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INNOVATIONS IN DETERMINING THE QUALITY OF LINERS OF MILKING MACHINES

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The article highlights some technological problems common in the practice of of milking systems operation. It describes the main characteristics of liners, which are essential for measurements and have a significant impact on the milking process. It finds that the development of new sound effective technological solutions for servicing the dairy cattle, parameters and operating modes of the technical means of production processes creates the basis for providing the maximum productive capacity of animals, as well as for improving staff efficiency.

The article presents a method of determining the quality of liners that provides a classification of goods according to three groups: I – excellent quality; II – good quality; III – unsatisfactory quality of rubber.

Keywords: dairy cattle, milking, quality, liner, method.

Палій А.П. Інновації у визначенні якості дійкової гуми доїльних апаратів

У статті висвітлено деякі технологічні проблеми, які поширені в практиці експлуатації доїльних систем. У ній описані головні показники дійкової гуми, які мають важливе значення при вимірах, значний вплив на процес доїння. Встановлено, що розробка нових обґрунтованих ефективних технологічних рішень з обслуговування молочної худоби, параметрів і режимів роботи технічних засобів виконання виробничих процесів, створює базу для забезпечення максимального виявлення продуктивних можливостей тварин, а також підвищення ефективності роботи обслуговуючого персоналу.

Представлений спосіб визначення якості дійкової гуми, який передбачає класифікацію виробів за трьома групами: I – якість відмінна; II – якість хороша; III – якість гуми незадовільна.

Ключові слова: молочне скотарство, доїння, якість, дійкова гума, спосіб.

Палий А.П. Инновации в определении качества сосковой резины доильных аппаратов

В статье освещены некоторые технологические проблемы, которые распространены в практике эксплуатации доильных систем. В ней описаны главные показатели сосковой резины, которые имеют важное значение при измерениях, значительное влияние на процесс доения. Установлено, что разработка новых обоснованных эффективных технологических решений по обслуживанию молочного скота, параметров и режимов работы технических средств выполнения производственных процессов, создает базу для обеспечения максимального выявления производительных возможностей животных, а также повышение эффективности работы обслуживающего персонала.

Представлен способ определения качества сосковой резины, который предусматривает классификацию изделий за тремя групами: I – качество отменное; II – качество хорошее; III – качество резины неудовлетворительное.

Ключевые слова: молочное скотоводство, доение, качество, сосковая резина, способ.

Formulation of the problem. In the agro-food sector of the country occupies an important place dairy cattle. Its role and value are determined by the need to provide the population with quality dairy products in accordance with the norms of consumption, as well as its high share in the structure of gross agricultural production.

It is possible to improve the efficiency of the domestic dairy farming gradually through an integrated implementation of the latest innovative technological, organizational

and technical solutions. Only complex mechanization of production processes and operations, coordination of mechanization issues with the technology and organization of production by means of creating of production lines can guarantee increase of production efficiency. The mechanization of individual processes doesn't reduce the total number of employees but, on the contrary, requires skilled professionals for maintenance of machinery and equipment and so increases the number of employees [1, 2].

The contemporary practice of domestic dairy farming shows that unexpected temporary shutdowns in the dairy farming violate the whole structure of a certain mode of a production line, and this, in its turn, significantly affects the physiological functions of the animals the violation of which leads to a decrease in performance and so increase in the cost of the products obtained. Therefore, the mechanization of modern dairy complexes must move both towards the restoration of the old equipment and its modernization and the transition to a new technological level. Thus, the development of tools and methods that will prevent unexpected stops and get as close as possible to the physiological needs of the equipment needs of the milk animals is urgent and prospective task both of practical and scientific interest [3, 4].

One of the main problems in the technology of milk production is the use of adaptive complex machines, which gives the opportunity to obtain quickly and accurately high quality milk saving its primary properties. Nowadays the introduction of modern milking technologies and equipment into the structure of the quality food production gains a huge importance [5 – 7].

