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# IMPROVEMENT vacuum systems Milking UNIT

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*The analysis of existing and development of several new technical solutions that enhance the efficiency and reliability of the vacuum equipment of milking units.*

***Vacuum unit, pump chamber, vacuum cylinder efficiency.***

**Formulation of the problem.**Milking livestock is one of the most important and very time-consuming process technology in milk production.

Its effectiveness is largely determined by the technical perfection of mechanization that this used and compliance with existing rules milking machine.

The structure milking equipment in addition to the basic elements (installation of vacuum manifold vacuum, vacuum valves and milking machines) may also include molokoprovidna system, metering, cleaning and cooling of milk and so on.

Energy (power) element is a vacuum unit, which includes the pump drive muffler filter, vacuum tank, vacuum gauge and vakuumrehulyator (Fig. 1).

It should create a vacuum air pressure specified parameters, the possibility of regulation, supervision and stability. Such air environment ensures normal operation of actuators milking machines - milking machines and milk transportation vydoyenoho (in general milking pail of milk or a milk separation) and others.

And of structural and technological excellence vacuum novok mouth-dependent performance of all the milking equipment.

**Analysis of recent research.** Review and comparative assessment of existing milking, shows the feasibility of using in their composition rotary plate pump as power element. Compared to the other they have very high efficiency (0,8-0,9) low energy (0,06-0,06 kWh / m3), ease of construction and maintenance, the possibility of direct connection to the motor.

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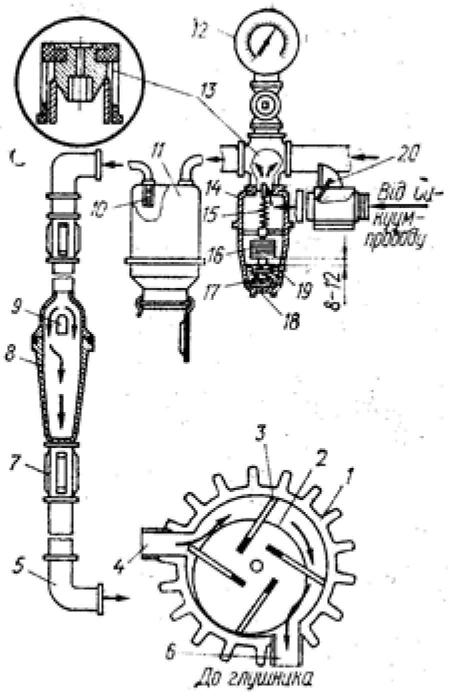


Fig. 1. Vacuum installations UVU-60/45[1] 1 - pump housing; 2 - rotor; C - scoop; 4 - inlet pipe; 5 - knee; 6 - outlet; 7 - coupling; 8 - fuse; 9 - return valve;
10 - valve-float; 11 - vacuum cylinder; 12 - vacuum gauge;
13 - valve regulator; 14 - vakuumrehulyatora body; 15 - spring; 16 - weight; 17 - dampened drive; 18 - glass; 19 - oil;
20 - LED costs.

In modern milking machines often use standardized vacuum systems UVU-60/45 (Fig. 1) with a rotary pump that can operate in two modes of performance - 60 and 45 m3 / h. However kgand vacuum systems have certain structural imperfections that reduce the effectiveness of their work.

Thus, intake and exhaust pipes to the pump working chamber placed (in the plane of the cross section) close to the radial direction. This length (in the direction of rotation of the rotor) inlet and outlet windows is relatively small and close to corresponding nozzle diameter and length of the compression zone air increased significantly and nearly 180o. The disadvantage of this solution is to reduce energy costs and increase productivity.

The inlet and outlet pipes are located along the vacuum container and the top shell. It is not fully helps clean the air before removing it through a vacuum pump, resulting in decreases its longevity.

**Goal** research - improving the efficiency and durability of the vacuum installation, by improving the design of its elements.

**Results.** The analysis and synthesis of known technical solutions [1-5] and the results of studies [6-11] workflow type rotary vacuum pumps respect justify its structural and technological parameters enable noted that to achieve this goal it is advisable to make such modifications to the vacuum unit:

• working chamber vacuum pump in cross section execute oval in shape (Fig. 2). This way of working chamber allows to increase the area of the living-sectional area of the intake pipe in [12] and thus improves the performance of the pump at the same values of the diameter of the rotor and the frequency of rotation;

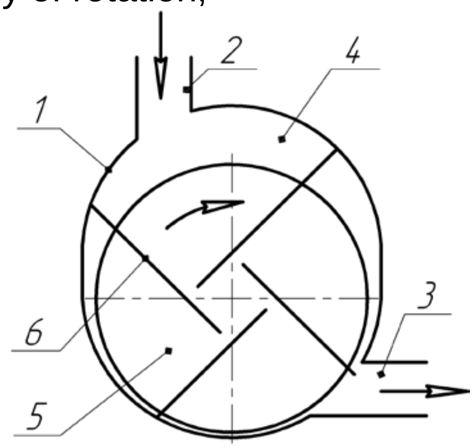


Fig. 2. Scheme vacuum pump working chamber oval: 1 - the case; 2 - inlet pipe; 3 - outlet; 4 - working chamber; 5 - rotor; 6 - blade.

