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FEASIBILITY STUDY ZASTOSUVANNYASYSTEMY SERVOKONTROLYA rotary plate vacuum pump milking machines

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As a result of technical and economic analysis found that application on a dairy farm with 100 head of livestock systems servokontrolyu developed rotary vacuum pump plate consisting of milking machines has advantages in terms of energy - saving electricity 2.44 times. payback period will be the introduction of 2.6 years and an annual economic impact is 13264 USD.

The economic effect, milking machines, servokontrolya system, vacuum pump, power, efficiency.

Formulation of the problem. Today there is a wide choice of high performance milking systems servokontrolyu their milk-vacuum systems, the main criterion for determining the effective operation of which is energy. Thus, the use of automated systems servokontrolyu rotary plate vacuum pump can reduce its specific energy consumption while maintaining the required level of vacuum and efficient provision [1-2].

Analysis of recent research. As a result of calculation of technological process performance indicators milking machine installed power dynamics change Np electric vacuum pump for milking system with its servokontrolyu without it. Established specific energy consumption for milking cows 1: without servokontrolyu - 0.2378 kWh. / Head of servokontrolem - 0.0973 kWh. / Head [2, 3].

The purpose of research. Determine the economic efficiency of the system servokontrolyu plate rotary vacuum pumps with reasonable structural and technological parameters consisting of milking.

Results. The object of research is to compare baseline and projected technological lines of milking animals on the dairy farm with livestock - 100 dairy cows, 2 one-time frequency rate of milking.

In the basic version milking cows milking perform the installation of the "Christmas tree 2 × 6" (within which there is a rotary vacuum pump plate).

Projected option is to use milking machines "Herringbone 2 × 6", which is equipped with a system designed servokontrolyu rotary plate vacuum pump.

Projected and basic milking line options differ only in the presence of design vacuum pressure gauges and air flow frequency converter and the motor, so the comparison will be performed only on performance indicators of these elements in the system servokontrolyu.

Compare the cost-effectiveness of milking machines will be in terms of unit operating costs, additional capital investment and additional revenue from increased product quality. Calculations are made according to the method of economic evaluation techniques during trial, which is the industry standard of Ukraine ISO 4397: 2005 [5].

The annual economic effect of the application of servokontrolyu rotary plate vacuum pump is determined by the difference reduced costs. Since the introduction of the new car is not the change in the scope of work, the annual economic impact calculate the formula [6]:

$$E_р = C_б - C_п + Д, \quad (1)$$

Where: Ep - annual economic effect, rub .; Sat and sleep - the annual cost of running the car in the old and new version, rub .; D - additional annual economic benefit obtained by improving the quality of milk, rub.

Define the annual costs of operating the machine in the old and the new version:

$$C = Ce + Ca + hundred + 3, \quad (2)$$

Where: Se - the cost of electricity, rub .; Hundred - maintenance costs, rub .; Ca - costs of depreciation, rub .; C - wage workers UAH.

According to [3, 4] Section milking energy installation will be: without servokontrolyu - 21,758.7 kWh. With servokontrolem - 8902.95 kWh.

The cost of electricity is determined from the cost of 1 kWh (1.81 USD.), For the basic version Seb = 39,383 USD; EPS for the project option = 16,114 USD. Costs for capital and current repairs and maintenance, define the formula:

$$C_{то} = \frac{K \cdot R}{100}, \quad (3)$$

where: K - the book value systems servokontrolyu UAH. For the base case kB = 1072200 USD., For the projected shredder Kb = 1106700 = USD .; R - the percentage of annual allocations for capital and current repairs and maintenance, R = 14%.

- For the base: Stobie = 150,108 USD .;
- For the project: Stop = 154938 USD.

Define depreciation costs:

$$C_а = \frac{K \cdot a}{100}, \quad (4)$$

where: a - interest deductions for depreciation costs, and = 15%.

- For the base: Cab = 160,830 USD .;

- For the project: CaP = 166005 USD.

Labor costs are calculated as follows

$$З = \sum_{i=1}^{n} ЛI_i t_i r_i n_i \,, \quad (5)$$

Where: Lie - the number of i-th category of production personnel employed to perform primary process, maintenance and repair of cars, people .; ti - the length of employment and the first production personnel, hours .; ri - hourly wage rate of pay for the i-th type of work, ri = 7,8 UAH / man-hour; ni - rate of payroll tax (pension fund, Social Insurance Fund for Employment), ni = 1,33.

Milking machines such as "Herringbone 2 × 6" serves 2 working milker each with 2541 hours. a year because wage job of work for the basic version is Sb = 52,720 USD.

Since servokontrolyu system is fully automated, it does not need nor any additional staff. Because wages is Sn = 52,720 USD.

Annual operating costs to determine the equation (2):

- For the base: Sa = 403,041 USD .;
- For the project: Cn = 389777 USD.

Since the degree of availability of servokontrolyu consisting of milking machines not increase the quality and productivity of milk cows, the additional annual economic benefit equal to 0. Then the annual economic benefit expected from the application of servokontrolyu a part of the milking installation is Er = 13264 USD.

The degree of reduction of operating costs is calculated as follows:

$$В_{експл.} = \frac{С_б - С_п}{С_б} \cdot 100\%. \quad (6)$$

Where: Veksp. - The degree of reduction in operating costs UAH.

Substituting (6) numeric value is Veksp. = 3.2%.

Payback period for investments taken us option in its implementation of:

$$Т = \frac{К_Н - К_Б}{F_р}. \quad (7)$$

where: T - the payback period of capital investment years.

Substituting (7) numerical values we get: T = 2.6 years.

Conclusion. It is established that the application on a dairy farm with 100 head of livestock systems servokontrolyu developed rotary vacuum pump plate consisting of milking machines has advantages in terms of energy - saving electricity 2.44 times. Payback period will be the introduction of 2.6 years and an annual economic impact is 13264 USD.

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As a result of techno-economic calculation established, something Application for breast Farms with 100 heads poholovem system servokontrolya razrabotannoho rotatsyonnoho plate-proof vacuum pump installation doylnoy ymeet Benefits for indicators эnerhozatrat - эkonomyya electricity to 2.44 times. Term okupaemosty at 2.6 Introduction sostavyt Manuscript and the Economic hodovoy effect sostavljaet 13264 USD.

The Economic effect, doylnaya installation system servokontrolem, vacuum pump, Electricity, effectiveness.

As a result of technical and economic calculation established that the application on a dairy farm with 100 head of livestock servo control system developed by the rotary vane vacuum pump as a part of the milking plant has advantages in terms of energy - energy savings in 2.44 times. the payback period will be the introduction of 2.6 years and an annual economic impact is 13264 UAH.

Economic effect, milking unit, servo control system, vacuum pump, power, efficiency.

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TIME CHARACTERISTICS OF ROBOTYPNEVMOELEKTROMAHNITNOHO pulsator pairs

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