STUDY THE IMPACT OF ARTIFICIAL TEAT LENGTH AND CROSS SECTION OF MILKING LINER ON EXERTED PRESSURE

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ABSTRACT

An analysis of milking liners from nitrile rubber with circular and triangular cross-section. Measured pressure is carried out by milking liner on artificial teat. The artificial teat length and form of milking liner shape significantly affect the pressure.

***Keywords**: milking machine, pulsation system, milking liner, pressure.*

Introduction

In accordance with the new guidelines for the humane care of animals ever greater importance is the relationship between the milking machine and animal. The Milking of cows is a process in which the milking machine respectively milking unit acts directly on the udder and teats. Milking liners is deformed under the influence of pulsation vacuum pressure is applied on the teat. This irritation have great importance for milk production, the normal functioning of the breathing organs, stomach, heart, genitals and others. (1).

The massage of the teat under the influence of milking liner is proportional to the pressure difference in both milk and pulsation chamber of the milking cup. The magnitude of the pressure exerted on the teat is directly dependent on the level of vacuum in the milk chamber. The vacuum level in the chamber, the type and size of pulsations in pulsation chamber influencing incentive effect of the milking apparatus (1). Some scientists study the pressure exerted on artificial teat (2, 3, 6, 8) and others examine the differential pressure in milking cup (5, 7, 9) it is recommended in range of 8-12 kPa. Kochman et al. (4) examines the pressure exerted on the artificial teat by changing the duration of the "**c"** phase. At the increase of phase with the initial pressure on the teat decreases. Van de Tol et al. (9) studied the different forms milking liners how putting pressure on the teat and recommends those with a triangular or square shape.

The purpose of this study is to determine the influence of the artificial teat length and milking liner shape on exerted pressure.

To achieve the purpose we have set the following tasks:

- Development of artificial teat which is measured by the pressure exerted by milking liner
- Using the developed device for measuring low pressure with high resolution and high performance.

Material and methods

The study was conducted in the laboratory of Milking machine of the Department Agricultural Engineering at Trakia University - Stara. Zagora on milking station Impulsa M624, pulse frequency f = 60min^{-1}, ratio γ = 60/40%, and vacuum level 50 kPa. Milking liners with circular and triangular cross-sectional shape and size of artifical teats shown in table 1 were investigated.

Table 1. Sizes of studied artificial teats.

№	Length, mm	Diameter, mm
1	90	27
2	80	24
3	60	25

The study carried out 4 times per milking liner. The maximum measured values for each test were averaged and the average of four test. The experimental setup is shown in figure 1.

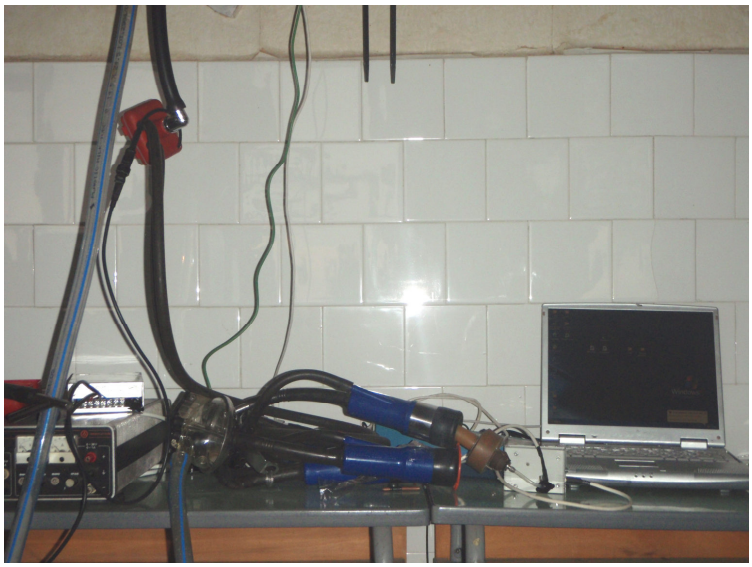

Figure 1. The experimental setup.

For the experiment was used polyurethane teat contained in its upper portion wherein a hole is left for the attachment of the nipple a flexible conduit which is connected to a pressure transducer to a device for measuring pressure (DMP). The received data is processed and recorded into a PC via specialized software. Data can be stored in tabular or graphical form. The pressure exercised by milking liner is in direct proportion to the pressure measured in the artificial papilla shown in figure 2.

