

**PECULIARITIES OF TECHNICAL MEANS OF MEAT PROCESSING
INDUSTRY IN UKRAINE**

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Abstract. *The state of meat and meat products production in Ukraine is described and analyzed. The influence of these parameters on the formation of the machinery and equipment fleet of the domestic meat industry, as well as the possibility and feasibility of providing this industry with food technology of Ukrainian production, is evaluated. The prospect of domestic machine building for meat production is to identify fairly narrow segments of equipment of medium technical complexity (for example, very well-developed top designs), which should be improved to maintain its own niche in the domestic equipment market and possible entry into the markets of other countries. But for the technically sophisticated meat cutting equipment (bowl cutters and emulsifiers), powerful casing fillers, automatic brine injectors, etc. it's advisable to import until our machine building enterprises reach such a technical level that would really make it possible to produce equipment that is competitive on the world market. Mastery of innovative solutions in the field of equipment for the meat industry is facilitated by properly organized technical regulation, in particular the standardization and harmonization of national standards with international and European ones.*

Keywords: *meat and meat products, technological equipment, innovation, standards, harmonization of national standards, food industry.*

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1. Introduction

Despite the widespread prevalence of equipment for the food and processing industry at numerous enterprises of this profile, the issue of updating the machinery and equipment fleet and technical improvement of such equipment has been outside the field of view of scientists and specialists for years, negatively affecting the development of the domestic industry in the above-mentioned industrial sectors. The reality is that the main export products to Ukraine continue to be agricultural raw materials and low-processed products - respectively, the main focus and most of the

investments are directed to this sector, but investments in machine building are declining. On the other hand, sales of finished foods or high value-added food raw materials on foreign markets would significantly improve the financial situation of processing and food enterprises, and would have the necessary funds for innovative updating of applied technologies and specialized equipment. However, so far there has been a dominance of foreign specialized equipment at domestic enterprises - both high-tech models and machines and apparatuses of medium and low complexity, the production of which has already been mastered, can be quickly mastered at the enterprises of the domestic machine-building complex.

2. Recent research and publications analysis

Nowadays, the concept of a "food system" is gaining ground, which covers all processes related to the cultivation, collection, processing, packaging, transportation, marketing, consumption and disposal of food and packaging. One of the important components of this concept is food production [1, 2]. The food system distinguishes certain types of industrial activity, the results of which determine the level of food security in the country. In this sense, the meat processing industry is an important component of the production unit of the food system [3], which is characterized by a variety of technological processes and specialized equipment used for the purpose of their implementation [4-7], including those intended for small meat processing enterprises in farms [8]. In addition to the traditional equipment for the primary processing of slaughter animals and the production of meat products, in the modern practice of the meat industry, a number of innovative physical and biotechnological methods are used [9-11], which are selected for application based on various technical and technological criteria, the main of which is energy efficiency [12, 13]. Without the involvement of innovative technologies and appropriate means of production, it is impossible to achieve progress in the food industry, in particular its industry such as meat and meat processing industry [14, 15].

3. Purpose of the article

The purpose of this article is analysis the current state of the meat and meat processing industry of Ukraine and justification, based on the indicated condition, opportunities and prospects for the development of the production of specialized technological equipment for the meat industry at domestic machine-building capacities, the main areas of innovation, as well as technical regulation in this area.

4. Results and discussion

Despite significant fluctuations in the number of flocks of slaughter animals and poultry in recent years, amounts of slaughter and primary processing of animals in Ukraine remain significant. According to the State Statistics Committee of Ukraine, in 2018 meat production in Ukraine amounted to 2355 thousand tons in slaughter mass. Five years ago, in 2014, the value of this indicator amounted to 2360 thousand tons. Therefore, since 2014, meat production in the country decreased by only 0.2%, that is, practically unchanged.