• intake and exhaust pipes placed tangent to the working chamber (over the course of the rotor in the plane of its cross section) and to increase the length of the intake and exhaust windows in such quantities that the angles between the intake and exhaust were at least 90o (Fig. 3). This and extent of these windows also reaches about 90o angle on the circumference of the working chamber [13]. Placing the inlet and exhaust nozzle relative to the working surface tangent itself allows slightly increase the length of the corresponding window in the direction of rotation of the rotor and promotes the flow of the camera and remove it from the air. In addition, by increasing the length of time these windows are increased and the rate of filling the chamber with air and reduced length compression zone and decreases air resistance. All these solutions will help increase productivity and reduce pump energy consumption during its operation;

• in a vacuum container containing cylindrical body inlet pipe should be placed on the side and tangent to the cylinder housing and outlet set on top of the cylinder axis of the body (Fig. 4). Placing the intake pipe side and tangent to the cylinder housing contributes to centrifugal separation of air from mechanical impurities (on a cyclone), and a central axial placement of the exhaust pipe from the top casing - ensures the removal of purified air from the purest and most calm zones of the container [14]. That result is achieved by improving working conditions and increase longevity vacuum pump.

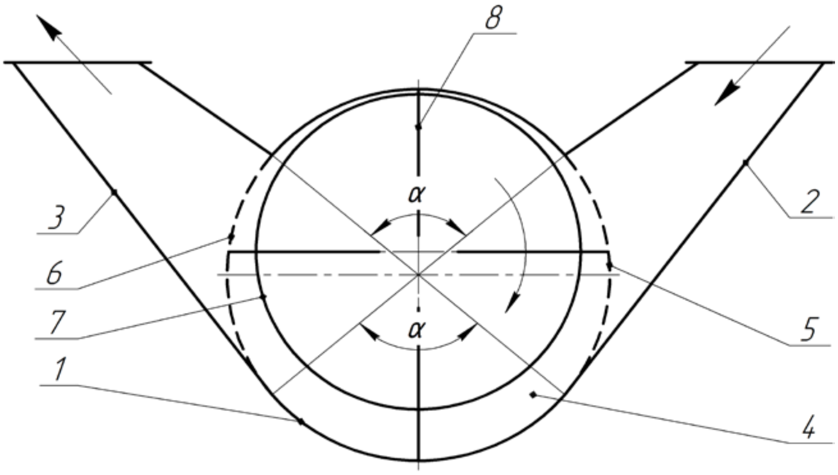


Fig. 3. Scheme of the intake and exhaust windows in the chamber vacuum pump: 1 - the case; 2 - inlet pipe; 3 - outlet; 4 - working chamber; 5 - inlet window; 6 - exhaust; 7 - a rotor; 8 - blade.

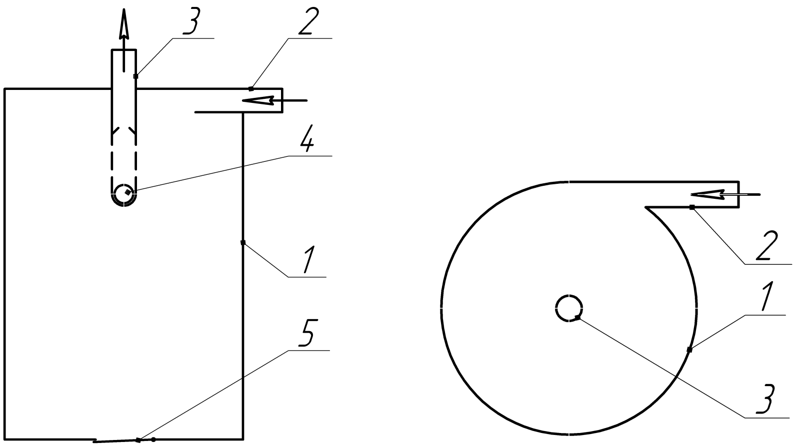


Fig. 4. Scheme vacuum container in an upright (left) and transverse (right) sections: 1 - the case; 2 - inlet pipe; 3 - outlet; 4 - Ball valve; 5 - drain cover.

**Conclusions**

To improve efficiency (increasing productivity, reducing energy consumption and increasing durability) of the vacuum installation, you must:

- create conditions for maximum possible filling of the working chamber of the pump and increase air space of the living area in the last section of the intake pipe;
- reduce the length of the air compression zone and create conditions for maximum removal of it from the pump in the area of the exhaust pipe;
- improve efficiency air cleaning vacuum ba-womb before it hit the working chamber vacuum pump.

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*LED and analysis of existing proposals novyh number of technical solutions, kotoryya sodeystvuyut Increase of the effectiveness and reliability of vacuum systems work doylnын agregatov.*

***Vakuumnaya installation, the pump chamber, vacuum tank, effectiveness.***

*The analysis of the existing technical solutions is shown and there are proposed a number of new technical solutions that improve the performance and reliability of the vacuum systems of milking machines.*

***Vacuum system, pump, camera, vacuum balloon, effectiveness.***

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## The influence of internal stresses in cemented LAYER OPERATING DATA ON STEEL

***OE Semenov, Ph.D.***

*Revealed regularities of distribution of internal stresses in the surface layer of consolidated parts after carburizing and hardening, the level of contact fatigue strength of steel. Established that the extreme nature of the changes compressive internal stresses provoke stress concentrators that lead to the birth of cracks, reducing the operational properties of steel.*

***Hardening, tempering, compressive stress performance properties, pitynh.***

**Formulation of the problem.** As a result of hardening thermochemical treatment in detail, both on the surface and in the core, formed residual stresses, the magnitude and direction of which EID-nachayutsya processes occurring cooling. Residual stresses can reduce or increase structural strength, so the analysis of the nature of their distribution in the surface layer of hardened components will enable to determine the overall performance properties cementing steels.

**Analysis of recent research.** Arguably, the residual stresses are desirable in cases where their direction is opposite the direction of the stress arising from the operation of products.

It is known [1, 2] that the presence of compressive stresses on the surface of parts increases fatigue strength and, conversely, the presence of tensile

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stress, it reduces. In this regard, details of which are exposed during operation alternating high contact load knowingly subjected to