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# Study on the level of generated vacuum in the teat cup milking chamber as a factor for assessing liner suitability

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***Abstract.*** *In the article is studied the impact of the generated vacuum in the teat cup milking chamber of the milking clusters for milking cows manufactured by the companies De Laval, Spaggiari and Gea Farm Technologies . New milking liners as well as ones with hours worked resources have been examined. The survey was conducted by a Device for Integrated Diagnostics of Milking Machines . The resulting data are presented in graphic and tabular form.*

**Keywords:** milking machine, pulsation system, milking liner, generated vacuum

## Introduction

The milking liner is the element that interacts directly with teats in machine milking. The efficient operation of the milking machine as well as productivity and animal health depend on the technical and performance parameters of the milking liner. In modern automated milking systems and their effectiveness at work a special role is given to the milking liner (Parssons, 1988). The timely replacement of milking liners is very important for the milk yield and preservation of the udder (Davis et al., 2000.), therefore it is recommended to replace milking liners 3 times a year (Kartoshov et al., 1987).

The objective of this paper is to determine the impact of the service life of the milking liner on the generated vacuum, by which to establish the suitability of liners.

## Material and methods

To achieve the aim integrated milking liners have been tested, new and ones with hours worked resources of the companies: De Laval, Spaggiari and Gea Farm Technologies (GFT). The survey has been conducted in the Machine milking laboratory at the Department of Agricultural Engineering, Trakia University, Stara Zagora. Experiments have been carried out on milking machine Impulsa M624 at a vacuum level of 50,6 kPa and standard load at frequency F=60 $min^{-1}$ and tact ratio γ=60/40%. The pressure of the milking liner is as per instructions (60 N). The survey has been conducted by means of Device for Integrated Diagnostics of Milking Machines (DIDMM) ( Banev, 2002).

Figure 1 shows the experimental system on which the study has been carried out. It consists of DIDMM 1, milk chamber 9 between the milking liner and the shell 4. In the head of the milking liner an artificial teat 8 is inserted closed with a stopper. The pulsator 4 is connected with the vacuum line for constant vacuum and input "A" of DIDMM. Pulsation chamber 5 of the teatcup connects to input “B” of DIDMM and input "C" on DIDMM - with the milking chamber of the teatcup. The data of the tests conducted are recorded in computer data base.

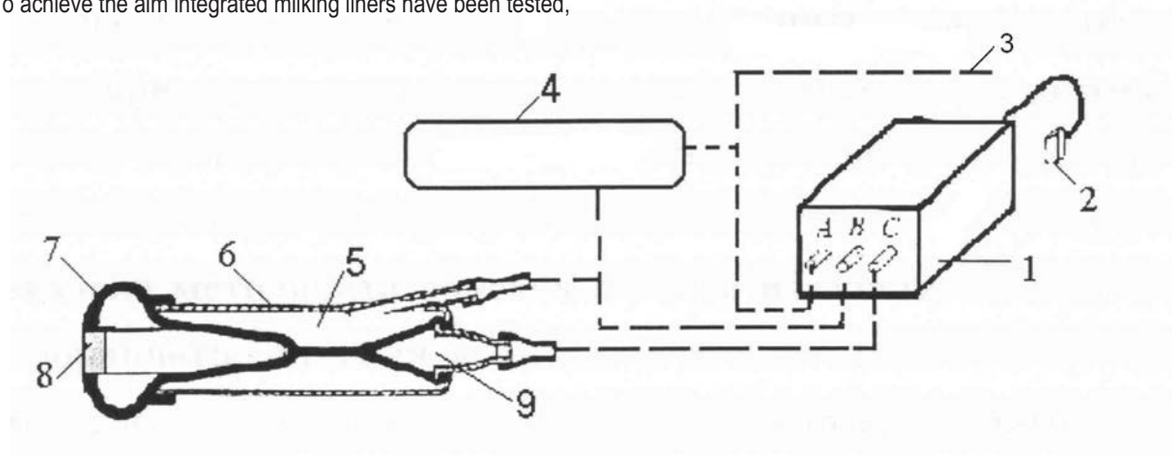


**Figure 1.** Experimental system:
1 – DIDMM; 2 – connection cable, 3 – vacuum line; 4 – pulsator, 5 – pulsation chamber; 6 – shell;
7 – milking liner; 8 – artificial teat with stopper; 9 – milking chamber.

