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Theoretically Poluchennыe results of research on ukazыvayut suschestvennoe Effect sootnoshenyya obъemov sostavlyayuschyh Vacuum system Changed the nature of the process pressure in obъeme breast emkosty, that dvyzhuschehosya raznytsы strangled the End value dependent pressure stabilization. Poluchennaya adekvatnaya matematycheskaya model Changed in breast emkosty pressure from the home value for pressure stabilization. Polozhytelnoe proved Effect vacuum Ballon Provision for kachestvennыh tehnolohycheskyh indicators work Vacuum systems, notably podderzhanye High urovnja stabylnosty Initial pressure vacuum in leadership.

Vakuumnaya system Ballon vacuum, pressure of vacuum-transmitting Stabilization.

The obtained results of theoretical studies indicate significant influence the volume ratio of components of vacuum system on nature of the pressure change in volume of milk vessel by moving the pressure difference depends on final value of pressure stabilization. Getting adequate mathematical model of pressure changes in mammary capacity from initial value to pressure stabilization. The positive influence of vacuum cylinder to ensure the quality of technological performance of the vacuum system, in particular, maintaining a high level of stability of the initial pressure in vacuum line.

Vacuum system, vacuum tank, pressure, vacuum line, stabilizing.

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MODELING THE NUMBER APARATIVPRY optimum milking machine milking ZAVANTAZHENOSTIOPERATORA

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The analysis of models calculation of time for machine milking cows mathematical model number of milking machines which can simultaneously serve milking machine operator at the optimum load factor operator The results of modeling for various types of milking.

Milking machines, load factor, milking machine, milking machine operator, the simulation results.

Formulation of the problem. The process of machine milking cows linked to the execution of the milking machine (OMD) complex manufacturing operations, which are aimed at ensuring the requirements of the physiology of milk output. Important operations are preliminary and final, allowing the cow to prepare and carry out the engine of milk dodoyuvannya and eliminate overexposure milking machines for cow udders. Compliance is ensured duration, which limited the number of milking machines, which also serves OMD. Therefore it is important to prove the number of milking machines for OMD, enabling optimum load-time and eliminate overexposure milking machines for cow udders.

Analysis of recent research. Modeling of processes of machine milking cows mainly based on determining the time parameters of the milking apparatus, namely the duration of machine milking time pre-closing operations OMD transitions, duration dodoyuvannya machine.

So VS, Mkrtumyan [1] using a probabilistic approach for determining the time machine milking (tm) offers a formula:

$t_м = (n-1)M[\tau_i] + 1{,}5\sqrt{n-1}\cdot\sigma_{\tau_i}$ Where n - the number of milking machines, which is the operator of machine milking; M [τi] στi - expectation and standard deviation of all transactions prior to machine milking, operated by the operator to machine milking one cow with.

It is clear that the process of milking cows at the livestock farm depends on the execution of the milking machine complex manufacturing operations. Therefore, obtaining functional relationship to determine the number of milking machines, which serves the operator of machine milking (OMD) as a function of the length of hand (TR) and machine-hand (tm-r) operations and the time vydoyuvannya (TA) milk from the udder, were based on studies of performance of technological operations for milking cows in stalls under the "unit moves to the cows' Fenenkom AI, Savran VP and others. scientists [2-8]. for the execution of manufacturing operations process machine milking cows when milking program OMD performs the "optimal" number of vehicles, their number can be determined from the relationship: $n_{да} = t_д + t_p / t_p + t_{м-р}$.

Defining characteristics of the process of milking time (cycle time of installation (ttso) milking process cycle (MC)) is carried out taking into account the size of OMD limited to general fund of time (T) [2-8]. Using this method of calculating the number of milking machines for one OMD and temporal characteristics of the process ignores the physiological characteristics of milk and individual features OMD.

Developers of software for automated milking systems, including milking equipment ALC "Bratslav" believe that the duration of machine milking cows is a random variable and is subject to a statistical model [9-11]. The authors of the studies were carried out milking time duration tTD using milking machines without milking process management functions and the phase controlled milking tKD milking machines to feature milking process management, the distribution of time intervals approaching the gamma distribution and is given by $P_{TD}(t) = t^l \cdot e^{\frac{t}{m}} / m^{l+1} \cdot \Gamma(l+1)$ Where RTD (t) - distribution law milking duration using milking machines without management functions milking and milking the phase controlled using milking machines milking management with function; l, m - distribution options.