The volume of beef and veal production in 2018 in Ukraine amounted to 359 thousand tons, therefore, there is a decrease compared to 2014, in which the value of this indicator amounted to 413 thousand tons of beef and veal meat in slaughter mass. In 2018, the share of beef and veal in the total meat produced in Ukraine was only 17.5%. In 2000, this parameter reached 45.4%, and the reasons for such a significant reduction in beef and veal are the shortage of bovine animals, exchange rate fluctuations, as well as the unstable economic situation in the domestic and foreign markets. In 2018, pork production amounted to 703 thousand tons, which is less than in 2014, when 743 thousand tons of pork were produced in slaughter weight. In 2018, the share of pork in the total volume of meat produced in the country amounted to 29.9%, second only to the volumes of poultry meat production (for comparison: in 2000, the share of pork in the total volume of raw meat was 40.7%). For five years, the volumes of mutton and goat meat production have not changed. And in 2014, and in 2018. The value of this parameter was 14 thousand tons in slaughter weight. Accordingly, the share of lamb and goat meat in the total meat production has changed - 0.6%, which is slightly less than in 2000,

when this indicator reached a value of 1%. In 2014, 12 thousand tons of horse meat were produced, in 2018 the value of this parameter decreased significantly - 8 thousand tons (the share in the total meat production is 0.3%).

The inheritance from the Soviet Union to independent Ukraine left a distorted structure of the machine-building complex, when enterprises that produced technological equipment for equipping food, including meat, processing enterprises, both in equipping and in personnel qualifications, and in technical level were always inferior to machine-building enterprises that they produced defense products, as well as aviation equipment, various machine tools, etc. Machine-building enterprises for the food industry (Poltava meat-processing machine-building plant, Donetsk food-processing machine-building plant, Cherkasy food-processing machine-building plant, etc.), however, they produced reliable and efficient technological equipment, which was appreciated practitioners of the meat industry and was in stable demand in the USSR and other countries. Today, several domestic machine-building enterprises produce food, in particular meat-processing equipment - these are Poltavamash OJSC, and DUCO-TECHNIK LLC (Dnipro), and NPP Tekhinserv LLC (Dnipro), etc. However, while the majority of machines and devices used in Ukraine for slaughter and primary processing of animals, as well as for the production of meat products, imported to our country. Most often, financially less powerful, small and medium-sized meat processing enterprises are equipped not with new, but with renewed meat processing equipment, which was previously used at enterprises in Germany, the Netherlands, Poland and other countries of Western and Central Europe. Some German, Austrian, Polish, Spanish and other West European manufacturers of meat processing equipment have their representative offices in Ukraine, other foreign engineering companies prefer to work through commissioning enterprises specializing in the complex construction and equipping of new and reconstruction of existing meat industry enterprises. Commissioning enterprises and firms organize the import of equipment from foreign manufacturers, including the restoration of machines that were in use. The profile of the activity of about 15 domestic enterprises (LLC "Matimex-Ukraine", LLC "FoodPlant", LLC "Schaller-Kyiv", etc.) is precisely the import and implementation of equipment for slaughter shops and meat processing enterprises, as well as technological design, assistance in mastering technological processes, development of normative and technological documentation, staff training, supply of food ingredients and supplies etc.

Previously, various technological equipment for slaughter and primary processing of animals, to a large extent, were domestic-made immobilization boxes, conveyor systems, and hide removal equipment, although they were too oversized and metal-containing, were successfully used at domestic enterprises and exported to other countries. Now the current trend is the concentration of animal slaughter in small enterprises, determines the demand for simple universal machines that do not require large production facilities. In Ukraine, technological equipment of this profile is produced by OJSC Poltavamash, LLC Mega-Tech (Yarmolinty, Khmelnytsky Region), and some other enterprises. Specialized technological equipment for this purpose is also imported from Poland, Austria, Denmark, the Netherlands, Germany and other countries.

