

SOLVING THE ENVIRONMENTAL PROBLEMS IN PRODUCTION AND PROCESSING OF MEAT

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The Russian meat industry traditionally stands for a complex use of raw materials, for a cut in wastes and losses during the manufacture, storage and transportation of the produce. At the same time, its specificity, a non-compliance with nature-protective regulations, resource-saving conditions result in that the manufacture and processing of 1,0 t meat produce 16-20 cubic metres of waste waters, production itself is accompanied by the formation of considerable quantities of unusable production and processing wastes, exhaust gases. The main part of noxious substances excreting into the environment from the manufacture of meat and meat products falls on unpurified and incompletely purified waste waters.

Waste waters arising from the production and processing of 1,0 ton meat carry away up to 20 kg of fat, 15 kg of protein substances, 15 kg of sodium chloride. At the local purification station of, e.g., a meat packing plant with the capacity of 30 t per shift about 11 t of a precipitate with the moisture content of 70-97% or about 900 kg, on the absolutely dry matter (ADM) basis, is formed. Therefore, equally with development and modification of resource-saving methods for the local purification, problems of cutting down raw material losses with waste waters, reducing specific volumes of unusable wastes, exhaust gases and noxious substances escaped are put in the forefront, the problems being solved by the ecologization of technological processes for the manufacture of meat products.

In the first stage of research work, water expenditures, raw material losses, the composition of waste waters and their loads, taking into account not only their primary parameters to be controlled (fats, suspended substances, COD, BOD), but also the specificity of such waters were determined for all operations in the meat production performed with water use.

First of all, based on the data determined, schemes of systems for a rational effluents disposal at the meat plants were developed and applied into designing practice, these systems creating conditions for an effective water purification and utilization of residues recovered during purifying. The main point of these schemes is a collection of waste waters, their disposal and purification with regard for their composition, concentrations and properties of foreign substances these waters contain.

Generalizing the results of studies on how the meat production influences upon the environment and a resource consumption allows to reduce the following technological operations to the most unfavourable ones: bleeding; paunch, abomasum, stomach emptying; hog scalding; scraping; scalding of mucilaginous by-products in centrifuges; separation of water-fat emulsion in the fat manufacture; processing of intestinal raw materials; hide preservation; juice vapour condensation in barometric condensers; cooking of meat products in broths; dry brine curing, etc.

Thus, during bleeding operation, even at the centralized blood collection, about 1-3 litres blood per animal get into the sewerage system and increase BOD loadings of effluents up to 6 kg per ton of meat produced and processed. Hence, the load of effluents only from blood loss accounts for more than 18 % of the overall one for the manufacture.

The pollution degree of waste waters at a plant following the transportation of stomach and intestinal contents totals about 20 %, including about 10 % - from intestinal contents and 11 % - from stomach ones.

A special place among unfavourable operations takes up the processing of woolly by-products. Waste waters from this production section contain much bristle and hair, besides other components. Their quantity can reach 12 kg per cubic metre. The presence of bristle and hair in effluents not only disturbs a normal functioning of the sewerage system but also seriously prevents the utilization of residues recovered when purifying technological effluents.

Great losses of raw materials in an abattoir sector take place during intestine processing. Thus, at a meat packing plant with the capacity of 30 t meat per shift, that operates on the conventional technology, waste waters from intestine processing carry away about 445 kg of intestine sludge what makes up more than 60 kg on ADM-basis and 6 % of the total BOD.

A fat washing operation in separators is accompanied by fat losses of 66 kg on ADM-basis (at a plant with the capacity of 30 t meat per shift) what accounts for about 8 % of the total BOD.

The analysis of a balance of chemical substances taking part in a technological cycle of hide preservation shows that about 70 % of the curing mixture is used according to its purpose and approximately 30 % or about 300-500 kg per shift (at a meat packing plant with the capacity of 30 t meat per shift) are discharged in sewage waters. It results in that total effluents of a meat packing plant are saturated with chlorides, sulphates, aluminium salts what leads to arising an extremely complicated and expensive problem of their purification from dissolved foreign matters.

When performing technological operations for the meat processing by traditional methods, actual losses of fat and protein with waste waters reach 1 % of the total mass of meat processed.

Based on the studies carried out, recommendations on the ecologization of the meat production and processing were made and adopted.

The main approaches to solving this problem are as follows: - automation of processes for water supplying; optimization of parameters and improvement of water-consumption means including sanitary needs; creating new schemes of water reuse; - use of auxiliary means and materials with due regard for an ecological factor; - choice, improvement and development of technological processes and facilities which could eliminate or cut down losses of raw materials and other materials; this problem may be solved by creating devices to be a constituent part of the technological equipment and by organising areas for an inter-department treatment of concentrated effluents or effluents disturbing the operation of sewage networks and installations, i.e. directly in places these effluents are formed.

The lack of inter-department means for the processing of concentrated effluents adversely affects operating conditions of sewage networks, decreases the efficiency and reliability of purification installations and in a number of cases excludes the possibility of utilizing wastes recovered when purifying.

Operations for the processing of by-products above-mentioned are accompanied by the formation of highly concentrated effluents in which fat and protein substances prevail. Fat and protein admixtures which are carried away with waste waters account for about 2,7 kg per paunch. Processes and apparatus used today for performing operations on scalding and cleaning of mucilaginous by-products are entirely lacking in some devices for preventing raw material components from to be taken away.

The main features of effluents above-mentioned are their inflow irregularity (discharge "in volleys"), higher temperatures (up to 68°C), extremely high concentrations, a widespread range of dispersity and instability of extraneous matters.

For these purposes we recommend to use a filtration (straining) process which most of all answers the above-mentioned conditions. According to the data of experiments, straining of effluents containing bristle and hair through a perforated partition with hole diameter of 2 mm ensures a practically complete removal of all foreign matters stated.

Processing of liquid wastes is an integral part of the meat production. In recent years, in connection with the expansion of constructing small-capacity plants, installations for the treatment of waste waters being discharged in municipal sewage systems were created.

The purifying effect of installations for sewage water treatment meets the requirements to the quality of effluents being discharged in municipal sewerage networks.

Experiments on studying acute and cumulative toxicity of residues being formed during purification of sewage waters haven't shown any toxic activity of these residues what confirmed potentialities of their use as raw materials for the manufacture of feed additives.



- 1 - feeding pump;
- 2 - strainer;
- 3 - settling tank;
- 4 - pump;
- 5 - flocculation chamber;
- 6 - flotation chamber;
- 7 - receiving chamber;
- 8 - saturator;
- 9 - reagent tank;
- 10 - coagulator;
- 11 - thickening plant;
- 12 - "PULSAR-32" - pulsing
burning plant;
- 13 - pipelines;
- 14 - compressor;
- 15 - solution tank;
- 16 - service tank.