Testing of vacuum during milking

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Abstract

Knowledge of the milking equipment working under normal conditions provides a good tool for evaluation of the influence of the equipment in relation to the risk for mastitis. With the computer system MT30 / MT2000 and similar systems, it is possible to use the testing equipment on the individual farm during milking. Testing during milking provides valuable information on both the technical condition of the milking machine and the ability of the milker to use the system. Changes in operator habits are cheap and may improve vacuum stability. Visualisation of vacuum fluctuations can be convincing.

Key words: *milking, test instruments, test methods.*

Introduction

It is well known that milking procedure and techniques are factors with a major influence on the udder health. However, mastitis is a multifactor disease and the search for single factors that cause mastitis outbreak is normally unsuccessful, but measurements during milking has shown account for 26% of the variation in new infection with mastitis between herds. (M. D. Rasmussen, Proceedings of 25th IDF Congress 1998). In fact, milking is a co-operation between three parts, viz. the cow, the milking machine and the milker.

Criteria to be considered during the milking evaluation include: (J. Hamann; Bulletin of the IDF 321):

1. Operator action and behaviour.
2. Animal factors and behaviour.
3. Machine characteristics.
4. General housing and management conditions.

Evaluation of the milking equipment - or the machine characteristics - is traditionally performed as dry and wet tests. The tests give information about the milking equipment upon machine running but not in connection with milking (ISO 5707, 1996; ISO 6690, 1996).

With the new measuring equipment, vacuum measurement of milking machine, liner and mouthpiece at the same time is now possible, and consequently, throws light on the interaction between cow, milking machine and milker. This provides a good basis for detection and evaluation of faults which may influence both milking and udder health.

Previously such tests were only carried out in a laboratory. With the computer system MT30 / MT2000, developed in co-operation between the Danish Dairy Board and the Danish Institute for Animal Science in Foulum, Denmark, it has been possible to use the testing equipment on the individual farm during milking since 1996.

Measuring equipment

MT30 is a portable computer with five transducers for the vacuum gauges. At the moment, the Danish Dairy Board and the Danish Institute for Animal Science in Foulum, Denmark are developing the new generation of measuring equipment, MT2000, which is handier and has the possibility of mounting at least eight transducers. MT2000 is expected to be ready for use in the autumn of 2001.

At present as a standard procedure, testing is carried out at the: (M. D. Rasmussen *et. al.*, N. M. C. 1996)

1. short milk tube (beneath the teat end);
2. mouthpiece;
3. short pulsator tube;
4. milk line;
5. pulsator line.

In the event that testing should be carried out under special circumstances, it is possible to mount the transducers elsewhere. For instance different types of liner could be mounted at the same milking unit, making it possible to measure the type of liner that is suitable for that type of cow. With the new generation of testing equipment, MT2000, simultaneous information recording from eight different transducers is possible. Both MT30 and MT2000 provide the opportunity of changing between different input frequencies from the transducers. The minimum sample frequency required depends on the circumstances of measurement. (D. J. Reinemann *et al.*, 2001) In Denmark - under practical conditions, application of at least 200 Hz for all vacuum transducers is recommended.

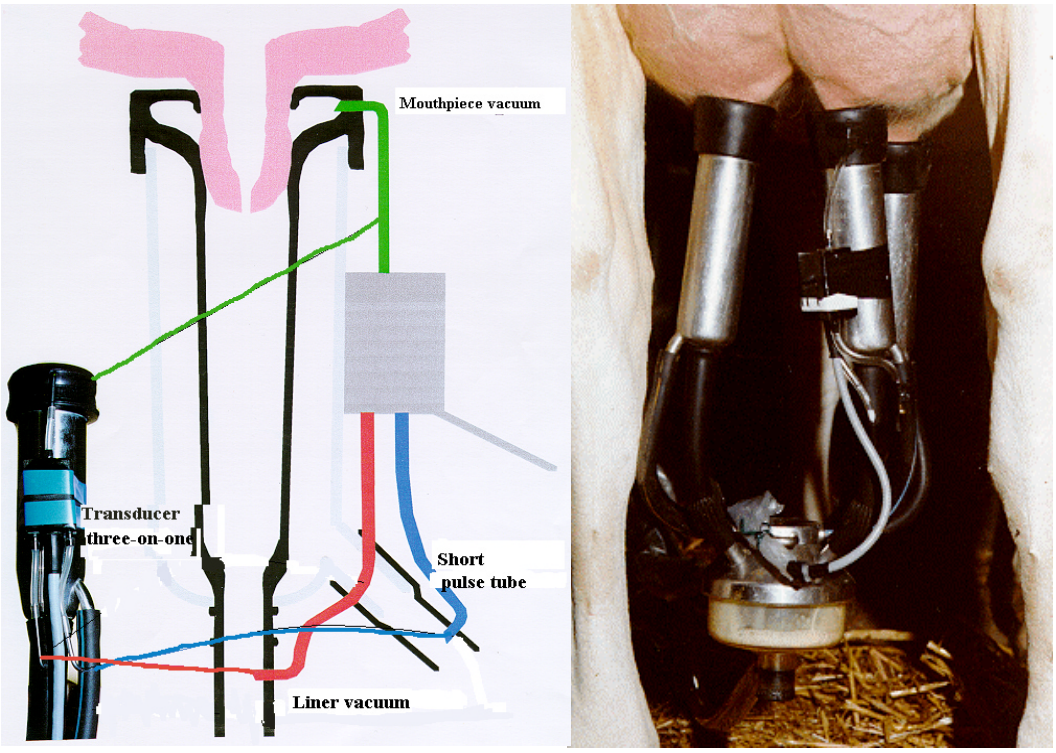

Fig. 1. Milking unit test points by means of dynamic testing.

