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RATIONALE DEVICE SETTINGS FOR MEASURING SPEED MILK FLOW AND INDIVIDUAL MILK YIELD

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The milking machine - the only mechanism of interaction in the process of milking a living organism on the basis of feedback, is under construction, as a rule, on measuring the intensity of milk animal. Therefore, the task of improving counter-milk sensor is relevant due to the growing level of management of the dairy farm as a complex system of biotechnology, as well as with the advent of milking machines and the need for setting modes of operation, appropriate physiological state of animals.

By Flow impose strict requirements: relative-tive measurement error of less than 5 %; the device should not affect the vacuum mode and well cleaned with circulation washing; removal of information should be provided electronically with the possibility of digital-processing.

The analysis device to measure the amount of liquid, gas and steam in other industries has shown that none of the known classes of accounting devices is not suitable for use in a continuous-process line milking due to special conditions: the presence of two-phase milk flows and the random nature of the change; multiple intensive mechanical effect on milk, accompanied by abundant foam.

The purpose of research - study parameters of the device to measure the rate of flow of milk and individual milk yield.

Materials and methods of research. Classification of modern types of equipment includes the following types of recording devices milk.

1. Proportional counters are selected certain portion of the total milk production in the measuring flask with visual level control milk or by passing through the electrodes on the digital display.

2. Counters defining portions of constant weight or volume using the chute ensure the separation of the stream into elementary portions and summarize them in a mechanical or electronic display.

Counters constant volume with a single or composite-meter chamber measure the level of milk float or sensory Electrical rows associated with a valve or an electric motor, showing yield on the digital display.

3. Counters defining portions of variable weight reflect the MSE-rate of milk and the amount of milk is calculated by measuring the flow time, using the asymmetrical chute.

4. Measuring the speed of milk is based on the measurement of gravitational-tion forces generated when the direction of the flow of milk. Calculations must be based on the angular momentum.

5. Measuring current levels flow rate determined in accordance with the level of milk in the separation chamber and the amount of milk produced by integrating the flow rate over time.

Currently, the domestic milking plants are mainly used trough sensor-counter weight type having considerable-ing weight and dimensions, also can not be used on the line milking plants with portable milking machines, which hinders the modernization of the latter.

Some firms (De Laval, GEA Farm Technologies, and others.) Proposal-gayut use a portable (mobile) milking units with infra-red, electrode and other devices that are compact and do not create obstacles to the measured flow, but the considerable cost and high accuracy measurements (up to 10 ... 15%), limiting the effectiveness of their use. Moreover, most of them do not measure flow, and indicate its limit state (yes-no), followed by disconnecting the teat cups.

The parlors to obtain more precise information on individual milk production can be used the milk chamber portions, which have a complex structure, a large mass and size that is not critical for these systems milking.

Therefore, the task of creating an improved sensor-meter chamber assumes its actualization in terms of use in the transfer-governmental automated milking machines for milking cows in the stalls and in the parlors. Thus the counter-sensor must have a small mass and size, acceptable error of measurement of the flow of milk to

control the milking machine, as well as to record and transmit information on the individual milk yield in farm automation.

The analysis counters sensors milk, wasps nova for further research was selected flow-chamber converter used in the milking machine "Duovak-300" or "Nat" domestic production with further modernization of a previously developed by us measurement algorithm (Fig. 1).

