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Quarter individual milking with MultiLactor® in milking parlours

The advantages of quarter individual milking systems are the possibility of collecting milking data and steering vacuum seperately per quarter. With the developement of the milking system MultiLactor® it is now possible to milk each quarter individually in conventional milking parlours. The system features many technical innovations that are interesting for future use in dairy farms by using conventional milking parlours. This article shows results of a first study about teatend vacuum depending on pulsation settings within the new system at the Leibniz-Institut für Agrartechnik Potsdam-Bornim e. V. (ATB).

Keywords
Milking technique, vacuum, vacuum fluctuations, mean vacuum, vacuum reduction, quarter individual milking

Abstract
Landtechnik 64 (2009), no. 2, pp. 106 - 108, 3 figures, 8 references

The agricultural-technical research has contributed to a strong optimisation of the milking process during the last years. Only the combination of the new developed teat cup with rigid casing and a flexible lining with the already introduced pulsator has created the precondition for a well-functioning milking machine [1]. The development of the milking parlours allow milking in a standing position which leads to a higher work efficiency. Through automatic milking system the working time directly related to milking process is reduced. However, more time is needed for the herd management. The work at the AMS brings less physical exposure and is not as monotonous as at the milking parlour. Nevertheless, 2007 there have been only 478 AMS farms [2] out of 100,000 milking farms in Germany [3]. Thus, the share 0,47% of AMS far-

Fig. 1

Milking System MultiLactor®

ms in Germany is still low, yet it shows a clear increasing tendency. That is due to economic reasons. Especially, in larger farms the monthly costs for milking personnel are prefered to the high initial investments and service costs of the AMS. Thus, it is expected that the milking system with the milking parlours will worldwide continue to be the most frequently used method for a long time. The milking system MultiLactor® is able to get here into a market niche. It is expected to reduce the work exposure of the worker at the milking parlour. This milking system is able to work without claw piece. As each teat cup can be applied separately, the exhausting holding of the milking cluster can be avoided. In contrast to the automatic milking systems an intensive controll of the animal and the udder is possible already during the milking process. Further advantages for the animal's health and the quality of the milk are to be expected.

New milking system enables new possibilities

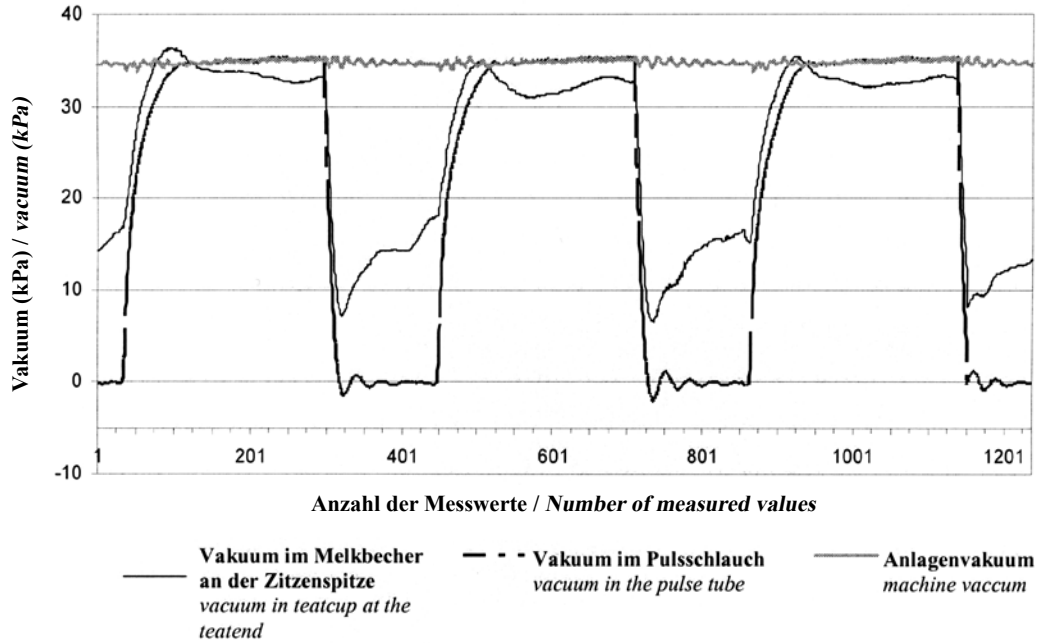
The milking system MultiLactor® has been developed by the company Siliconform GmbH **(Fig.1)**. It is produced in Germany and due to several new construction elements it can be classified as an important innovation.

The application of this milking system dramatically differs from the working methods of conventional milking systems. For the attachment the milking magazine automatically swings under the udder. The teat cups are removed manually and attached one by one. The removal of the teat cups from the udder is processed automatically [4]. Further technical innovations of the system is an automatic in-between-cleaning mechanism, sequential pulsation and a vacuum off-set mechanism individual for each udder quarter. Beyond, a pneumatic arm is integrated, which periodically moves the milking tubes, enabling a relaxation of the udder muscles. A further feature is the use of teat cups with periodical air inlet [4]. These teat cups reduce the vacuum fluctuations using the milking tubes of 2100mm length and 10mm in diameter. The separation of each individual milking tube further avoid the bacteria transfer among the udder quarters. The milking machine is operated by low vacuum. The machine vacuum is 35 kPa.