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The relative change δa (in per cent) of the generated vacuum is calculated by the equation:

$$\delta_a = \frac{A_H \quad Ao}{A_H}.100,$$

where $A_H$ is the average value of amplitudes of the generated vacuum in new milking liner kPa, *Ao* is average value of amplitudes of the generated vacuum in milking liners with hours worked resources, kPa.

## Results and discussion

Figure 2 presents in graphical form the data from the conducted studies. The resulting average values for amplitudes of the

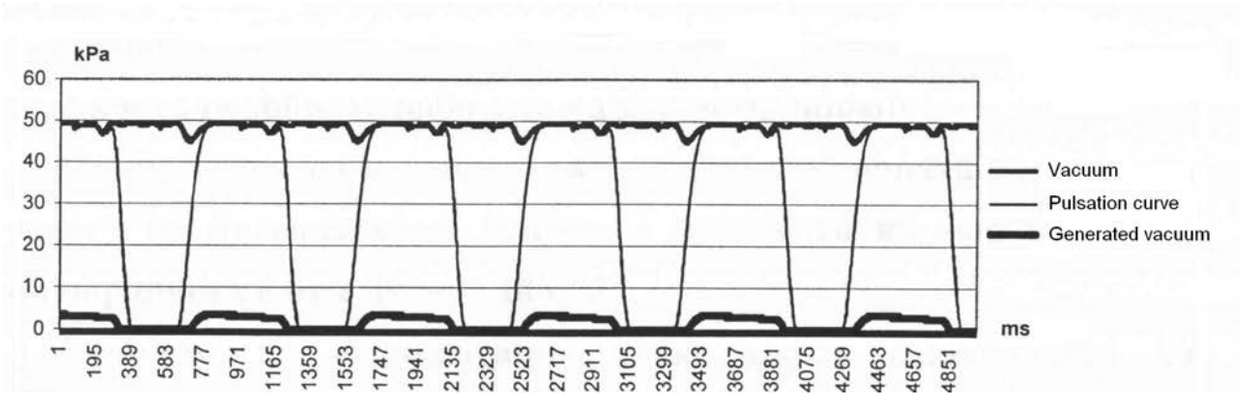


**Figure 2.** Overview of pulsation curve and generated vacuum in teatcup.

**Table 1.** Average values of the generated vacuum.

| Companies and model of the milking liner | De Laval | Spaggiari | | GFT |
|---|---|---|---|---|
| | 96 00 36 | 0-325 | Nw23 | 7020.2725.240 |
| Ao, kPa | 2.17 | 2.17 | 1.94 | 1.94 |
| $A_H$, kPa | 3.48 | 3.48 | 2.39 | 3.48 |
| δa, % | 37.6 | 37.6 | 18.9 | 44.2 |

generated vacuum for new liners and ones with hours worked resource are given in Table 1. The data in show that in the new liners tested the average generated vacuum $A_H$ is greater ($A_H$=3.48 kPa), except for liners made by the company "Spaggiari" model NW23, where $A_H$ is lower 2.39 kPa. For milking liners with hours worked resource the average range Ao varies from 1.94 kPa to 2.17 kPa. The relative change of the generated vacuum in new liners and ones with hours worked resource is from 18.9% to 44.2%. The results obtained show that operation time affects the functioning of the milking liner and the changes that occur in its work affect the size of the generated vacuum in the milk chamber and the relative change of the range of the generated vacuum for the studied milking liners (new and with hours worked resource) is from 18.9% to 44.2%.

## Conclusion

The generated vacuum in the milking chamber declines with the expiry date and the relative change is from 18 to 44%. Changes in the range of the generated vacuum in the milking chamber of the teatcup can be used as a parameter for assessing the suitability of the old milking liner.

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