Determining the priorities of improvement of technologies applied in the dairy farming is impossible without the implementation of the analysis and monitoring the necessity of the application of innovative techniques and technologies.

Objectives and methods of investigation. The goals were achieved by means of application of analytical, theoretical, zoo-technical research methods, as well as standard and original control and measuring equipment.

Development method carried in a scientific laboratory of the department technical systems and technologies livestock them. B.P. Shabel'nika ERI of Technical Service HNTUA them. P. Vasylenko.

Scientific and economic studies were carried out on the basis of state-owned enterprise experimental farm "Kutuzovka" Livestock Institute of the National Academy of Agrarian Sciences Ukraine Kharkiv district Kharkiv region on the national milking machines UDA – 16A (2×8) production of AO "Bratslav".

Result of investigation. To implement a large scale technological restructuring of milk production process it is necessary to ensure a constant and efficient operation of milking and dairy equipment. To ensure the mechanization of principal and auxiliary operations for milking cows it is planned to start the production of high-performance and fuel-efficient machinery and equipment making up a unified technological complexes. But along with the development of high-performance equipment and saturation of dairy livestock industry, more acute is the question of improving its reliability as one of the main reserves for increasing machine productivity, reduction the breakdown time by eliminating technical and technological failures that will increase milk yield and milk quality. More efficient use of milking and dairy equipment, rational use of all its systems and components, timely detection and prevention of failures and malfunctions largely depend on the timely and quality diagnostics and maintenance.

Liners are the only item in the milking machine which is in direct contact with the animal's udder. Compared to the other parts of the milking machine it operates in harsh conditions. During the milking a teat cup liner is expanded and compressed up to 60–70 times per minute, and for 5–6 minutes (an average time for most milk cows) it squeezes a teat 300–420 times.

Liners are made of rubber or silicone. They consist of the following main parts: a head located in the upper part; a hose (a middle part); a teat tube (a bottom part).

The main data which are essential for measurements and have a significant influence on the milking process are as follows: a diameter of the head inlet, a diameter of the rod of a liner, an outer diameter of a liner sucker deformation, the wall thickness of the rod, the effective length of the whole liner.

The wall thickness determines the physical properties of a liner hose (the degree of softness/hardness). The edge of the head inlet is also essential. It should also vary in softness/stiffness, depending on the shape of the teat, which it is applied to.

The milking process is carried out so that to keep an udder healthy and to milk the animal quickly and completely painlessly. For more than a hundred years, since the establishment of the milking machine of the described mode, it has not almost changed.

The use in the milking machine of liners with different physical and mechanical properties and the degree of tension leads to the fact that the teat cups are not equally affect the cow's teat, and this is one of the main reasons that animals fall ill with mastitis. Along with this, the loss of milk at milking cows with milking liners, which do not correspond the zoo-technical requirements or those of poor quality, can reach from 7 to 21 %.

After carrying out the patent search it's possible to conclude that the present methods, devices and tools to study the performance properties of the teat cup liners, namely their tension, have a number of disadvantages: difficulties during the operation, unreliable design, the need for time-consuming measurements. In addition, not all of them provide a rapid collection of reliable data.

To eliminate drawbacks mentioned above we have designed a method determining the quality of liners.

The method used to determine the quality liners is as follows: set liner in the device for fault detection and determine its stretching under the weight of 6 kg. Values for tensile fixed scale. Then liner removed from the device and determine the value of the arithmetic mean value of elongation ($\overline{X}_i$) taking into account the value of the extension (X_i) in mm and number of experiments (n), using the formula:

$$\overline{X}_i = \frac{1}{n}\sum_{i=1}^{i=n} X_i$$

Then the formula calculated standard deviation values of elongation (σ):

$$\sigma = \pm\sqrt{\frac{\sum_{i=1}^{i=n}(X_i - \overline{X})^2}{n}}$$

The next step is determining the coefficient of variation ($\cup$):

$$\cup = \frac{\sigma}{\overline{X}} \times 100$$

In terms of determining the quality coefficient of variation liner using a three-stage gradation.

