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DYNAMIC PRESSURE CHANGES IN VOLUMES KONSTRUKTYVNYHELEMENTIV VACUUM SYSTEM INSTALLATION MOBILNOYIDOYILNOYI

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The results of theoretical studies point to significant influence volume ratio of vacuum system components the nature of the process of pressure changes in the volume molokozbirnoyi capacity of the driving pressure difference depends on the value of the final pressure stabilization. The resulting mathematical model adequate pressure changes in molokozbirnyku the initial value for pressure stabilization.Proved positive impact cylinder vacuum technology to provide high-quality performance of the vacuum system, including maintaining a higher level of stability initial pressure in the vacuum wire.

The vacuum system, the vacuum cylinder, pressure, vacuum-wire stabilization.

Formulation of the problem. Mobile milking machines have a wide range of applications as the premises for keeping cows and pastures (upon completing the internal combustion engine). Comparative analysis [8, 10] known milking systems pointed to much higher productivity, lower labor costs and lower specific energy and metal content of mobile milking compared with stationary milking unit, provided the same number of concurrent korovodoyin. These advantages, compactness and low cost makes this type of milking machines most attractive option for mechanization of machine milking cows in the outbuildings and small farms (of livestock to 32 cows), which is inherent in manual milking, and as a consequence, low quality milk received in terms of cleanliness and bacterial contamination [2, 3].

However, the lack of adequate information makes it impossible to fully assess their technological usefulness depending on the application. In addition, the mobile milking system is not enough research on the impact of a design features and process parameters on the efficiency of the process - machine milking cows.

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Analysis of recent research. Significant influence on the productivity of milk cows and speed is the value of vacuum pressure and its stability in a vacuum wire. Research [1, 9] found that systematic fluctuations in the vacuum space piddiykovomu milking cups within 9.7 ...

20 kPa cause a decrease in milk yield of cows 1.9 ... 2.5% and a decrease milking speed 0.06 ... 1.5 l / min. Therefore, one of the main criteria for assessing the quality of milking operation can be considered to ensure a stable the pressure in the vacuum network while milking cows. We confirmed the positive impact of increased volume vacuum cylinder the stability of vacuum pressure. research results[5, 6] indicate mandatory to equip mobile milking machines vacuum container, the amount of which depends on the amount of structural elements of the vacuum system. Thus, the volume of a cylinder vacuum between 10-20 liters. reduces the pressure loss of the main 32.8 ... 43.5% compared to the mobile milking systems komponovochniy scheme in which the cylinder is not at capacity molokozbirnyka within 20-30 l [4]. In such a system increases the reliability of actuators milking machines by dilution stable in vacuum-wire.

However, the question remains unresolved influence of design parameters of the mobile milking vacuum system installed on the dynamics of change in their vacuum pressure, until stabilization at the initial values.

The purpose of research is to identify the impact of structural parameters of the vacuum system on the nature of the change in pressure in the structural elements of the mobile milking machines.

The objective of research is to simulate the pressure change from the initial value to the operating pressure in each of the structural elements of the vacuum system mobile milking unit within the stabilization period.

The method of research based on the use of mathematical modeling using laws of continuum mechanics.

Results. When combined together the structural elements of the vacuum system, etc.ISK in molokozbirnyku (vM) is reduced through the redistribution of gas throughout the volume vacuum system (V) and remove the excess air mass vacuum pump. We found [6, 7], the first time interval (t1) pressure molokozbirnyku reduced pressure pc, and the driving force is the pressure difference SM-RP, and during the second period (t2) pressure will take important initial pressure vacuum network RP, but the driving force is the pressure difference PC-rP.

Up a differential equation of pressure changes in these limits for some period of time, consider that the rate of change of pressure depends on the driving pressure difference.

$$\frac{dp}{dt} = k \cdot (p_M - p_П), \quad (1)$$

where: k - proportionality factor that determines the impact of volume vacuum system components on the rate of change of the pressure in it.