Over the past years, Ukraine has not lost its relevance in the trend towards an increase in the share of poultry meat in the total volume of raw meat, which, according to slaughter mass, in 2018 amounted to 53.5%, which is 4.7 times higher than the value of this parameter in 2000. This forced the meat product manufacturers to significantly work on updating the technologies used, since traditional recipes for sausages and other meat processing products provide for only limited use of poultry meat. In 2018, 1259 thousand tons of poultry meat were produced in slaughter mass, which is significantly higher than the 2014 indicator (1165 thousand tons). Since 2014, domestic producers of poultry meat have been operating in the capacious and promising market of the European Union, exporting to the Netherlands, Germany, Romania, Ireland, Estonia and others. Ukrainian poultry meat is also in great demand in important solvent markets in the Middle East. During 2018, 12 thousand tons of rabbit meat were produced - in slaughter mass, which amounted to only 0.5% of the total meat produced in Ukraine for slaughtered animals and poultry, with the fate of rabbit meat produced by households being preferred. A slight decrease in the production of this type of meat is observed, since in 2014 the value of this parameter amounted to 13 thousand.

In 2018, 248 thousand tons of sausage products were produced in Ukraine, less than in 2014, when 260 thousand tons of these products were produced. The structure of the main products for the indicated group is as follows: 2014 - cooked sausages, frankfurters, sardellas - 171 thousand tons, half-smoked sausages - 47 thousand tons, cooked smoked, semi-dry, raw and raw smoked sausages 25 thousand tons; 2018, 168 thousand tons, 41 thousand tons and 24 thousand tons respectively. The general dynamics of the production of meat products in Ukraine is shown in Fig. 1.

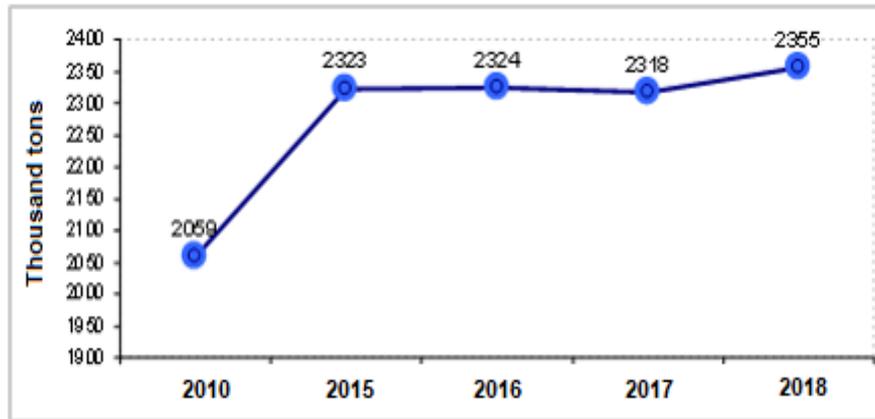


Figure 1. Meat products output in Ukraine [16]