Interpretation of the data is carried out according to table 1, using the following classification quality liner: I group – quality liner is considered excellent (the coefficient of variation (∪) to 10 %); II group – good quality (the coefficient of variation (∪) from 10 to 20 %); III group – the poor quality of liner (the coefficient of variation (∪) above 20 %).

Table 1 – Classification quality liner milking machine

Group	The value of the coefficient variation, %
I	to 10
II	from 10 to 20
III	higher 20

Thus, the proposed method provides high accuracy in determining the quality of liners of the teat cups and to obtain reliable information about its condition, it is convenient and easy to use, does not require significant financial costs to conduct measurements.

Testing of the method under real production conditions confirmed its efficiency and effectiveness.

Conclusions. One of the main ways to increase the speed of milking of cows, to improve animal productivity, as well as an milking operator productivity and milking machine productivity, to increase the quality of milk, to reducing the incidence of animals is the use of high-quality liner providing efficient operation, its reliable fault detection during their service that previews the improvement and development of high-tech means and reliable methods.

The use of the proposed method in a production environment will ensure prompt receipt of reliable information about the condition of liners, which will allow identify the negative factors arising in the course of its operation timely.

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ЯКІСНИЙ СКЛАД МОЛОКА ШВІЦЬКИХ КОРІВ ЗА ПРОМИСЛОВОЇ ТЕХНОЛОГІЇ ЕКСПЛУАТАЦІЇ В СТЕПОВІЙ ЗОНІ УКРАЇНИ

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В статті викладено матеріали щодо жиро- та білковомолочності швіцьких корів за промислової технології експлуатації в Степовій зоні України, для яких якісний склад молока є породною ознакою, за якою масова частка жиру в молоці сягає показника 4,19 %, а білка – 3,7 %. При цьому, синтез жиру в молочних залозах лактуючих тварин більш динамічний, тоді як білок молока має стабільний характер.

Ключові слова: *швіцька порода, корова, лактація, удій, жир і білок молока*

Пищан И.С. Качественный состав молока швицкой коров по промышленной технологии эксплуатации в степной зоне Украины

В статье изложены материалы касательно жиро- и белковомолочности швіцьких коров в условиях промышленной технологии эксплуатации в Степной зоне Украины, для которых показатели качества молока являются породным признаком, где массовая доля жира в молоке доходит до показателя 4,19 %, а белка – 3,70 %. При этом, синтез жира в молочных железах лактирующих животных более динамичный, в то время как белок молока имеет стабильный характер.

Ключевые слова: *швицкая порода, корова, лактация, удой, жир и белок молока*

Pishchan I.S. Quality composition of milk of schwyz cows under the industrial exploitation technology in the steppe zone of Ukraine

The article presents data on the content of fat and protein in the milk of Schwyz cows under the conditions of industrial technology of exploitation in the steppe zone of Ukraine; for those cows milk quality parameters are breed characteristics, where the mass fraction of fat in their milk comes to a value of 4.19 %, and protein – 3.70 %. In this case, fat synthesis in the mammary glands of lactating animals is more dynamic, while milk protein has a stable character.

Keywords: Schwyz dairy breed, lactation, milk yield, fat and protein of milk

Постановка проблеми. Молоко не лише цінна біологічна продукція, а є одним із найважливіших продуктів харчування для людини. В коров'ячому молоці міститься в середньому 12,5-13,0 % сухої речовини, у тому числі 3,8 % жиру й 3,3 % білка, 4,8 % лактози (молочного цукру) та близько 1 % мінеральних речовин. Молоко вміщує близько 200 необхідних для людини поживних речовин в оптимальному співвідношенні й легкозасвоюваній формі. У складі молока більше