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OPTIMIZATION OF THE TECHNOLOGICAL PROCESS OF MACHINE MILKING OF HOLSTEIN COWS UNDER THE CONDITIONS OF A “CAROUSEL” MILKING PARLOR

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Summary. *The article presents the results of a study on the technology of machine milking of cows at the dairy complex of LLC "Agrofirma Pischanska" in the Berestynskyi district of Kharkiv region. The structure and organization of the milking process in a rotary milking parlor of the "Carousel" type are described, which ensures efficiency, automation, reduced manual labor, and increased productivity. The advantages of this system are considered, such as process continuity, convenience for the staff, and reduced stress for the animals. At the same time, disadvantages are analyzed, including high cost, the need for large space, and regular technical maintenance. Special attention is paid to mastitis prevention, milking hygiene, veterinary measures, and staff training. Recommendations are provided for optimizing the use of the milking system through animal selection, systematic data analysis, and implementation of individual milking settings.*
Keywords: *Holstein cows; milk productivity; machine milking technology.*

Relevance of the problem. An innovative development is a universal tool for solving tasks related to the development of agrarian regions. It enables the most effective use of a competitiveness assurance strategy aimed at reducing costs while simultaneously maintaining, and in some cases improving, the quality of the obtained products through creating optimal conditions for the keeping and exploitation of animals [1–3].

Currently, new trends have formed in the development of milk production technology in Western European countries, which are exported along with modern equipment in the form of software algorithms that ensure the operation of the equipment and herd management. However, experience shows that new approaches and technological solutions that come with new imported equipment require adaptation to the conditions of domestic farms, as well as adjustment of animals to intensive production technology [2–5].

Relevance of the chosen research direction is justified by the fact that the process of machine milking of cows is at the very end of a long technological cycle, where even the smallest element can become a key factor of efficiency, and a minor mistake by one person can negate the efforts of the entire team.

Purpose of the study. The purpose of this work was to investigate the features of the machine milking technology of cows under the conditions of the dairy complex of the limited liability company "Agrofirma Pischanska" in Berestynskyi district, Kharkiv region.

Presentation of the main material. The machine milking technology at the dairy complex of LLC "Agrofirma Pischanska" includes:

- organization of a continuous-flow workshop system considering the configuration of the farm buildings;
- development of animal flow schemes within the building volumes and enclosures;
- determination of cows' suitability for machine milking based on udder morphology and milk flow rate by monitoring the herd and statistically analyzing the complex's electronic database;
- formation of production groups of animals according to key criteria (productivity, status, milking time, milk flow rate);
- development and implementation of measures to ensure sanitary and hygienic conditions of technological processes;
- selection of group and individual settings for software control of the milking process (machine stimulation, additional milking, etc.);
- selection of the sequence and duration of machine milking operations according to the milking schedule and chosen group and individual software settings;
- feedback in herd and technical process management is provided through systematic analysis of information and decision synthesis using herd management software resources.

The milking and dairy unit includes, besides the milking parlor, a pre-milking area, cattle lanes, a sanitary zone, technological and utility rooms. The main factor determining the layout of the milking and dairy unit is the milking parlor. The milking parlor is the center of a computerized system for collecting information about animals and herd management. The rhythm of the milking parlor's operation is a key factor in the overall functioning of the farm.

The carousel-type milking system is efficient in terms of labor costs, allocation of workplaces, personnel specialization for performing specific operations, continuous movement of animals on the conveyor, and the sequence of task execution.

Fig. 1. Milking of Holstein cows in the carousel-type milking parlor at LLC "Agrofirma Pischanska," Berestynskyi District, Kharkiv Region

The milking system includes: a vacuum production and regulation system; a milking system; a system for milk accounting, transportation, and cleaning; a cleaning system; a herd management system; and a selection system.

The carousel-type milking parlor has both advantages and disadvantages that must be considered during operation. Among the advantages are efficiency, convenience for personnel, and the ability to simultaneously service a large number of cows.

One of the most desirable features of the milking system is the option to ensure the physiological nature of the milking process. For example, paired milking best imitates calf suckling and closely replicates the centuries-old principle of manual milking. This ensures vacuum stability and effective milk evacuation from the collector.

