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НОВЫЕ ТЕХНОЛОГИИ В ЖИВОТНОВОДСТВЕ

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Аннотация. В статье представлен обзор технологических новшеств, обеспечивающих производительность и другие преимущества для мировой животноводческой отрасли. Проанализированы системы автоматизации доения, кормления, поведения животных и контроля среды в животноводческих помещениях. Подчеркивается, что животноводство является большим рынком для использования новых технологий.

Ключевые слова: автоматизация доения, компьютерное управление, мониторинг, благополучие животных.

NEW TECHNOLOGIES IN LIVESTOCK

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Abstract. This article provides an overview of technological innovations that provide productivity and other benefits to the global livestock industry. Automation systems for milking, feeding, animal behavior and environmental control in livestock buildings have been analyzed. It is emphasized that animal husbandry is a large market for the use of new technologies.

Key words: milking automation, computer control, monitoring, animal welfare.

The industrial revolution has radically changed the way livestock production is used around the world. The end result is more comfortable animal housing, increased production and lower labor costs. The rapid penetration of new century technology into farms facilitates agricultural labor and enables the development of new livestock strategies. Some of the technologies are already available in the market, but most of them are in the laboratory research phase [3].

For example, the milking automation system began to be used in animal husbandry in the 1990s. The use of an automatic milking system on the farm required a completely different system for managing milking, feeding, cow movement and behavior, cattle grazing, milk quality and animal health. Objective measuring systems were needed to diagnose diseases, stress in animals and detect heat. Electronic devices or sensors began to replace the visual inspection of a person. The main function they had to perform was the analysis of milk that did not meet safety standards. Sensors have been in the market for a long time, but their use in milking systems is an innovation due to the development of intelligent milking systems. Milking robots equipped with sensors for the diagnosis of mastitis measure many indicators of low-quality milk, such as milk pH, somatic cell count, milk acidity. The sensors can also show such characteristics of the milking system as performance in the parlor, milking efficiency [7].

Milking systems also include a behavior meter to monitor the animals. The behavior meter continuously records the time spent by the cows lying down and the activity of individual animals. Behavioral observations of cows allow the assessment of animal welfare in various environmental and stressful situations, as well as the state of reproductive health.

Another technological solution is the use of dividing gates in automatic control systems. Dividing cattle is a risky and complex undertaking that needs to be done frequently. Grouping and dividing cattle in a large herd is a huge workload for farmers. Sick cows should be in the farmer's field of vision. Some sensors are currently available for this purpose, but they do not meet all the requirements. In large herds, animal identification is the main task [6].

There are many sensors that are used to detect good quality milk, but faster results have been achieved using microchip technology. It provides more options for improving the reliability of data collection. With these technologies, mastitis can be diagnosed more successfully with effective tests and more accurate results. On farms, they mainly look at milk conductivity and appearance, but other methods can detect mastitis in the early stages, which contributes to the fastest treatment of the disease. Some other indicators have been added to the new sensor, such as the level of milk progesterone, milk temperature [8].

When it comes to feeding animals, programmers have developed many software tools so that the farmer can choose the optimal diet. Various automatic feeding systems are used in many large dairy and pig farms to improve production. They include every stage of feeding, feed preparation, mixing equipment, feed dispensers. Feed ingredients as well as mineral feed and feed concentrate are loaded, mixed and delivered to the dispensing table. Simple automation systems consist of a control panel, a software controller, a scale, a communication interface and, finally, all the necessary equipment for organizing the process of feeding animals of each age group [2].

For example, computer controlled calf feeders have many advantages over traditional feeding methods in that the daily intake of individual calves can be monitored. Calves easily learn to use the computer-controlled milk feeding system and this technology can significantly reduce labor costs by up to 73%. These systems can be combined with an automatic weighing and health monitoring system for calves.

There are stationary animal feeding systems such as conveyor belts and mobile systems such as self-propelled or rail-mounted feed dispensers [4]. In addition to automating feeding systems, rumen activity sensors to reduce metabolic disturbances are very popular and innovative methods for cattle farmers. When sensitive cows show increased acidosis, this allows the farmer to adjust the feeding to prevent serious problems.

A major threat to livestock is an outbreak. The disease can spread rapidly in crowded animal housing. Many diseases have specific detection signals that can be used to locate and identify affected animals before the problem spreads. Animal disease has serious economic implications for farms. When a disease is detected in time, treatment costs are reduced, mortality rates decrease and production efficiency increases. Product quality, product composition, animal body condition and behavior are good indicators of animal health. By carefully monitoring any changes, farmers monitor the health of animals. Sensors are installed to monitor the health of each cow. Sensor networks are made up of a few tiny, inexpensive devices and are logically self-organizing ad hoc systems. The role of the sensor network is to monitor animal health parameters, collect and transmit information to other receiving nodes. Sensors that collect data such as temperature, pH, etc. receive a lot of data so they can be transmitted at intervals. Many new sensor technologies have been developed that will benefit animal health. Assessing the behavioral indicators of animal welfare on a farm is challenging, but the growing availability of low-cost technology now makes it possible to automatically monitor behavior.

In animal husbandry, sensors have also begun to be used for the automated control of microclimate parameters in the barn: temperature and relative humidity sensors, air velocity, carbon dioxide, ammonia and light sensors. When the ambient temperature rises above 25 ° C, the cow begins to use its energy for cooling rather than for milk production. The effect of heat stress on the physiology and productivity of dairy cattle is well known. Milk yield can be reduced by about 10 percent. At the same time, if environmental factors such as air quality are low, milk production and quality may be affected. Highly productive dairy cows need an optimal indoor climate throughout the year to maintain high production levels.

In recent years, the identification of farm animals, such as pigs and cows, has become an urgent problem, as accurate objective measurements (for example, weight) are required [1]. Best practices currently include the use of tags, which are time consuming and distressing for the farmer. A group of scientists from Great Britain proposed on-invasive biometrics of an animal's face using highly accurate artificial neural networks [5].

Thus, each new technology can provide productivity, growth and other benefits at the farm level, for both animals and farmers, as well as at the country level, where accelerated productivity is urgently needed. Livestock is a big market for technological innovation. Technology plays an important role in solving many problems.

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