

QUALITY CONTROL SYSTEMS IN SWINE PRODUCTION IN BELARUS

V. V. Solyanik

National Unitary Enterprise «Scientific and Practical Center
of National Academy of Science of Belarus Animal Husbandry»

The estimation of ecological consequences of swine stockbreeding farms where from 6 to 80 thousands pigs was situated on the territory from 10 to 66 hectares had to be done. Computer system providing to make complete technological, hygiene, ecological and economical certification of the swine farms. The principles of pig industry certification is as follows: 1) adaptation of Hazard Analysis and Critical Control Point system; 2) permanent improvement of technological process; 3) manager status and influence increasing; 4) the personnel involvement in quality improvement process.

Key words: QUALITY CONTROL SYSTEMS, SWINE PRODUCTION

At the beginning of the 1970's in the USSR, according communist party decision a great number of so called «stockbreeding complexes» were built up. The main aim of their building was to create conditions for full mechanization, new management, and labor productivity increasing. At present time in Byelorussia stockbreeding complexes with productive capability 12 thousand fattening pigs in a year and more (24, 27, 54 and 108 thousand) pigs, and also pig farm 2...6 thousand pigs provide about 80 % of pork production in the country. In Byelorussia are functioning more than 280 farms the capacity of 2...6 thousand pigs, the 54 complexes with 12 thousand fattening pigs in a year capacity, 42 — with 24–27 thousand pigs in a year capacity, 8 — with 54 thousand pigs capacity, 4 — with 108 thousand pigs capacity.

The personnel of the swine stockbreeding complexes (including managers, main and auxiliary worker) fluctuate from 96 to 1150 units.

Pig's breeding complexes were created by pig concentration on limited areas. Pig breeding complex with 12 thousand pigs capacity occupies the area of 10,2 hectares (for pigsties, purifying construction and so on), complex with 24000 capacity — 19,7 hectares, 54000 complex — 41,4 hectares, 108000 complex — 66,5 hectares. Pig density is about 1176–1624 pigs/hectare. Stationary manure utilization fields are requiring about 300–2400 he. Similar situation exists in Russian and the Ukraine.

There was the commission of the Ministry of Agriculture and The Committee on Science and Technologies to make: ecological and economical evaluation of the swine stockbreeding complexes functioning; program product, which allow to elaborate models of swine stockbreeding complex.

An addition to this the principles of hygiene certification of stockbreeding complexes were elaborated.

Materials and methods. On the MS Office, Visual C++, MatLab, MatCAD basis the Package of Computer programs (PCP) were created. The ecological certification simulating system and consequences forecasting of stock breeding complexes were made on integrated approach by using a number of stochastic and deterministic models. The PCP starts information were the statistic data of stockbreeding complexes functioning.

Results and discussion. Pig breeding complex exploitation was profitable during. USSR existing period when electric energy and fuel were cheap. Cheap energy was the basis for building ferro-concrete pigsties, which have thermal resistance of external walls about 0,7–1,05 ($m^2 * K/Wt$), of floors — flout 1,05–1,4 $m^2 * K/Wt$. Thermal resistance coefficient in former USSR were from 2 to

4 times smaller than in Western Europe countries. It is necessary to add that climatic conditions in Western Europe are much more mild than in European part of former USSR (here fluctuation of the external air temperature is from $-30\text{ }^{\circ}\text{C}$ to $+30\text{ }^{\circ}\text{C}$ in a year). About 40 % internal stock breeding building temperature changes depends on external ones, and especially daily temperature fluctuation.

At the beginning of the 90-th after USSR disintegration the energy costs raised drastically. This makes limitation of energy using for pig breeding complexes. As a result of such situation pigs are forced to waste the main part of feed energy on supporting thermal balance, and pig breeders receive financial losses. The impossibility of supporting in stock-breeding buildings optimal thermo-moisture balance (because of high costs of power resources) leads to moisture condensate forming on protecting designs and the presence in internal air of ammonia is the basis reason not only of decreased animal productivity, but also of break down of ventilation and heating systems fast corrosion of metal details and equipment. Condensate appearance, fluctuation of daily temperature and accumulation of moisture in external protecting designs results in reduction of work period of buildings 3–5 times.

At the same time the methods of pig maintenance on so called complexes have entered the contradictions with turned out in evolution process physiological peculiarities of the animals. Unbalanced feeding, permanent staying in ferro-concrete buildings, microclimate changes, frequent regrouping — all these factors cause overstraining of separate organs and systems, increasing of sensitivity to stresses.

Exploitation of pig complexes has put forward a number of serious problems, connected with environment protection. When high concentration of animals on small territory exists then solving such problems as air protection, soil protection, agricultural plants and water sources protection are difficult (because of no litter pigs maintenance, manure tidying up by water, and very complication technology of manure utilization).

On complexes all aspects of pigs maintenance assume great amount of water expenditure.

Building project for complexes have such figures: for producing 1 ton of pork is spent 88–110 m^3 of clean water (in practice these figures are much above), this situation leads to forming great amount of manure drains. We may calculate that during a year on 54000 complex not less than 640000 m^3 of clean water is necessary. We must also understand that on this complex about 900000 m^3 manure drains must be utilized. Manure drains isn't only organic fertilizer, but also a pollution source of soil, superficial and subterranean waters and atmospheric air. Special problems are with pathogenic microorganisms, which in pig breeding complex conditions keep their viability for a long time. Stock breeding complexes allocate in atmosphere huge quantity of a dust, microorganisms, ammonia and other pollution substances. Ecological pressure of 54000 pig breeding complex may be very perceptible in 10-km radius. Specific source of pollution is manure drains. Fertilization fields in amount of 1520 kg nitrogen/he leads to more than 250 kg/he nitrogen, and significant phosphorus losses. At the same time soil properties are aggravating, because of helminths eggs pollution and others components of liquid organic fertilizer influence. Further feedstuff pollution is going. Bacteriological research have shown, that 100 % of tasted samples of grasses, which were grown on the fields with complex manure drains fertilization, contained Salmonella, in 80 % cases this pathogenic microorganisms were found after 3 weeks ending of fertilization. All above mentioned shows what a great number of problems should be solved in order to protect environment and to give technological solution for increasing pork productivity of these complexes.

