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Milk recording per quarter

Milking system with modified recording equipment

The adjustment of milk flow sensors in an automatic milking system (AMS) comprising four milkmeters modified for low milk flow was investigated in two recording series of 25 and 29 milkings. The following parameters were evaluated: total milk, milking time/cow and quarter, milk flow parameters, blind milking time and manual stripping per quarter. The milkmeters on the AMS were adjusted for the second test series. Milk produced, as well as average and peak milking rate per minute, were of an expected level in both test series. After adjusting the AMS the parameters „blind milking", „milk flow at cup removal" and „stripped milk" were to a large extent balanced, the length of blind milking reduced.

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Keyword

Automatic milking systems, udder quarter, milking parameters, milk meters

In automatic milking systems milk flow is controlled per quarter. Required for this are sensors with uniform adjustment according to parameters drawn from the milking characteristics of the individual quarters.

It is therefore helpful not only on practical, but also scientific [2] grounds to seek possibilities for controlling the equipment for monitoring milk flow in automatic milking systems to ensure faultless functioning and, where necessary, correct settings. Towards this aim, it is possible to fit four milkmeters for individual evaluation of milking at each quarter. The solution is already in practice [1]. Umstätter and Kaufmann used a milkmeter („Lactorecorder", Foss Germany) which continually measured milk flow and gave milk yield through multiplication with milking time. Through very high performance software several parameters can be additionally calculated for individual evaluation of cow milking performance.

Because milkmeters are designed to record peak milk flow per minute from the entire udder they work on the lower limit of their measuring capacity when they are only used with a single quarter. The result is a very limited resolution of recorded values especially at the beginning and end of the milking process. Umstätter and Kaufmann [1] were therefore had to record a relatively large amount of data over a period of 72 hours in order to get reliable information.

Material and methods

To solve the problems and speed-up the investigation the above mentioned milkmeters adjusted to measure low milk flows were fitted into an automatic milking system (AMS) (Merlin, Fullwood-Packo). The information recorded was used to check and, where required, correct the AMS functioning.

In two test series data from 25 and 28 milkings were collected. The AMS management computer delivered information in each case over the total amount milked. At the time of removal of a milk cup the milk flow per minute recorded by the appropriate milk-meter was marked. At the end of each test series the data recorded by the milkmeters were processed and evaluated with the software included with the AMS. Used as parameters for further processing were „milking time", „highest flow per minute", „average flow per minute" and „length of blind milking". After removal of all milk cups the quarters were manually stripped and the milk thus produced then weighed. Data evaluation took place with the help of simple variance analysis.

Based on the results of the first test series the AMS milk flow sensors were readjusted to achieve an even control of the milking process. The success of this action was

Table 1: Results of session 1

Quarter	back left	back right	front left	front right
Milking time (min)	5.3	5.3	5.3	4.4
Average 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
Blind milking (min)	1.08	0.96	1.57	0.44
Milk flow at removal (kg/min)	0.07	0.12	0.07	0.18
Stripped milk (g)	59.3	64.6	20.3	28.4

evaluated from the results of the second test series.

Results and discussion

An average 12.3 kg per milking was achieved in the first test series. Average and peak milk flow per minute *(table 1)* were normal when performance per quarter was added up.

The characteristics „milking time“, „blind milking time“, „milk flow at cup removal“ and „stripped milk“ were not balanced. The milking time measured for the forward right quarter was the shortest and analogue to this was the highest milk flow at cup removal. The difference between the front quarters for blind milking time was significant ($P<0.01$). This also was true for the milk flow at cup removal on the left and right udder half as well as for stripped milk on the front and rear quarters ($P<0.05$).

Average total milk in the second test series was 12.2 kg. After readjustment of milk flow sensors a higher level for average and peak milk flow per minute with consistent distribution between individual quarters was recorded (*table 2*). As expected, milking time differed between rear and front quarters ($P<0.01$) but not, however, with regard to left and right udder side. With most quarters the length of blind milking was significantly reduced compared with the first test series and only the results from the front right-hand quarters were almost unchanged and thus higher than for the other quarters ($P<0.01$). The milk flow at cup removal for front right quarters was also unchanged and lowest in comparison with the other quarters ($P<0.01$) Stripped milk from front quarters was slightly more compared with the first test series but compared with the total udder quarter-specific differences were no longer found.

The results of the investigation showed that milkmeters with suitable sensitivity can, at low milk flows, be useful instruments for evaluation and improvement of the milking process in automatic milking systems. In order to carry out corrections efficiently, AMS manufacturers should, however, include their own procedures with equipment.

Literature

[1] *Umstätter, C. und O. Kaufmann*: The importance of process control in relation to udder quarters in milk production. Proc. 5th Conference: Construction, Engineering and Environment in Livestock Farming, 6.-7. 3. 2001, Stuttgart-Hohenheim (D), pp. 230-235

[2] *Weiss, D. und H. Worstorff*: Effects of quarter take-off with and without machine stripping under simulated automatic milking conditions. Proc. Int Symp. Robotic Milking, 17.-19. 8. 2000, Lelystad (NL), pp.68 – 69

Quarter	back left	back right	front left	front right
Milking time (min)	6.4	7.2	3.9	3.8
Average 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
Blind milking (min)	0.16	0.11	0.17	0.37
Milk flow at removal (kg/min)	0.22	0.24	0.28	0.16
Stripped milk (g)	44.5	67.7	42.6	42.8

Table 2: Results of session 2