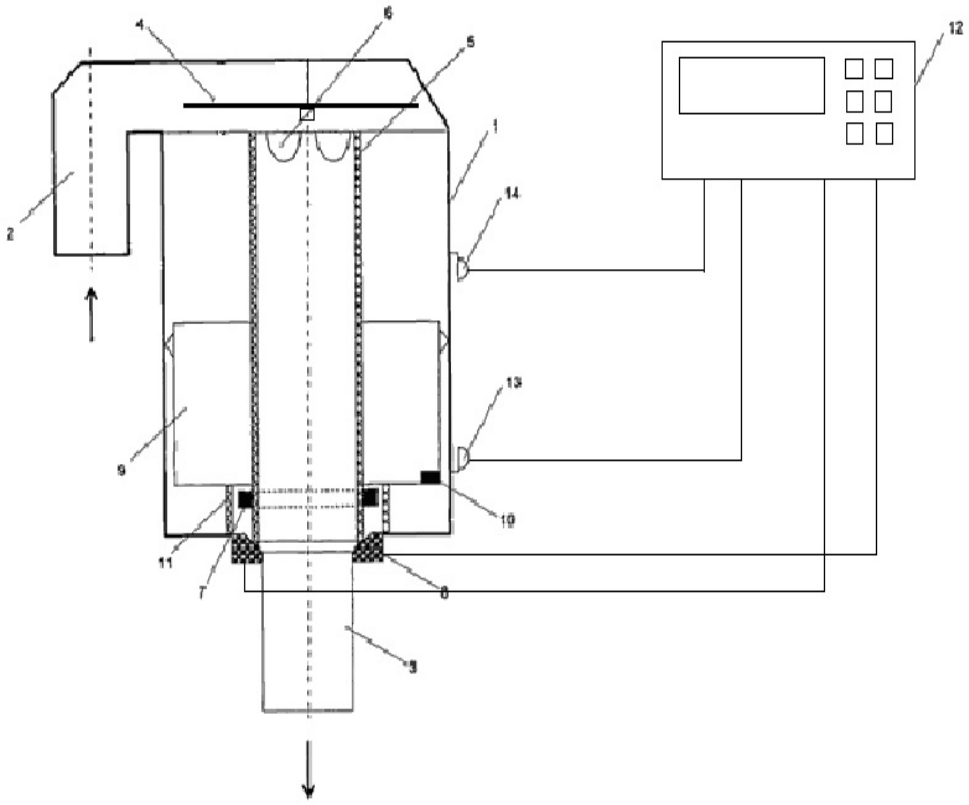

Fig.1. Chamber sensor-counter milk:

1 - body of the glass; 2 - suction intake; 3 - outlet; 4 - damper flow; 5 - hollow stem valve; 6 - slots-passages; 7 - ring magnet; 8 - electromagnetic coil; 9 - float; 10 - flat magnet; 11 - rack rails; 12 - Controller milking; 13 - lower Hall sensor; 14 - upper Hall sensor

Therefore, the main objectives are:

- Research and the establishment of the laws of the dynamics of two-phase milk pulsating flows in the milking machine and counter-sensor with the develop-

ment of methods, algorithms and technical means of control, measurement and control;

- Development of control algorithm milking process with changing the present values for individual milk flow from the udder quarters and mechatronic design algorithm for its implementation on the basis of sync physiologically safe milking vacuum on and off the individual shares of the udder