When using a milking machine function without control, milking time be determined by the sum of two random time intervals - the duration of training animals to milking and milking time $t_{N-D} = t_p + t_{TD}$ Law distribution of amounts PD (t) is a convolution of the laws of distribution [9-11] $P_D(t) = P_{PD}(t) \cdot P_{TD}(t) = \int_0^{+\infty} \frac{\tau^{\frac{k}{2}-1} \cdot (t-\tau)^l \cdot e^{-\frac{2t+\tau\cdot(m-2)}{2m}}}{\tau^{\frac{k}{2}} \cdot m^{l+1} \cdot \Gamma(l+1) \cdot \Gamma\left(\frac{k}{2}\right)} d\tau$.

It is advisable to note that the above listed authors duration milking using milking machines with the function of managing the process of milking is defined as the amount of time training animals (tp), time of stimulation (tS), time uncontrolled milking (tND), time controlled milking (tKD), time dodoyuvannya (tM): $t_{K-D} = t_p + t_S + t_{ND} + t_{KD} + t_M$.

The random variable is the preparation of controlled animals and milking time, the law of distribution amount is determined by the expectation milking time using milking machines with process control function is given by $M_{K-D} = t_S + t_{ND} + t_M + m \cdot (l+1) + k$.

For the duration of the training milking robot for milking animals is determined indexes tP, and the expectation milking time of the milking robot will use $M_{R-D} = t_P + t_S + t_{ND} + t_M + m \cdot (l+1)$.

The authors of [9-11] operations are regulated by time of use of automated milking systems. The question of the number of milking machines justification does not apply. Managers consider the main characteristics of the process is time and the number of milking machines and the value regulated. This calculation method can only be used in automated milking systems when OMD performs the function of monitoring and emergency intervention in the manufacturing process of machine milking.

An important parameter in the number of milking machines justification for OMD is its workload when performing machine milking process that regulates the quality of their performance [12].

Analysis of the main ways of calculating the milking process has shown that they do not reflect the quality or process side of machine milking cows [7-9], or is hromistkymy for analytical dependencies that zatrudnyayut their practical use [4, 10-12].

The purpose of research - Develop mathematical models to study the optimal number of milking machines that can simultaneously serve milking machine operator without.

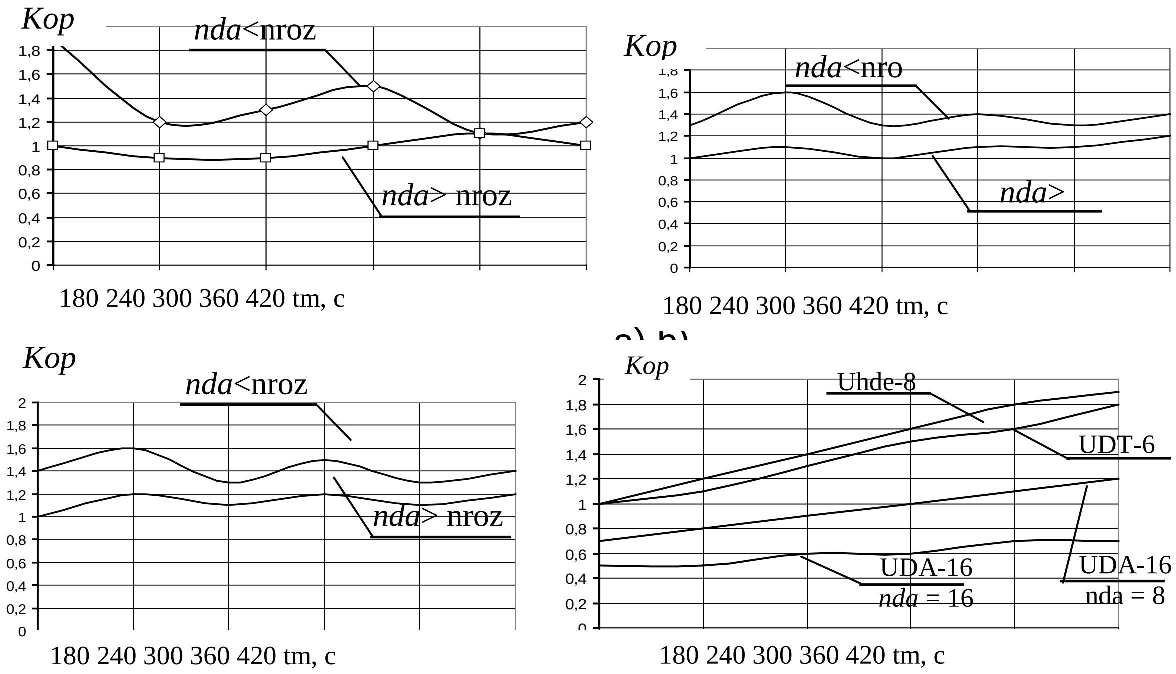
Results. In the best option for a given number of milking machines serviced by OMD, OMD load factor must be equal to 1. Clearly, preparatory and finishing operations depend on compliance with the rules of machine milking cows and technological skills (professional) OMD. OMD Kop load factor based on the sequence of preparatory and final operations of machine milking cows calculated by the formula [12]:

$$K_{on} = \frac{t_{\partial} + (n_{\partial a} - 1) \cdot t_{з}}{n_{\partial a} \cdot t_{n-з}}, \qquad (1)$$

