry. This is because the production processes in the meat industry are highly mechanized, have highly qualified personnel and a large amount of raw material resources.

In such conditions, it is necessary to use such a universal technology of production of semi-finished products that they are convenient and useful for catering enterprises, semi-finished products outlets and the food industry.

This, in turn, creates favorable conditions for improving the final results of these industries, reducing the loss of raw materials, as well as intensifying the production process on the basis of the application of scientific and technological advances.

The industrialization of the industry primarily involves the production of products in continuous, mechanized lines (rows).

Manufacturing of semi-finished products on an industrial scale are the first steps taken to create a universal technology of production. However, this situation does not fully reveal the possibility of catering enterprises of the food industry to produce semi-finished products at the level of demand for a new type of semi-finished products to provide outlets. One of the main tasks in solving this problem is to organize the slaughter of cattle and the production of semi-finished products from them in meat processing plants. As a result, it will be possible to provide the population with quality semi-finished products that have undergone veterinary sanitary inspection.

Due to the very short shelf life of sub-products of category I and II (liver, lungs, heart, kidneys, etc.), which are separated after slaughter, they can be processed immediately, preparing a variety of semi-finished products.

The separated blood, endocrine-enzyme raw materials, bones, wool, skin and other wastes can be sent as a secondary resource to specially adapted enterprises for the preparation of flour, technical oils, medicines, etc. for lactation in cattle and poultry.

Conclusions and Suggestions
In this direction, the use of chilled meat and meat products reduces the natural loss by eliminating the freezing phase, eliminates the need for electricity, manpower, separate refrigerated rooms (defrosters) for defrosting and defrosting, loss of juice when defrosting meat decreased. Also, in addition to semi-finished products made from meat, by-products, their nutritional and biological properties are based on the addition of non-traditional but scientifically proven food products (dietary fiber, dried powder of flavoring herbs, etc.). increase the value of new raw materials as a food product, the use of waste-free and low-waste technology.

Based on the scientific literature and the above, it is advisable to make the following suggestions:
The optimal solution for the design of technological processes of processing of agricultural products and processing of meat and other agricultural products in collaboration with specialists in other fields Mathematical calculations - the production and application of mathematical models;
- An important factor in creating opportunities for centralized production of semi-finished products on a commercial scale, providing the population with a wide range of quality, semi-finished products on the basis of cooperation of food enterprises, semi-finished products outlets, meat and other agricultural processing industries.

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