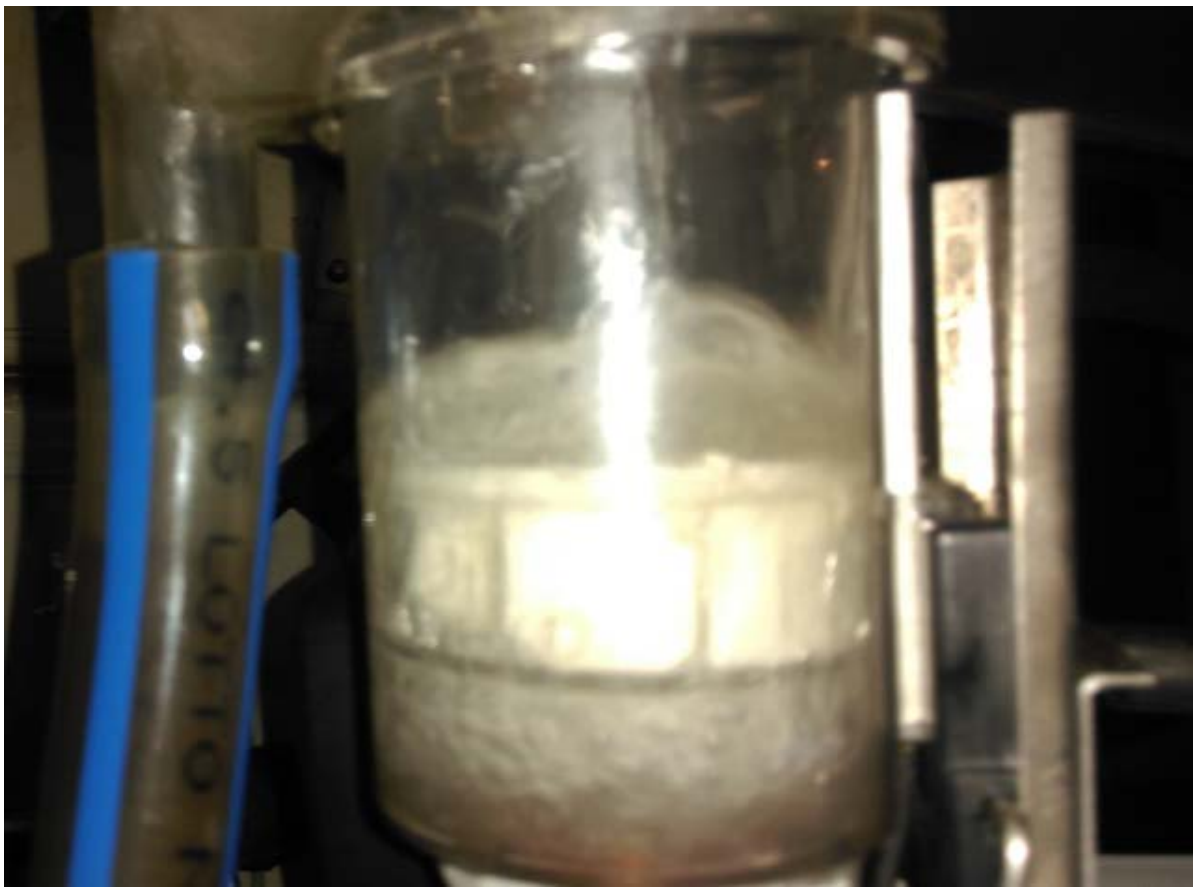

Fig. 2. Foaming at high flows

The results of research. Laboratory tests were conducted to verify the measurement uncertainty, which at the request of ICAR should not exceed 5%. Measurements were performed on a laboratory bench, which includes a simulator of the udder, the capacity installed on the scales and a fragment of a milking plant with the test device. Milk flow rate was controlled in the range of from 1 to 6 L / min, determining a difference of the balance at the beginning and end of time and experience. Just take readings by measuring the amount of milk with milking controller. The research re-

sults are shown in Fig. 3. The graph shows that the error does not exceed 5% at a flow rate of 5 l / min, which satisfies the requirements.

