New Technology For Milking Vacuum Diagnostics Helps Veterinarians Better Understand Udder Health Problems

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SUMMARY

Udder health problems are often related to the milking equipment, many times in combination with inadequate milking routines. Notorious are teat-end vacuum fluctuations due to insufficient vacuum capacity, pathogens reaching the teat-end due to 'back-spray' and of course insufficient preparation before milking.

Most veterinarians are familiar with the Milking Time Test, or 'wet test'. In the wet test the milking vacuum and pulsation are recorded during milking which gives a good indication of how the milking equipment and milking routines perform in real life; when milking cows. Veterinarians understand the high value of this wet test because it helps them indicate if an udder-health problem is animal related or equipment related.

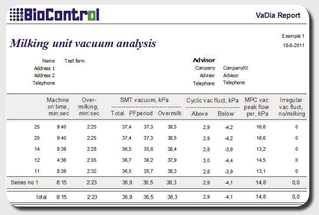
Despite this, many veterinarians are reluctant to do a wet test because of the perceived complexity and time this consumes. When normally performing a wet test, the veterinarian is wired to the milking point, meaning that the milking routines can't be observed, also the vet's presence disturbs the milking. To get a good overview, data of quite a few cow milkings should be recorded which implies that the vet is trapped in the milking parlour and can't spend his valuable time on anything else in the meantime.

This poster is about experiences of European veterinarians and advisers with a new battery operated data logger that logs the vacuum autonomously at 4 points during milking. This data logger (VaDia) is small and light enough to be taped to a teat-cup and makes wet testing much easier, faster and hands- and eyes-free.

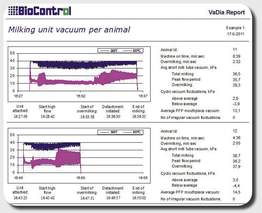
CONCLUSIONS

The data is presented in overview reports listing individual and average values so that conclusions can be made.

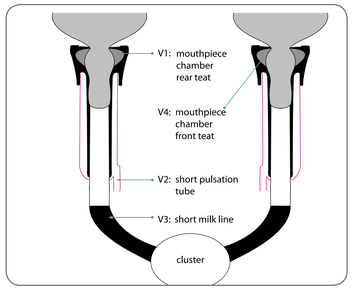
The used calculation methods and algorithms result in a 'snap-shot' summary of the current milking situation, enabling the veterinarian to present an overview that can be a starting point for discussion with the farmer.



Summary of all analysed milkings



Report with individual milkings



VaDia logs the vacuum at 4 points in the milking cluster

VaDia logger can be used on any type and brand of milking equipment, including robot

MATERIALS AND METHODS

The VaDia is connected to the Short Pulsation Tube, the Short Milk Tube and the front and rear Mouth Piece Chambers. The pulsation and milking vacuum data of many cow milkings are recorded and analyzed with vacuum diagnostics software.
The software divides each cow milking into phases and calculates a.o. Cyclic Vacuum Fluctuations, Irregular Vacuum Fluctuations, Vacuum during Peak Flow, total milking time, peak flow period and over-milking time.

Four milking phases are defined. The five marker lines are calculated as follows (see graph on the left)

1. ***Start Milking***
   This is the moment when the teatcup is attached to the teat.
   Automatic detection
   The moment when SMT vacuum rises above 25 kPa.

2. ***Start peak flow period***
   This is the end of the period when the teatcup is establishing a stationary position on the teat, and milk flow is established. It is also the start of a period with relatively stable conditions and a relatively stable milk flow.
   Automatic detection
   Is based on the common mechanism that vacuum level declines when milk flow increase. The average SMT vacuum in 10 seconds periods after attachment is monitored. When the average vacuum from one period to the next declines less than 0,15 kPa, the midpoint of the first (of the two) periods is indicated as start of peak flow period. The first 20 seconds period is excluded from the calculations, so there will be a minimum value of 25 seconds.

3. ***Start overmilking***
   Overmilking of the relevant teat can be detected by means of MPC vacuum. When the teat gets empty, there will ordinarily be a shift in the MPC vacuum level, or a marked change in the MPC vacuum fluctuations, or both.
   Automatic detection
   is based on an increase in MPC vacuum variation. When the current variation is equal to or above 1,3 times the preceding running average variation, start of overmilking is denoted. Current and running average variation is calculated every two seconds. Variation is the difference between maximum and minimum per two seconds. New running average is 0,7 times the old running average plus 0,3 times the current variation.

4. ***Start take-off***
   Is the moment when teatcup detachment is initiated. It can be seen on the SMT vacuum as the start of a rapid decline towards zero, or it may be a shift in vacuum in some types of equipment.
   Automatic detection
   The program loops through all datapoints after start peak flow period and finds maximum vacuum. Then the program loops through backwards from the end of milking until the SMT vacuum is less than 5 kPa below maximum vacuum. This datapoint denotes the start of takeoff.

5. ***End of milking***
   Is when the SMT vacuum falls below a set value.
   Automatic detection
   The program loops through all datapoints after start of peak flow period. The first datapoint with SMT vacuum below 5 kPa denotes the End milking.

RESULTS

Machine on Time
Time in minutes and seconds from Start milking till End milking

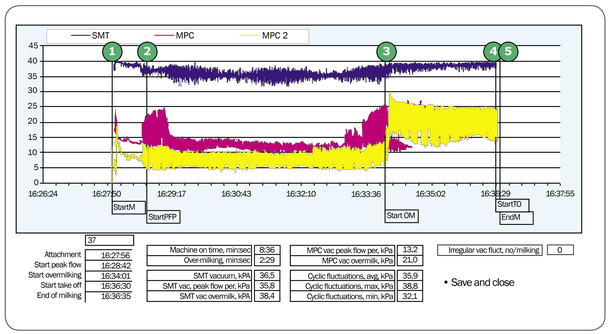
Overmilking
Time in minutes and seconds in the Overmilking period

SMT vacuum
Average vacuum in kPa of all datapoints of the short milk tube vacuum channel, given for various phases of milking:
- Total – from Start milking till End milking
- PFperiod – in the Peak-Flow period
- Overmilking – in the Overmilking period

MPC vacuum in Peak-Flow period
Average vacuum in kPa of all datapoints of the mouthpiece chamber in the Peak-Flow period.

Cyclic vacuum fluctuations
This value is assessed for ten pulsation cycles 60 seconds after the start of the Peak-Flow period. Average, maximum and minimum vacuum in each of the ten cycles are calculated. Finally the averages of the ten individual values are formed. Results are presented as fluctuations Above (maximum) or Below (minimum) the average vacuum.

Irregular vacuum fluctuations
An irregular vacuum fluctuation is a rapid drop of a certain magnitude in SMT vacuum. A vacuum change of 56 kPa/second and a magnitude of 14 kPa is set as limits to qualify for an event of Irregular vacuum fluctuations. Results are given in events of Irregular fluctuations per milking.



Automatic detection of milking phases

SIGNIFICANCE

This new technology helps the veterinarian to easier log, analyse and understand the milking equipment and milking routines as possible cause of udder health problems on a farm.

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