Basic negative ecological and economic phenomena, connected to activity stockbreeding complexes:

— assignment of the large areas ground under construction of buildings and structures of complexes, camps quarantine, clearing systems, manure repository, ponds-store, agronomic of a field irrigation and other;

- large volume irrevocable (on 90 %) water consume (on need of branch is consumed water in the basic drinking quality);
- the intensive pollution of air in agricultural district (one stockbreeding complexes of the average sizes allocate hour of 28,8 kg of ammonia, 166,8 billion microorganisms), distribution of unpleasant smells;
- pollution superficial and subterranean of waters, also increase of a level subterranean of waters;
- decrease of productivity of agricultural cultures, deterioration of quality of production in result of unreasonable norms irrigation and increased concentration of harmful substance in pigs drains, used on agronomic field irrigation;
- decrease of efficiency of the agricultural animals, increase of a level them morbidity, frequently wreck them, deterioration of quality of production of animal industries;
- increase morbidity of the population living on surrounding industrial pig complex territories.

For the animal hygiene certification system the package of special computer programs is developed. The basic units of programs allow for users:

- to calculate the dynamic turnover of swine's herd (with ability to know quantitative and quality characteristics of swine herd in stockbreeding buildings at any time you need);
- to develop optimal on nutrition value and with minimum cost rations, which at the same time provides the optimal usage of available fodder;
- to carry out swine welfare estimation in stock-breeding buildings of high productive capacity;
- to make plan of maximum pork obtaining with lowest expenditure for producer;
- to estimate manure utilization systems and to calculate the optimal doses of organic fertilizes with taking into consideration the way of their processing;
- economic calculation and estimation of pigs production process.

For example, the application of PCP for swine diet optimization allows to decrease the diet costs to 5,7–15,6 %, or 7,5–36,4 \$/ton. The PCP usage for diet optimization for all swine stockbreeding complexes in Byelorussia will allow saving more than 16 million dollars.

Within the framework of technological processes standardization program, the authors of the given article developer the State standards on grain forage, such as barley, oats, rye, wheat, soybean, triticale fodder.

The PCP application with addition of some other specific modulus allows providing functioning of ecological management systems and ecological audit on the swine stockbreeding complex territories. ISO 14001 should become normative basis for ecological control on swine stockbreeding complex territories.

From our point of view, the certification of stockbreeding complexes and creation of their Quality systems must be based on ISO 9001, including following principles:

- Hazard Analysis and Critical Control Point system is of great importance for creation of quality systems a swine stockbreeding complex.
- Permanent improvement of technological processes on the basis of monitoring system, which should influence management.
- The chief managers of swine stockbreeding complexes must demonstrate real adherence to quality improvement. They must determine their enterprise long-term policy on quality problems. Quality improvement should be stimulated by financial means.
- Quality system should be based on authentic and point data relating the solving problem. Certainly, it is impossible to deny significance and intuition in decision making process, however, the standard ways is more desirable.
- In connection with that the personnel is the most valuable part of organization, it is necessary in the best way to use possibilities of the staff, because it can bring for the enterprise a

maximum favor. Therefore it is necessary to involve the workers in the quality problem solutions.

— The suppliers selection and realization the mutually advantageous contracts with feed suppliers, authentic information of there own quality system functioning is of initial importance.

The existing operating conditions of swine stockbreeding objects in Byelorussia essentially differ from those ones in western countries. The main problems are arising on stock breeding farms where up to 80 thousands pigs is situated on the about 70 hectares territory.

Conclusions

Negative influences such enterprises on environment, progressive ecological degradation of the surrounding territories insist on adequate measures. The main obstacle on this way is absence of the strict legislation in Agricultural and Environment protection sphere. The can be changed only after elaborating and adoption such Laws as: Agricultural animal welfare Law; Forages quality and their feeding to agricultural animals; Mutual relations of the state and enterprises producing cattle-breeding production.

In connection with this the main purpose of the article is search for scientists, in countries with developed animal industries, for creating international team, which could solve forth above problems.

В. В. Соляник

СИСТЕМА УПРАВЛІННЯ ЯКІСТЮ СВИНАРСТВА В БІЛОРУСІЇ

Резюме

Розроблена комп'ютерна система, що дозволяє проводити комплексний технологічний, гігієнічний, екологічний і економічний аудит виробництва свинини у свинарських комплексах великої виробничої потужності (12 108 тис. голів річної відгодівлі). Запропоновано розробити кодифікований акт правового регулювання тваринництва Республіки Білорусь.

В. В. Соляник

СИСТЕМА УПРАВЛЕНИЯ КАЧЕСТВОМ СВИНОВОДСТВА БЕЛАРУСИ

Аннотация

Разработана компьютерная система, позволяющая проводить комплексный технологический, гигиенический, экологический и экономический аудит производства свинины на свиноводческих комплексах большой производственной мощности (12...108 тыс. голов годового откорма). Предложено разработать кодифицированный акт правового регулирования животноводства Республики Беларусь.

1. ISO 9001 Quality systems. Model for quality assurance design, development, production, installation and servicing.

2. ISO 14001 Environmental management systems- Specification with guidance for use.

Рецензент: завідувач лабораторії живлення великої рогатої худоби, доктор сільськогосподарських наук І. В. Вудмаска.