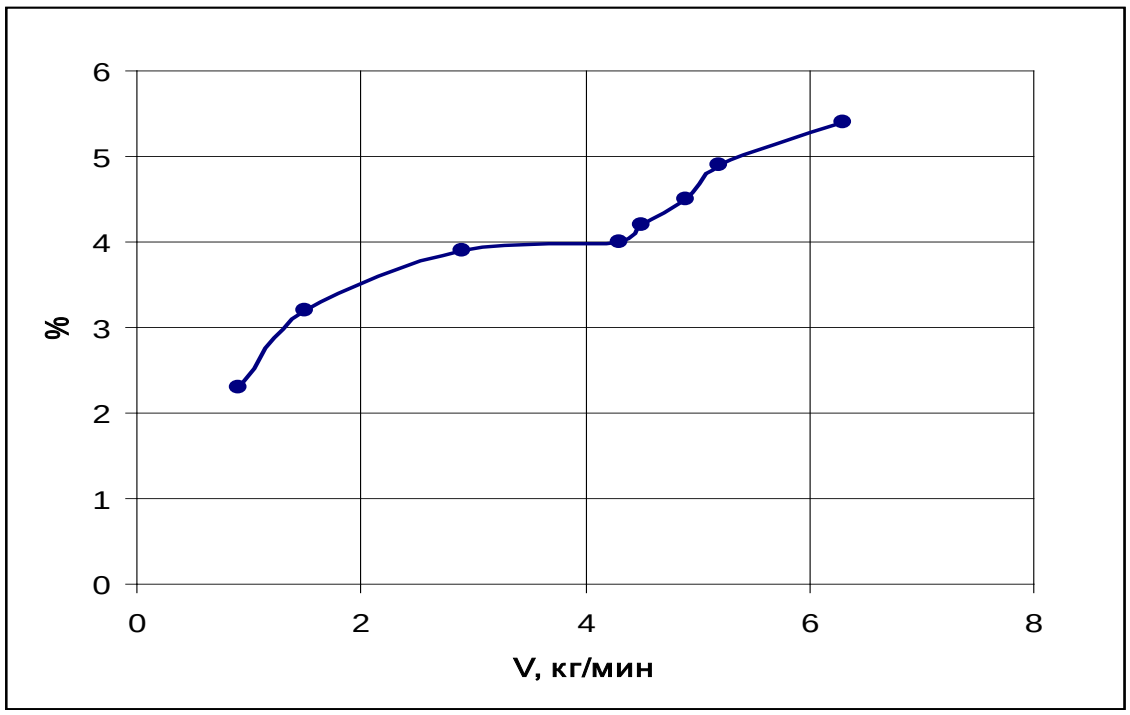

Figure 3. The dependence of the error rate of milk

Also, the counter has been tested on fluctuations of the vacuum mode (Figure 4), the requirements of ICAR should be that the counter should not affect the vacuum mode, the allowable fluctuation + -3 kPa. Using the device pulsotest company SAC vacuum fluctuations were recorded (maximum and minimum) for one minute, at different speeds of milk, which modulate the throttle of different diameters, the differences turned out normal.

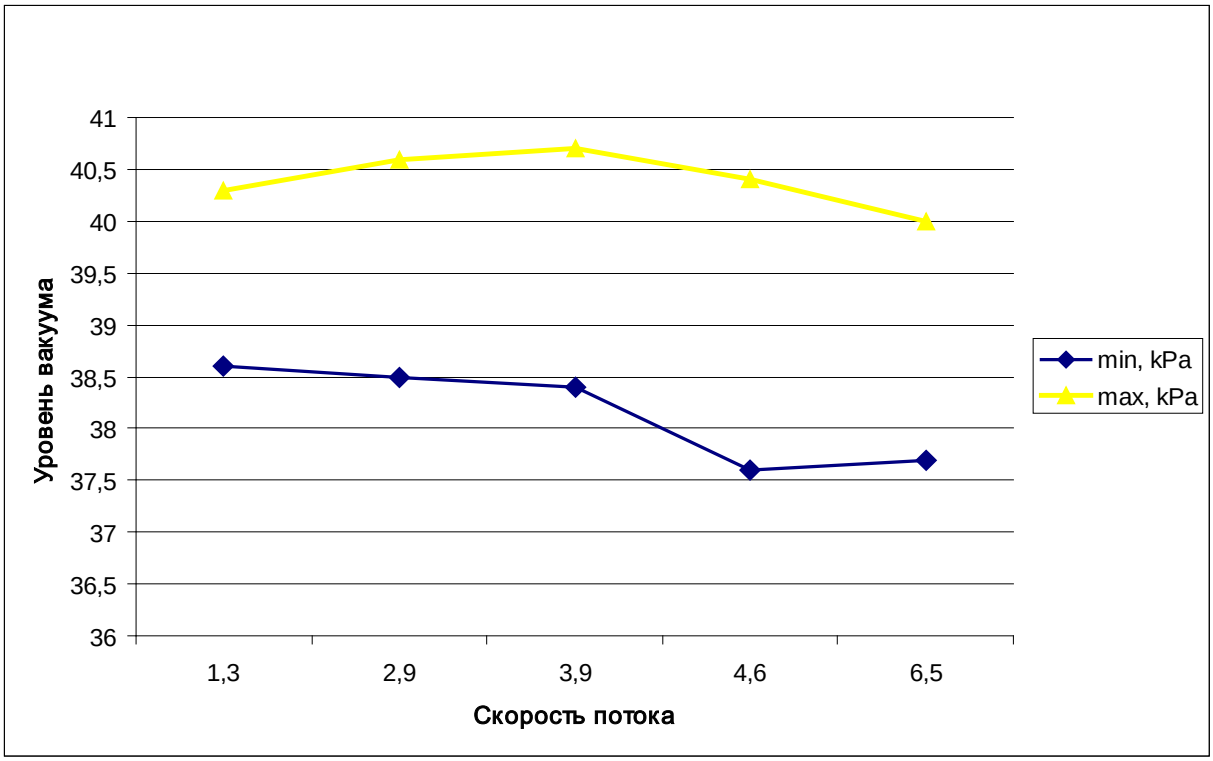

Figure 4. Measuring the vacuum mode, depending on the speed of the milk-returns

Conclusions

The proposed sensor counter milk can be used for measuring the quantity of milk flow and process control in automated milking the teat during milking installations such as in halls and on-line installation in the automated milking machines because of its small size.