Where: TA - duration of milking one cow, TA = tm + TP-out, with [13]; tz - the duration of the closing transactions with.

If Kop> 1 - operator underloaded, according Overexposure milking machine for milking udder absent when the Kop <1 - milking machine operator overloaded nor matured regulations preparatory and final operations or milking machines peretrymuyutsya. Number of milking machines, serving one OMD cows, describes its workload. Promodelyuyemo load OMD cows using dependence (1) and present the results in Fig. 1. From the relationship (1) obtain the equation to calculate the optimal number of milking machines, considering that with TA-TA = + tz, TA = TA + tm + tz:

$$n_{\partial a} = \frac{t_{м}}{t_{n}} \cdot \left[K_{on} + \frac{t_{з}}{t_{n}}(K_{on} - 1) \right]^{-1} + \left[K_{on} + \frac{t_{з}}{t_{n}}(K_{on} - 1) \right]^{-1}. \qquad (2)$$



c) d)

Fig. 1. Workload milking machine operator when working on the milking installation: a) NSA 100; b) The UDM-100; a) ADM-8A; d) milking in the milking room.

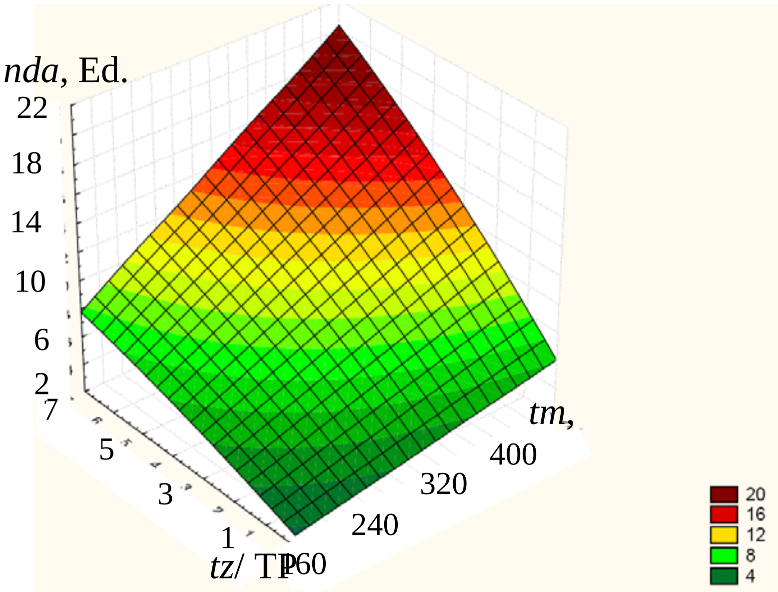


Fig. 2. Dependence of the number of milking machines nda that served OMD duration of machine milking cows tm and the ratio of final and preliminary operations tz / TA.