The advantages of testing during milking

Both vacuum level and vacuum stability of the "fixed milking machine" are evaluated during practical testing conditions. The vacuum stability of the milking section is of special interest. The stability depends on dimensioning / drop, milk flow and the amount of air used during attachment / detachment of the milking units. An evaluation of the optimum functionality of the milking routine chosen is also obtained and in addition it is possible to have an impression if the removers remove at the correct time.

The testing expresses in which way the teat and the liner fit together in the herd. The dimension of the liner in interaction with the teat size of the cows is in focus. It is important that the cows tested represent the average cows of the herd.

Observations during milking

One unit is followed during the milking of the heard. During the testing, observations of the milking in practice can be achieved.

Observation / registration of the milking routine is important in connection with a vacuum testing during milking because the evaluation of the testing during milking with an MT30 indicates in which way the milking machine,

the cows and the milker interact. Usually, the milker will not notice that he or she is in focus. This is a great advantage to the subsequent evaluation. Improvements can often be suggested that can relieve the work.

Testing during milking will provide valuable information on both the technical condition of the milking machine and the ability of the milker to use the system.

This information is a valuable supplement to the ordinary service. It will also be of current interest to carry out a testing in connection with the start of a new-installed milking machine in order to define the correct vacuum level and to find possible faults.

Evolution of the measurements

Milking equipment: Vacuum increase in the pulsator or milk line above 1 kPa indicates a slow regulator function. A stable vacuum in the milk line within 2 kPa indicates that slugs are not formed in the milk line. Vacuum drops at the milk line independent of operator functions indicate the use of more milking units or a larger milk flow than the milk line is designed for. High milk flow rate cause large vacuum fluctuations beneath the teat end, resulting in poor dimensions of the short milk tube. Pulsator function is tested before the measuring during milking.

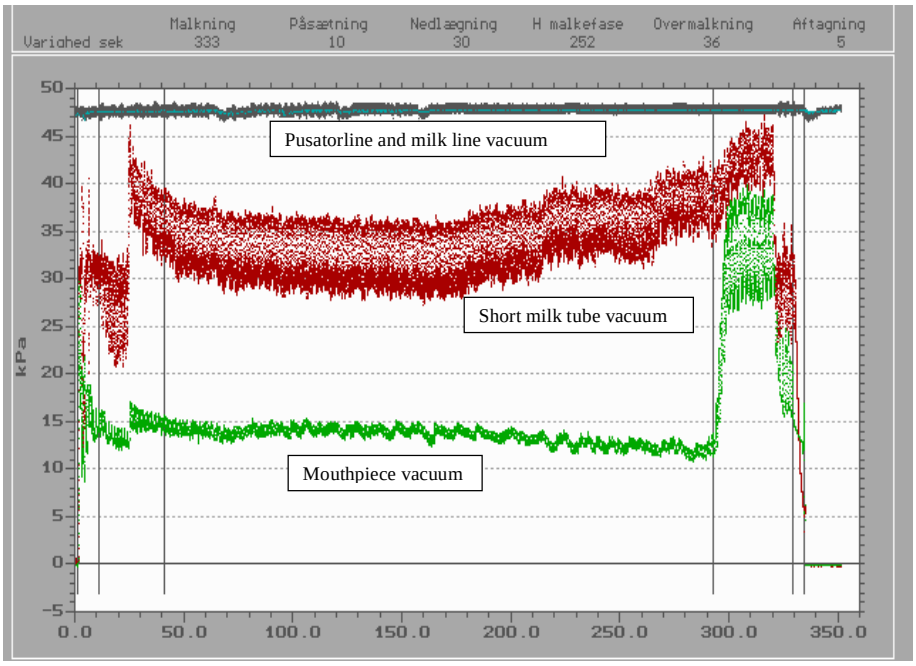

Fig. 2. Recording of vacuum during milking in a stanchion barn.

The cow: The operating milking machine is divided into 5 phases:

1. attachment - the first 10 sec.;
2. milk ejection - 90 sec.;
3. peak flow;
4. over milking - change in mouthpiece vacuum;
5. detachment – decline in vacuum in the short milk tube and in the mouth piece chamber.

Operator: Vacuum fluctuations caused by attachment or detachment of other milking units can be noted and may be compared with periods without operator functions. Changes in operator habits are cheap and may improve vacuum stability but arguments are often lacking. Visualisation of vacuum fluctuations caused by operator functions can be convincing.

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