Divide variables and solve the resulting equation with respect to DP.

$$\ln\left(p_M - p_П\right) = k \cdot t + \ln C. \quad (2)$$

Perform potentiation.

$$e^{\ln(p_M - p_П)} = e^{k \cdot t + \ln C} = e^{k \cdot t} \cdot e^{\ln C}. \quad (3)$$

$$p_M - p_П = C \cdot e^{k \cdot t}. \quad (4)$$

With the initial conditions: t = 0, C = RM - RP. Equation (2) becomes:

$$p_M - p_П = \left(p_M - p_П\right) \cdot e^{k \cdot t}. \quad (5)$$

The value e^k determine based on the condition that at some specific time Ti pressure system will meet some of the pressure groove. From our research we know that at the end of the first period (Ti = t1) achieved pc pressure because the condition RM = RS.

$$\left(e^k\right)^{t_1} = \frac{p_c - p_П}{(p_M - p_П)},$$

$$e^k = \left(\frac{p_c - p_П}{\left(p_M - p_П\right)}\right)^{\frac{1}{t_1}} = \left(\frac{\frac{p_M \cdot V_M + p_П \cdot V_П - p_П \cdot V}{2 \cdot V}}{\left(p_M - p_П\right)}\right)^{\frac{1}{t_1}} = \left(\frac{V_M}{2 \cdot V}\right)^{\frac{1}{t_1}}. \quad (6)$$

The general solution of equation (2) looks like.

$$p_{V_{ij}} = p_j + \left(p_i - p_j\right) \cdot \left(\frac{V_M}{2 \cdot V}\right)^{\frac{t}{t_i - t_0}}. \quad (7)$$

where: $p_{V_{ij}}$ - A change in volume pressure from the initial to the final value, Pa; t - current time coordinate (in the range from 0 to Ti) s; re - opening pressure of a period of Ti, Pa; rj - the value desired (final) pressure vacuum system element, Pa; Ti - duration of achieving some pressure, determined driving pressure difference SM-RP or RP-RS, c; t0 - duration of the period preceding and-so, with.

Thus the nature of the pressure changes in the volume molokozbirnoyi capacity has significant impact the ratio of the volume of vacuum system components, and the driving pressure difference has an impact just by changing the value of the final pressure. For the first period of Ti = t1 = RM pressure groove for the second period of Ti = t2 = pressure groove MS. In both cases, the final value will be pressure rj = RP. In graphic form, equation (7) is shown in Fig. 1.

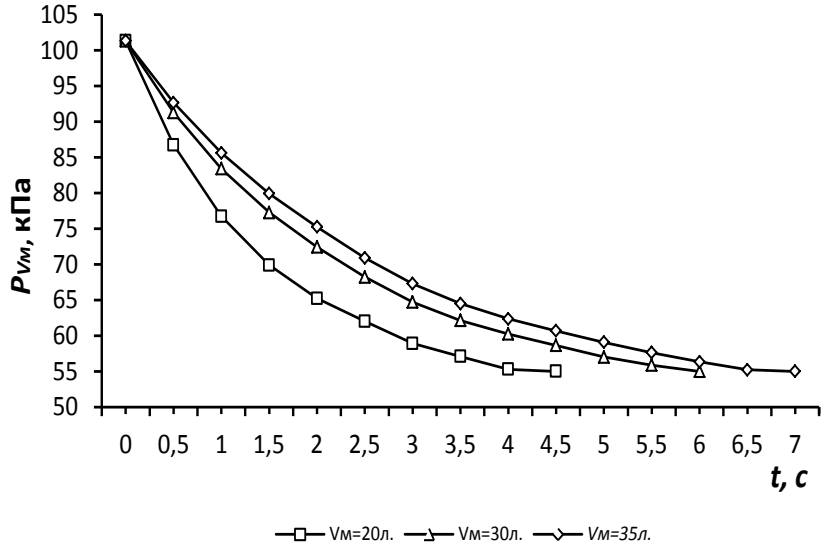

Fig. Figure 1. The pressure changes (p_{V_M}) In molokozbirnyku (vM) different fixed amount over time t at constant volume vacuum container*Vb*= 0,010 m3 and the initial pressure vacuum network *rp* = 55 kPa.