Machine stimulation allows partial replacement of manual udder massage, which is impossible to perform on large-scale farms with intensive technologies.

Differentiated stimulation provides an individual approach to the milking process. The best results come from systems that enable stimulation only for cows whose milk flow rate after a programmed milking interval in the main mode does not exceed a set threshold.

Control over complete milking of each quarter of the udder, machine stripping by cup reattachment and vacuum reduction, separate finishing of milking each quarter, and conductivity measurement — including for each quarter — help avoid dry milking and allow early diagnosis of udder diseases.

However, there are also some disadvantages that may affect its use.

High initial costs. The cost of a carousel-type milking parlor installation is significantly higher compared to other types of milking systems, such as parallel or herringbone parlors. This includes expenses for the installation itself, infrastructure, and assembly.

Maintenance and repair. Since the parlor has a complex mechanical structure, it requires regular maintenance and repair. This can lead to unexpected costs as well as temporary work stoppages, reducing production efficiency.

Delays of cows due to technical problems. If technical issues occur, for example with the milking equipment or carousel mechanism, this can cause cows to be delayed on the platform. Because cows enter and exit sequentially, this may cause downtime, decreasing operational efficiency.

Limitations on the number of cows. The carousel parlor is limited by the number of stalls that can be placed on the platform. Therefore, with very large herds, it may be difficult to provide efficient service without increasing the area and additional costs.

Low flexibility in changing the technological process. Since the milking parlor has a fixed structure, it is difficult to adapt it to changes in technological requirements or farm size. This can limit farmers' opportunities to expand production or adapt to new technological conditions.

Potential stress for cows. Although the carousel parlor is a convenient milking method, for some cows this process may be stressful, especially if they are not accustomed to moving platforms. Constant rotation and the need to enter and exit may cause discomfort or even injury in some animals.

Requirement for large space. The carousel milking parlor requires a large area for placement, which may not always be possible under limited farm space conditions. Therefore, its installation demands investments in building construction and facility modernization.

These disadvantages are not necessarily critical, but they should be taken into account when selecting and operating a milking system under farm conditions.

Preventive measures should focus on identifying and eliminating causes that contribute to the development of mastitis, as well as preventing the penetration of pathogenic and conditionally pathogenic microorganisms into the mammary gland. Additionally, an important aspect is increasing the general and local resistance of the animals' bodies, particularly the mammary gland. The preventive system against mastitis in farm animals includes a set of sanitary-hygienic, zootechnical, and veterinary measures covering all stages—from herd composition and animal maintenance to the care of young stock health.

For the effective use of the carousel-type milking system aimed at preventing or eliminating possible negative effects (especially mastitis), it is necessary to adhere to a number of important rules.

Provide rational and balanced nutrition for animals considering their physiological needs. This helps avoid metabolic disorders and prevents toxic damage caused by feed.

Follow zoohygienic standards in animal maintenance, ensuring proper care, including the correct organization of resting and grazing areas. Ensure optimal microclimate conditions in animal housing (temperature, humidity, air velocity, lighting). Animal health depends on the cleanliness of the air environment, so monitoring these parameters is important.

Regularly provide active exercise to animals, ensuring physical activity and maintaining muscle mass. Special attention should be given to the postpartum

period. To prevent mastitis, it is useful to place animals in specialized calving pens and ensure the co-housing of mothers with newborns for several days after birth.

Animals suffering from infectious diseases (endometritis, retained placenta, mastitis, phlegmon, and other purulent processes) should be isolated from healthy individuals. Regular clinical examinations should be conducted at least once a month to detect problems early. The microbial burden on the udder can be reduced through the use of disinfectants. Animals that do not respond to treatment or frequently suffer from mastitis (more than three times per lactation) should be culled.

It is important to train personnel to promptly recognize early signs of mastitis, even if they are mild and not always immediately visible. Special attention should be paid to the hygiene of machine milking, as this is a crucial factor in maintaining udder health.

