
Evaluation of milking parameters by quarter in an automatic milking system with modified milkmeters

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Four milkmeters, designed for milk yield recording with sheep or goats, have been used for monitoring the settings of flow sensing devices in an automatic milking system. In two sessions data were recorded including the milking of 25 cows and of 28 cows. Parameters evaluated were total milk yield, milking time per cow and per quarter, various milk flow patterns, time for overmilking and the milk yield of manually stripping all quarters individually. For statistical treatment analysis of variance was used. Based on results of the first session the milk flow sensors of the AMS were readjusted. The average milk yield was 12.3 kg/cow respectively 12.2 kg/cow. Average and peak milk flow in both sessions were found to be at a reasonable level. The parameters "flow at take off" and "stripping yield" in the first session were more uniform after readjustment of the AMS. The time recorded for overmilking in most quarters was considerably reduced. These results indicated that milkmeters with an appropriate sensitivity for low rates of milk flow may be helpful for evaluation and adjustment of milking behaviour of AMS.

Key words: Automatic milking systems, milking parameters, milkmeters.

Milking procedures in automatic milking systems generally are controlled by quarter. For this purpose sensing devices are required with identical settings of parameters related to milk flow patterns of individual quarters.

Not only for practical but also for scientific reasons (Weiss and Worstorff, 2000) it therefore is helpful to look for possibilities to check the milk flow monitoring devices of automatic milking systems, to make sure they are working correctly and to optimize their operation if necessary. One option is using four milkmeters for individually monitoring the milking procedure of each quarter. This solution has been adopted already, e.g. by

Summary

Introduction

Umstätter and Kaufmann (2001). They used a type of milkmeter ("Lactocorder", Foss Electric, DK) which is continuously measuring flow rates and calculates the total yield by integrating milkflow over time. Due to powerful software several parameters to individually characterize milking behaviour of cows can be calculated. Since milkmeters are designed to handle full milk flow of an udder they have to work at the very low end of their range of operation when they are connected just to one quarter. This may result in a rather low resolution, mainly at the beginning and at the end of milking. To obtain reliable information Umstätter and Kaufmann (2001) therefore over a period of 72 hours had to collect a relatively high amount of data.

Materials and methods

To overcome these problems and to reduce the amount of time required for investigations prototypes of the above mentioned milkmeter, designed for milk recording with sheep and goats, have been used in connection with an automatic milking system (AMS) ("Merlin", Fullwood-Packo, B/D/GB/NL), with the goal to use information obtained by this equipment for checking and eventually correcting the operation of the system.

In two sessions data were recorded including the milkings of 25 cows in the first and of 28 cows in the second session. The AMS provided listings of milking time per cow and per quarter and of the total milk yield. The actual flow rate displayed by the milkmeter was manually recorded at the moment when the teat cup of the respective quarter was taken off. After the end of each session data recorded by the milkmeters were read out and printed using the software provided with the device. For further evaluation data on milking time, peak milk flow, average milk flow and overmilking were used. When all teat cups were taken off the efficiency of each milking procedure was evaluated by manually stripping all quarters individually and by weighing the amount of milk obtained. For statistical treatment of data analysis of variance was used.

Based on information obtained during the first session the milk flow sensors of the AMS were readjusted to obtain more regular control of milking procedures. The efficiency of the adjustment was checked using the results of the second session.

Results and discussion

In session 1 an average milk yield of 12.3 kg per milked cow was obtained. Average milk flow and peak flow (Table 1) were found to be at a reasonable level when the results per quarter were summed up. However, the parameters "milking time", "overmilking", "flow at take off" and "stripping yield" indicated some irregularity with respect to the quarter "front left". It therefore was decided to readjust the flow sensors controlling the milking procedure.

Table 1. Results of session one.

Quarter	Hind left	Hind right	Front left	Front right
Milking time (min)	5.3	5.3	5.3	4.4
Aver. milk flow (kg/min)	0.6	0.5	0.5	0.7
Peak milk flow (kg/min)	0.8	0.7	0.7	0.8
Overmilking (min)	1.08	0.96	1.57	0.44
Flow at take off (kg/min)	0.07	0.12	0.07	0.18
Stripping yield (g)	59.3	64.6	20.3	28.4

Table 2. Results of session two.

Quarter	Hind left	Hind right	Front left	Front right
Milking time (min)	6.4	7.2	3.9	3.8
Aver. milk flow (kg/min)	0.7	0.7	0.7	0.6
Peak milk flow (kg/min)	0.9	0.9	0.9	0.8
Overmilking (min)	0.16	0.11	0.17	0.37
Flow at take off (kg/min)	0.22	0.24	0.28	0.16
Stripping yield (g)	44.5	67.7	42.6	42.8

In session 2 the average milk yield was 12.2 kg per milking. The levels of average milk flow and of peakflow per quarter had increased and were more uniform over quarters (Table 2). In most quarters the time recorded for overmilking was considerably reduced, only quarter "front right" did not show much difference to session 1. "Flow at take off" and "Stripping yield" were higher than in session 1, but more uniform and still at acceptable levels.

The results obtained indicated that milkmeters with an appropriate sensitivity for low rates of milk flow may be helpful for evaluation and adjustment of milking behaviour of AMS. However, to do this efficiently the manufacturer of the AMS should define suitable procedures.

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