Source: developed according to the State Statistics Service of Ukraine

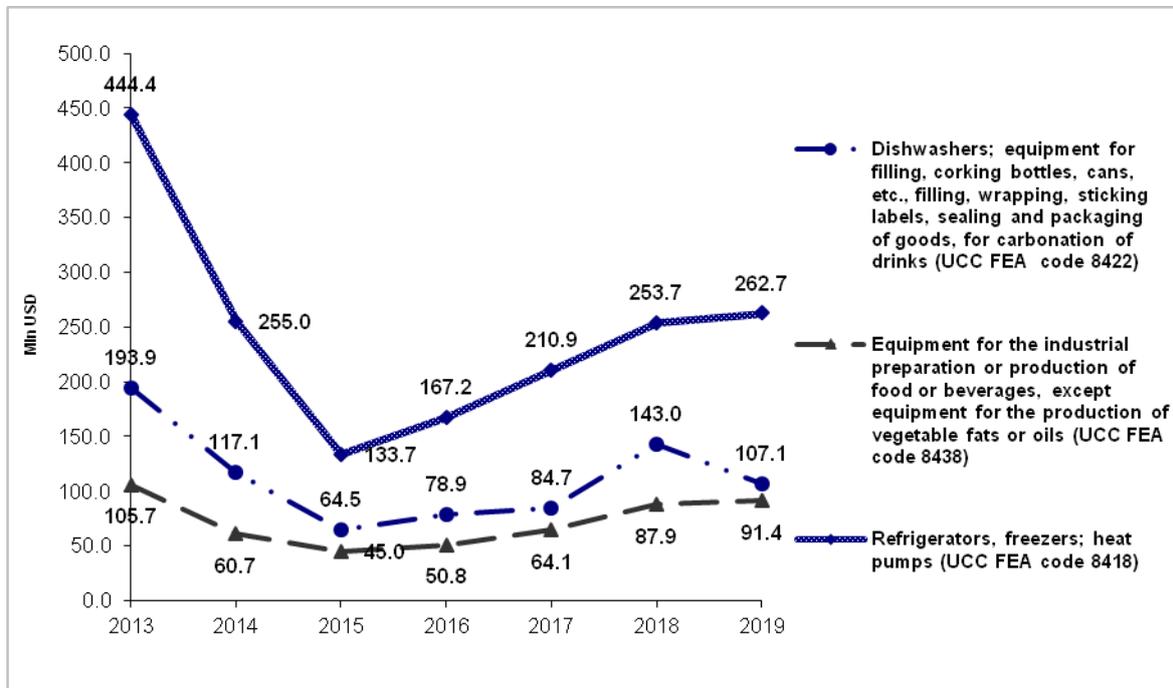


Fig. 2. Dynamics of imports of equipment for the food industry, million US dollars

Source: Customs statistics (<http://sfs.gov.ua/ms/f11>)

In Ukraine, there are several manufacturers of equipment for the thermal and climatic processing of meat products (DUKO-TECHNIK LLC, Poltavamash OJSC, NPP Tekhinserv LLC, RPE Inzhemash LLC), however, the overwhelming market share of equipment was taken by foreign

manufacturers. The leading positions in the domestic market of equipment for the production of semi-finished dumplings are occupied by Italian, Chinese and Taiwanese manufacturers. However, some types of equipment used in this production are produced by Belopillia Machine-Building Plant LLC and Smila Machine-Building Plant OJSC. Sophisticated modern equipment for packing meat and meat products (trailers, thermoformers, etc.) has not yet been produced in Ukraine - unlike vacuum-packing devices or shrink tanks that are simple in design. It should also be noted that the Ukrainian market of meat processing equipment does not go unnoticed by Turkish and, above all, Chinese machine builders who offer machines for all sectors of the meat industry - from slaughtering animals to packaging finished products.

In Ukraine, there are machine-building enterprises, which are large manufacturers of specialized technological equipment for industrial poultry farming and poultry processing. First of all, it is OJSC Poltavamash and OJSC Plant Nizhynsilmas. However, large industrial poultry processing enterprises are sufficiently solvent to afford the purchase of new equipment from the best world manufacturers - Dutch, French, German, etc. The need for equipment for slaughter and primary rabbit processing is satisfied through semi-amateur constructive solutions and unsystematic imports from China, Spain, Hungary, Belarus and other countries.

An analysis of the foreign trade in equipment for the processing of agricultural raw materials in 2019 indicates an increase in import operations over the past five years (Fig. 2), while the value of imports continues to significantly exceed exports (Fig. 3). All this points to the significant potential of Ukraine in providing the food industry with high-performance equipment in case of innovation.