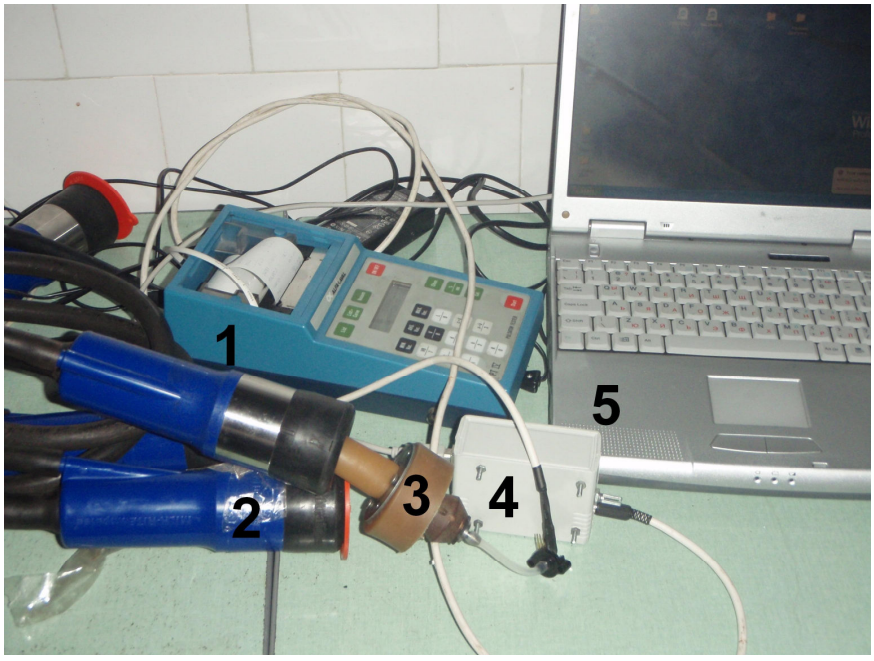

Fig. 2. Elements of the experimental set-up: 1 - pulsotester, 2 - milking cup 3 - artificial teat; 4 - DMP, 5 - PC.

Results and Discussion

Figure 3 shows the measured pressure in Pa for investigated milking liners and artificial teats.

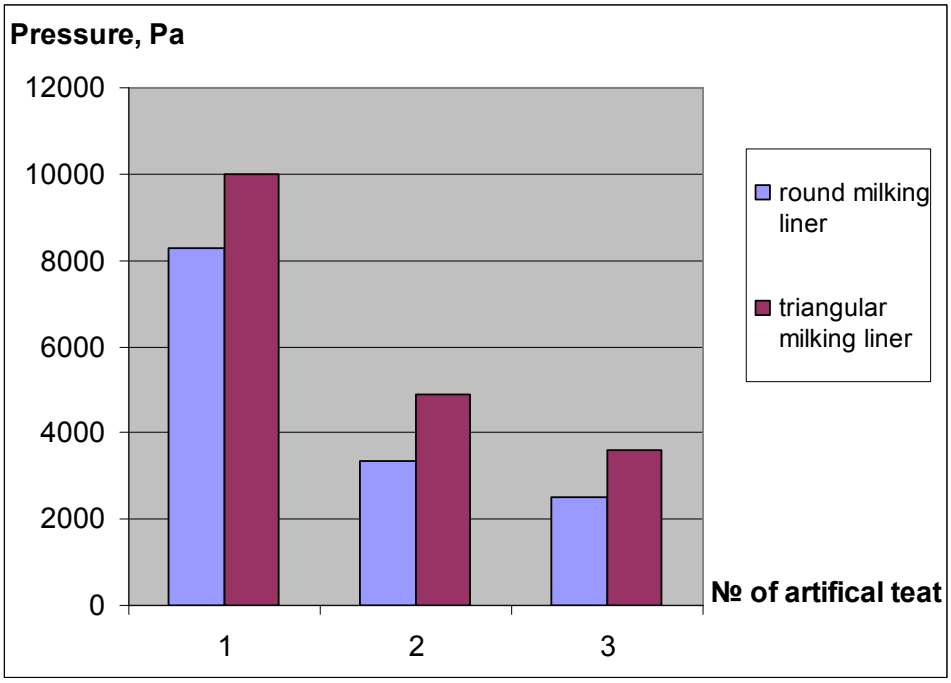

Fig. 3. Influence of length of the artificial teat and milking liner shape on the measured pressure.

It is clear that the length of the artificial papilla significantly affect the resulting pressure due to the pressure exercised on it by milking liner. The result of artificial papilla № 1 of 9988 Pa is the maximum pressure used sensor which lead us to think that we should use sensor with a larger scope in order to correct the results. Cross section of milking liner also influences the magnitude of the pressure. Triangular section of milking liners level of pressure in artificial teat is higher than milking liner with a circular cross section and the pressure range from 3602 Pa to 9988 Pa.

At milking liners with circular (round) section exerted pressure is lower and in the range from 2498 Pa to 8279 Pa.

It can be seen that the milking liner with a triangular cross section regardless of the length of the used polyurethane teat showed higher pressure of about 1500 Pa.

Study on the use of artificial teat as an indicator of the pressure exercised by milking liner should be extended in order to obtain more detailed results using different sized artificial teats and the use of sensor with a larger scope.

Conclusions

1. The shape and cross section of the milking liner affects the magnitude of the exerted pressure. Milking liner with a triangular cross-section puts greater pressure of about 1500 Pa from circular milking liner.

2. The length of the artificial teat has a significant influence on the pressure exercised by milking liner.

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