Conclusions and Recommendations. It has been established that the farm uses a modern rotary milking parlor of the "Carousel" type, where the animal enters an automated rotating platform, and milking occurs during one full rotation, after which the cow independently leaves the parlor. This is a high-tech automated system that includes vacuum and milking systems, recording, identification, cleaning, and herd management. Such a system minimizes the time for animals to enter and exit and reduces operator movements to a minimum, making it currently the most productive solution for mass milking.

The analysis of machine milking technology showed that for the effective use of the "Carousel" milking system, it is necessary to ensure clear organization of animal flow, timely attachment and removal of milking units, as well as regular technical maintenance of the equipment. The preparation of personnel, adherence to milking hygiene rules, and the use of an automatic accounting and control system of the technological process also play an important role.

To optimize the technological process of machine milking of cows, it is recommended to continuously conduct selective breeding aimed at creating a homogeneous herd of cows with high productivity and rapid reflex responses for efficient use of the "Carousel" milking parlor. It is also advised to organize systematic staff training on effective habituation of cows to milking on the rotary milking unit, early detection of mastitis symptoms, and proper machine milking procedures to minimize animal stress and increase productivity.

References:

[1] Асоціація виробників молока. Блог. 2023. Дата звернення: 20.05.2024. URL: https://avm-ua.org/uk/post/virobnictvo-moloka-siroviniskorotilosa-na-6-v-sicni-veresni-2023-roku

[2] Behren, L. E., König, S., & May, K. (2023). Genomic selection for dairy cattle behaviour considering novel traits in a changing technical production environment. *Genes*, *14*(10), 1933.

[3] Chernenko, O. M., Prishedko, V. M., Mylostyvyi, R. V., Shulzhenko, N. M., Orishchuk, O. S., Chernenko, O. I., ... & Khmeleva, O. V. (2019). Welfare and sperm quality with a focus on stress resistance of Bos taurus. Ukrainian Journal of Ecology, 9(4), 493-498. https://cyberleninka.ru/article/n/welfare-and-sperm-quality-with-a-focus-on-stress-resistance-of-bos-taurus

[4] Mylostyvyi, R., Kalinichenko, O., Skliarov, P., Lesnovskay, O., Karlova, L., Begma, N., ... & Izhboldina, O. (2021). The influence of the season on the efficiency of fertilization and the manifestation of postpartum pathology in dairy cows. Ukrainian Journal of Ecology, 11(4), 81-86. https://www.proquest.com/openview/61b222dfffdb8f6d5df96c7610da2f77/1?pq-origsite=gscholar&cbl=2032106#
[5] Mylostyvyi, R., Sejian, V., Souza-Junior, J. B. F., Wrzecińska, M., Za, T., Chernenko, O., ... & Hoffmann, G. (2024). Digitalisation opportunities for livestock welfare monitoring with a focus on heat stress. Multidisciplinary Reviews, 7(12), 2024300-2024300. https://doi.org/10.31893/multirev.2024300

ОПТИМІЗАЦІЯ ТЕХНОЛОГІЧНОГО ПРОЦЕСУ МАШИННОГО ДОЇННЯ ГОЛШТИНСЬКИХ КОРІВ В УМОВАХ ДОЇЛЬНОГО ЗАЛУ «КАРУСЕЛЬ»

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Анотація. *У статті висвітлено результати дослідження технології машинного доїння корів на базі молочного комплексу ТОВ «Агрофірма «Пісчанська» Берестинського району Харківської області. Описано структуру та організацію доїльного процесу в умовах роторної доїльної зали типу «Карусель», яка забезпечує ефективність, автоматизацію, мінімізацію ручної праці та підвищення продуктивності. Розглянуто переваги цієї системи, такі як безперервність процесу, зручність для обслуговуючого персоналу та зниження стресу у тварин. Водночас проаналізовано недоліки, включаючи високу вартість, потребу у великій площі та регулярному технічному обслуговуванні. Особливу увагу приділено профілактиці маститу, гігієні доїння, ветеринарним заходам і навчанню персоналу. Запропоновано шляхи оптимізації використання доїльної установки через селекційну роботу, системний аналіз даних та впровадження індивідуальних налаштувань доїння.*

Ключові слова*: голштинська корови; молочна продуктивність; технологія машинного доїння корів.*