The measurement of vacuum

In order to measure the vacuum condition close at the udder over longer time and with constant flow rates, wet method, according to DIN ISO 6690, with water as test liquid have been accomplished at the MultiLactor® [5]. The flow rate per udder has been preset from 0,8 to 6,0 l/min. The wet method enables a simulation of the milking process. The liquid tank, the flow simulator and artificial teat have been connected through tubes. The four teat cups of the equipment have been attached at the holder and the artificial teats have been inserted. For the vacuum measurement the equipment „Bovipress" from A&R Trading GmbH has been used [6]. The pulsation patterns of the MultiLactor® have been tested. The gathered results have been analysed by inserting the measured vacuum results over a certain time frame. Further, the vacuum fluctuation and the vacuum reduction for the b-phase of the pulsation cycle have been calculated, under the application of 18 pulsation cycles, according to DIN ISO 6690 [5] [7]. The vacuum reduction has been calculated by substracting the mean vacuum from the machine vacuum. The data shown in the following figure represent the mean of four udder quarters measured during three replications.

Fig. 2



Typical vacuum conditions at milking system MultiLactor® at a flow rate of 4 l/min

Low vacuum during the c-phase

In **figure 2** an extract of the characteristic vacuum curve of the MultiLactor® is shown in time sequence. The measurement has been carried out at 60:40 a-/b- to c-/d-phase proportion, while the pulsation was sequentially. The vacuum in the milking tube, vacuum at the end of the DIN ISO teat [5], the pulsation vacuum and the machine vacuum have been measured.

The results showed that the vacuum curve during the a-, b-, and c-phase of the pulsation

cycle are nearly congruent with the pulsation vacuum. Only during the d-phase the vacuum falls to a level of 20 to 7,5 kPa. Thus, with here presented milking system a strong vacuum reduction during the d-phase can be reached, which consequently leades to a relaese of teat tissue. This curve is reached through the co-action of periodical air inlet and pulse controll. During the b-phase the maximal vacuum reduction, with 5 kPa under the machine vacuum, is relatively low. Thus the machine generates a stable vacuum condition, close at the teat end.

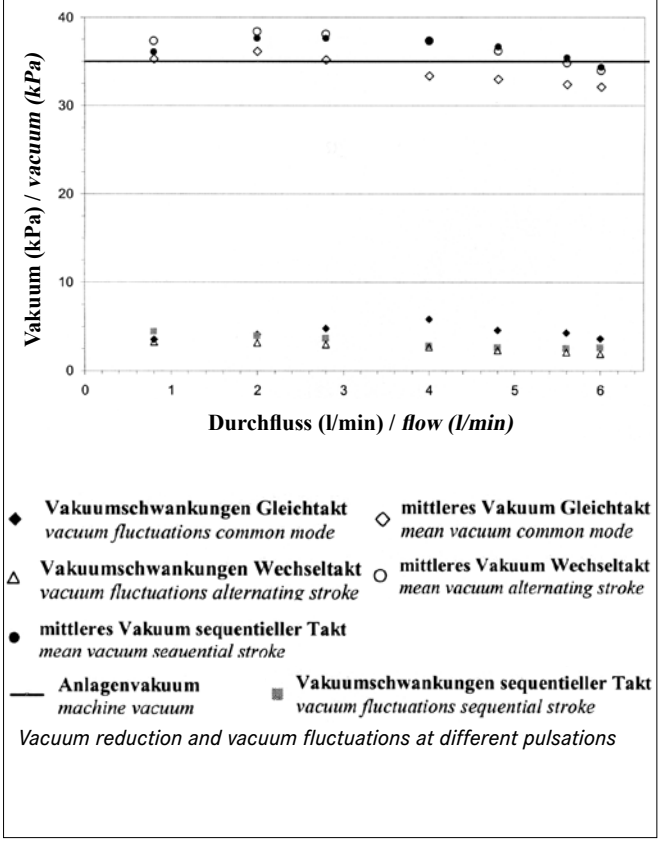
Optimal adjustment releases the cow teat

The results show that vacuum fluctuations as well as vacuum reductions in the milking system MultiLactor® at the sequential pulsation and at the alternating stroke pulsation appear to be lower than at the common mode pulsation. Especially, during a flow of over 2 l/min at the common mode pulsation there is a reduction of up to 4 kPa. A vacuum reduction at the alternating stroke pulsation and sequential pulsation only starts by a flow of over 5 l/min. This correlation is shown in the **figure 3**. Higher vacuum fluctuations and vacuum reductions only appear at the common mode pulsation, in particular at a flow rate of 4 l/min. Stable vacuum conditions in the milking system are a precondition for satisfactory milking characteristics of the system [8]. Too high exposure of the teat can lead to udder inflammations. Thus, the here presented milking system basically should be used at the sequential pulsation or the alternating stroke pulsation. Sequential pulsation can be definitely recommended as the mixing of the milk of each quarter at the tube junction is processed more smoothly.

Summary and outlook

The MultiLactor® is a highly promising new product shortly before its market launch. It has the potential to find solutions for several problematic areas of the milk production in milking parlours. Before the milking system can be sold with a high coverage the software should be changed so that the farmer has only to adjust the settings for individual requirements of the farm. Any further adjustment of the software should be exclusively processed by the dealer. The tests show that the milking system should only be used by sequential pulsation. In general, the system generates a stable vacuum curve with a distinct d-phase at the teat end, thus contributing to tissue release. During a nine-month long practical study, under the leadership of ATB, should be proved whether there are considerable advantages for the udder hygiene, milking duration and milk quality while using the MultiLactor®. These tests have started in April 2009 and are supported by the Bundesanstalt für Landwirtschaft und Ernährung (BLE).

Fig. 3



Vacuum reduction and vacuum fluctuations at different pulsations

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