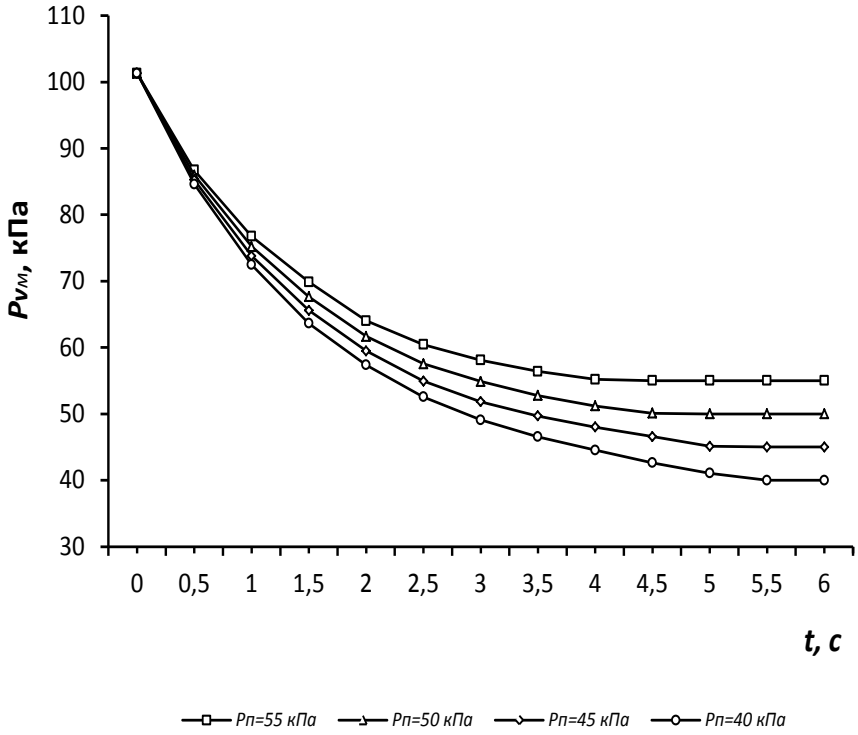

Fig. 2. Schedule changes in pressure (p_{V_M}) In molokozbirnyku (vM) for time t provided constant volume molokozbirnyka (*vM*= = 0.020m3) and vacuum cylinder (*Vb*= 0,010 m3) at different values the initial pressure vacuum network (RP).

The variation in pressure molokozbirnyku (see. Fig. 1) mobile milking unit responsible logarithmic law and, with increasing volume molokozbirnyka (vM) increases time to establish initial pressure vacuum network (RP). This can be explained immutability design parameters of

the system throughput by increasing the volume of air that needs to be removed from the vacuum system to set the initial pressure Pn at the same values the difference between the initial (SM) and the final value (AC) pressure.

A significant role and duration (t1) pressure setting (RS) completion of mixing, which increases with the volume molokozbirnyka (vM). This can be explained by the increase in the coefficient of proportionality (k) at a constant volume vacuum container.

The law changes the pressure remains constant for different values of initial pressure and vacuum networks for different elements of the value volume vacuum system. It should be noted that if the lower value of the initial pressure vacuum network (RP) duration of his installation in the vacuum system increases provided equal coefficient of proportionality volumes.

Conclusions

The established model changes in pressure molokozbirnyku mobile milking unit within the stabilization period for the restoration of the original vacuum pressure network (RP). Thus, the duration of stabilization period decreases with increased volume of the vacuum container provided initial pressure rise, and greater volume capacity molokozbirnoyi (vM) meets the above mentioned duration of the stabilization period. At any value of the initial pressure vacuum-wire character specified functional relationship remains unchanged.

Further, it is advisable to investigate the impact of structural parameters of the mobile milking vacuum system installed on the dynamics of the pressure in the vacuum-wire, until stabilization at the initial values.

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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