AGRICULTURAL SCIENCES

EFFICIENCY OF MACHINE MILKING TECHNOLOGY FOR COWS IN AUTOMATED MILKING CONDITIONS (AMS) AND USING A LINEAR MILKING UNIT

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Introduction. Innovation and the introduction of new technologies are two central elements of the process of business and industry development in agriculture. One of the most relevant innovations on dairy farms is the robotization of the milking process through the introduction of automatic milking systems (AMS) [1, 3, 7]. Increasing the production of high-quality dairy products is one of the main tasks of livestock farming and the agricultural industry in general. Milk productivity and milk quality are influenced by the conditions of rearing replacement young animals [16], keeping and operating cows [5, 6, 8], linear origin [14] and other factors. In addition, intensive technologies in dairy farming are associated with technological stress on animals [4, 13, 17]. Therefore, when forming a herd, it is necessary to take into

account the stress resistance trait, which affects the adaptive capacity of animals [2, 12, 15]. Currently, dairy farming is transitioning to intensive methods of milk production, which include the use of robotic milking machines [9, 10].

Objective. To investigate the effectiveness of the technology of machine milking cows using DeLaval robotic milking units and the ADM-8A linear milking unit in the conditions of an industrial dairy complex.

Results and discussion. The research was conducted at the private enterprise "Agroservice SG" of Novovodolazhsky district of Kharkiv region. In the farm, dairy cows are kept mainly in buildings with group housing and milking using DeLaval robotic milking units, and there is also 1 building with tethered housing and milking using the ADM-8A linear milking unit.

Milking robots are automatic milking units in which milking is carried out without the direct participation of the operator. Cows are milked throughout the day. The average number of milkings per day is 2.5-3. As a result, milk yields increase by 10-15%. Cows can visit the milking robot voluntarily. In cowsheds with a milking robot, cows are kept indoors all year round.

Robots of the automated milking system perform almost all the functions necessary for milking: they process the udder before and after milking, put on and take off the milking cups, disinfect the teat liner, measure milk yield, etc. Milking robots allow you to assess the condition of each quarter of the udder and timely detect signs of mastitis. The effectiveness of using robotic systems for milking cows lies not only in the elimination of manual labor, but also in creating comfortable physiological conditions for the animals themselves. The cow is given the freedom to choose the time and frequency of visiting the milking box, each animal is served in accordance with its daily rhythms [11, 18, 19].

Our observations showed that the number of milkings of each cow during the day depends mainly on their productivity. Thus, cows with an average daily milk yield of 16.3-26.7 l visited the milking box up to two times a day (35% of the total number of animals), with an average daily milk yield of 30.1 l - three times (48% of the total livestock), and cows with an average daily milk yield of 38 l visited the

milking box four times. However, not all animals are suitable for milking by a robot. When forming a herd, 5-15% of cows have to be culled.

Analysis of the daily distribution of the number of milkings depending on the time showed that animals come to the milking box more often at 9-11 am and 8-9 pm (1-2 hours after they are given a balanced and mixed feed ration).

In the early morning (at 5-6 am) and during chewing and resting, fewer animals come to the milking boxes. This may be ethological confirmation that the time of milking animals in conventional milking units should be reviewed.

Analysis of the research results showed that with an average of 2.8 milkings per cow per day, its value for individual individuals varied from one to six milkings. The increase in the frequency of visits to the milking robot by cows from 6 to 7 am is associated with the appearance of service personnel on the farm, which, as it turned out, stimulates the animals to milk. The decrease in the frequency of visits by cows to the robot from 7 to 8 am was associated with its technological downtime (the milked milk was unloaded from the cooling tank). The maximum number of visits by cows to the robot (5.7 - the average value for the entire observation time) was observed from 10 to 11 am, and the minimum (3.4) - from 5 to 6 am.

Our research has shown that the ADM-8A milking system has lower efficiency compared to the milking robot, but the literature data show that tethered keeping of cows with high milk productivity (8.0-9.0 thousand kg of milk per year) and labor costs of up to 2.0 people/hour per 1 t of product, feed of 0.9-0.8 t of feed. unit. and production profitability of up to 60% can be effective provided that the requirements are met: targeted breeding work, full-fledged balanced feeding, use of modern technical means for milking and cooling milk, creation of comfortable conditions for keeping and optimal microclimate.

The technical equipment of livestock farms greatly affects both labor costs and animal productivity (by 35-45% and 8-10%, respectively). The share of labor costs for milking cows is up to 35% of the working time for animal care.

In a milk pipeline installation, milk extracted by the machine is transported from the teats to the dairy through a closed pipeline system (milk pipeline) under the

influence of vacuum. The installation includes milking machines, milk pipeline, milk tap, vacuum pipeline, water ring vacuum pump, water tank.

During milking, the operator works with three milking machines. He starts milking the cows standing at the beginning of the milk pipeline branch (from the end closest to the milk receiver), since in this case the branch is constantly wetted with milk and the residues will not dry on the walls of the milk pipeline.

Technological milking operations performed by each milker-operator must be carried out in accordance with the rules of machine milking. The average milking time of a group of 100 cows was 1.67 hours with an average milking of one cow in 4.2 minutes. The milk milked by the installation is classified as the first cleanliness group.

The main advantage of robotic milking complexes is a significant saving in labor costs. At the same time, a high level of physiological milking is achieved due to strict adherence to technology.

Differences were found between the experimental groups in terms of milk yield over 305 days of lactation. The difference was 1596 kg in favor of the robotic milking unit. The result of data analysis for the 4th lactation showed that milk yield over the entire experimental period in the group that was kept in a non-tethered manner and milked by a milking robot was higher compared to the milk yield of cows in the first group that were milked into a milking tube and kept on a tether. In cows in the first group, milk yield increases until the third lactation, then decreases, while in cows in the second group it continues to grow until the fourth lactation. Thus, the productivity of cows milked using the ADM-8A milking system and cows milked using DeLaval robotic milking units increases from the first to the third lactation by 5% and 17%, respectively, and from the first to the fourth - by 2% and 21%, respectively.

The second group of cows, milked using a milking robot, shows an increase in milk yield during all four lactations by 8–26%. Thus, the realization of the genetic potential of milk yield in cows of the second group is more efficient. The technology of milking on automated installations allows to increase milk yields until the fourth

lactation in our case.

Conclusions. It was determined that the main advantages of robotic milking units compared to the classic ADM-8A unit are their autonomy and the ability to accurately control the quality of milk. Cows decide for themselves when to come for milking, which, together with the three-stroke milking mode, is well combined with the physiology of animals, relieving them of the stress that animals often experience when milking in the milk duct. The use of milking robots allows: to reduce the cost of manual labor in the dairy complex by 30%; to increase the productivity of cows by 10-20%; to increase the economic use of cows by creating comfortable conditions for them; to increase the prestige of work in dairy farming.

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