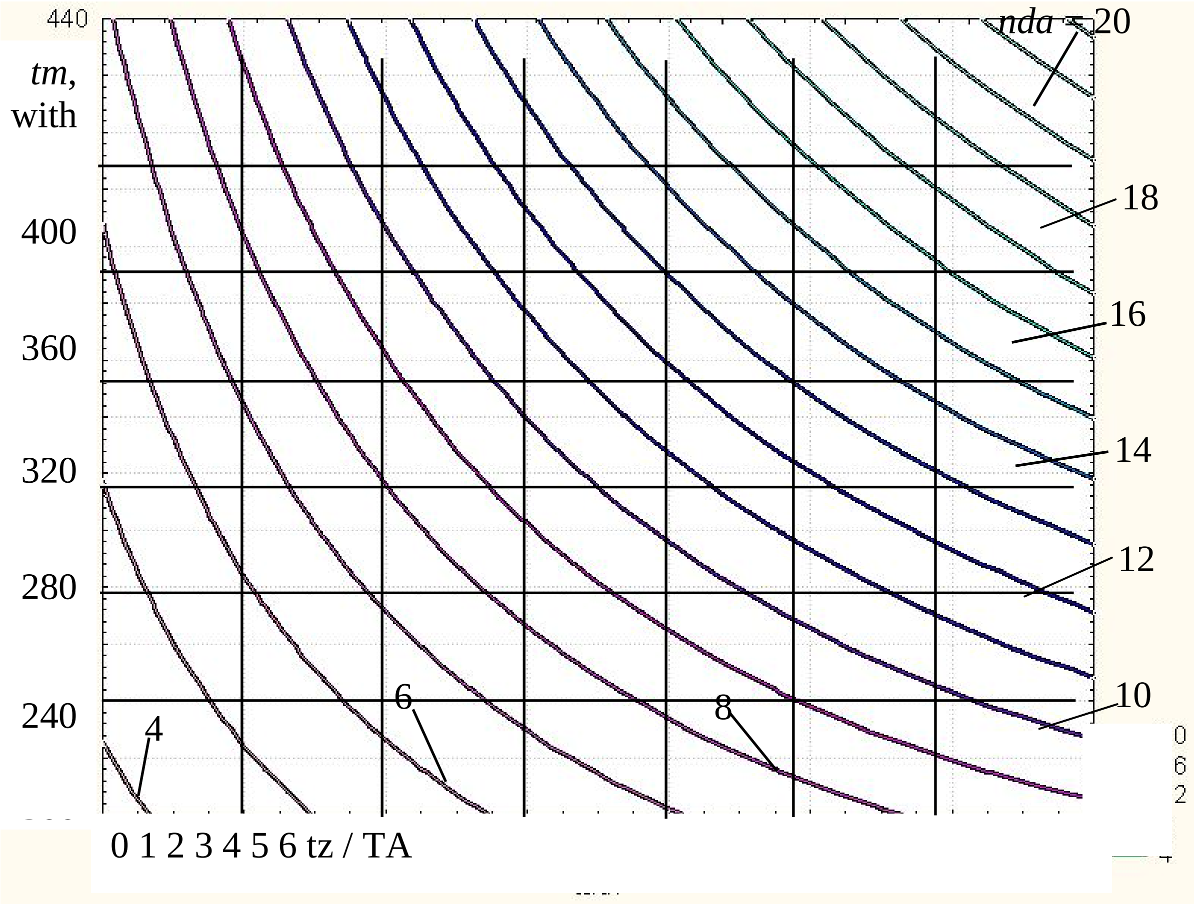


Fig. 3. Schedule surface projections of the number of guest nda milking machines that served OMD duration of machine milking cows tm and the ratio of final and preliminary operations tz / TA.

The best value is Kop = 1. Then the relation (2) becomes:

$$n_{\partial a} = t_{м}/t_{п} + 1, \quad (3)$$

Where: TP - the duration of the preparatory operations OMD, p.

The results of modeling the optimal number of milking machines shown in Fig. 2.

For ease of analysis of dependence (2) build schedule projections response (Fig. 3).

Conclusions

The analysis process machine milking cows shows that the duration of the preparatory and final operations regulated type of milking machines, the level of automation of machine milking operations and partly depends on the skill of OMD and his level of responsibility.

Changes related value tz / TP 1 to 7, provided that finishing operations are performed without OMD (machine dodoyuvannya, removing the milking machine, its movement performed mechanisms milking installations at automation or robotics process) provides a significant increase in the number of milking machines serviced OMD. So OMD can simultaneously work with 5.8 devices in milking machines for milking stalls in a molokoprovod, and 8-12 when milking in milking rooms and the automation of the final operations - from 7 to 20 milking machines. Parameters that influence the number of milking machines which can simultaneously serve OMD is the duration of machine milking one cow tm.

Number of milking machines, serving one OMD describes its workload. The operator can comply with machine milking technology or break it. Subject to the requirements of the process OMD milking machine is at Kop ≥ 1.

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Conducted analysis of models calculation parameters vremennыh machine doenyya cow model is designed matematycheskaya Quantity

doylnыh apparatov with kotorыmy Can simultaneously served doenyya machine operator at the optimum loading koэffytsyente operator pryvedenы modeling results for doylnыh DIFFERENT typical installations.

Doylnaya setup Factor image, doylnыy apparatus, machine operator doenyya, modeling results.

The analysis of models calculation time parameters of machine milking cows mathematical model number of milking machines which can simultaneously serve milking machine operator at the optimum load factor operator The results of simulations for different types of milking machines.

Milking unit,load factor, milking machine, operator of machine milking,simulation results.