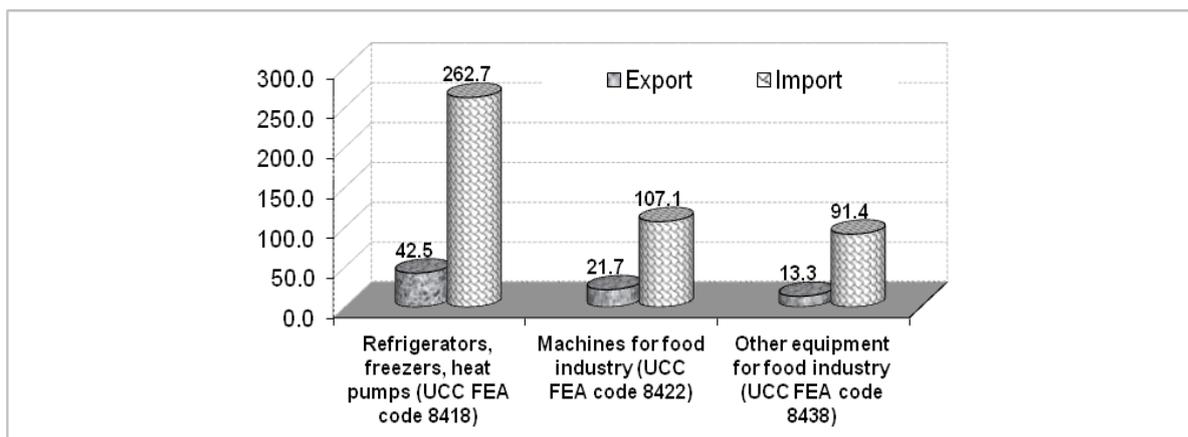


Fig. 3. Foreign trade in equipment for the food industry in 2019, million US dollars

Source: Customs statistics (<http://sfs.gov.ua/ms/f11>)

Since a significant share of meat raw materials used in Ukraine is import, there is a significant need for efficient equipment for defrosting imported meat delivered frozen - in the form of cuts or meat blocks. In modern meat processing practice, frozen meat is defrosted by processing in the air special defroster chambers equipped with automatic heating, humidification and forced air circulation systems, or (at small meat processing plants) by thawing in a stream of water. Working defrosting chambers are usually organized in adapted rooms and equipped with various heating and ventilation equipment, however, there are also offers on the market of specialized devices for this purpose made by Dutch, Finnish, French, and other companies.

Properly organized technical regulation, in particular standardization at various levels, including national one, contributes to innovative solutions in the field of equipment for the food, in particular meat, industry. In general, standardization is a collective activity aimed at establishing and implementing standards to determine the requirements that products, products, services, procedures must meet, and the main purpose of standardization is to resolve conflicts that may arise when implementing repetitive situations, as well as unification of criteria by introducing a common terminology in a certain field of practical activity [17, 18]. It is especially important, in this sense, to

ensure the proper harmonization of domestic national standards with international and European ones. A small part of the array of meat and meat product standards and a predominant share of equipment standards for the food and processing industry are now harmonized. Basically, the last group is made up of harmonized, in accordance with the Agreement on Association of Ukraine with the EU [19], European standards EN on safety and hygiene of the specified equipment - this information is given in table. 1.

Table 1. Quantity and harmonization rate of the national standards of Ukraine according to state classification codes 67.120 and 67.260 (adopted from [20])

Nomenclature group of standards according to the official classification	Number of standards*		Harmonization rate, %
	Overall	Incl. harmonized**	
67.120 Meat, meat products and other animal products	184	26	14,1
67.260 Plants and appliances for food industry	91	75	82,4

* Standards having national power (DSTU, GOST, etc.)

** National and existing in Ukraine interstate standards harmonized with European and international (DSTU EN, DSTU ISO, GOST ISO, etc.)

5. Conclusions

So, it can be stated that for certain positions of technological equipment for slaughter and primary processing of slaughtered animals, as well as for the production of meat products, domestic enterprises produce reliable and used equipment that is in demand in Ukraine and the countries of the former Soviet Union: equipment for the primary processing of animals and poultry, meat grinders, thermal and climatic equipment, etc. As for the segment of cheaper equipment, in this segment we observe significant activity of Belarusian, Turkish and Chinese manufacturers. We believe that the prospect of domestic machine-building for meat production is to identify fairly narrow segments of equipment of medium technical complexity (for example, very well-developed meat grinders designs), which should be improved to maintain its own niche in the domestic equipment market and possible entry into the markets of other countries. But it's technically sophisticated meat cutting equipment (vacuum cutters and emulsifiers), vacuum casing fillers, automatic brine injectors, etc. it's advisable to import so far - until our machine-building enterprises reach such a technical level that would really make it possible to produce equipment that is competitive on the world market. At the same time, in the case of innovative modernization of machine-building enterprises, domestic equipment will not yield to the best foreign models in metal consumption and reliability, level of control systems and the like.

The mastery of innovative solutions in the field of equipment for the food, in particular meat, industry is promoted by properly organized technical regulation, in particular standardization and harmonization of national standards with international and European ones.

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