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Trends in Milking- and Cooling Technology

Product development by milking machinery manufacturers is currently focusing on the maintenance of udder health and workplace design. The optimization of electronic management aids supports the farmers by allowing them to keep an overview even in larger herds, providing them with decision aids, and helping them to fulfill the growing documentation requirements comprehensively and efficiently. Cutting-edge electronic systems enable milk quality to be monitored and documented continuously. These new technologies make a significant contribution towards the securing of the quality of milk as a food item in the future.

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Sinking milk prices, the high costs of milk quotas and land rent, as well as the enormous labour expenses for foreign workers are a burden on the income of dairy cattle farms. Nevertheless, milking- and cooling technology is developing tremendously fast, and it is showing interesting innovations, not least due to the structural change in agriculture and the use of automatic milking techniques.

Energy Conservation in Vacuum Generation

Even though vacuum requirements fluctuate during milking, the output of the vacuum pump remains the same. The use of frequency-controlled vacuum pumps, which adjust to the actual vacuum requirements, provides a possibility of reducing energy consumption. Especially in robot use, where the pumps run around the clock, frequency-controlled vacuum pumps are a valuable improvement. During rinsing, maximum pump output is required. In order to guarantee sufficient cleaning of the milk tubes, whose sizes keep increasing, and to keep energy consumption to a minimum, a second vacuum pump for rinsing may be useful. Another advantage of frequency-controlled vacuum pumps is the reduction of noise emissions because vacuum intensity is adjusted by means of frequency control and only the currently required vacuum must be maintained.

Control valves must guarantee a constant vacuum. This requirement is fulfilled by modern servo-controlled regulating valves. Large pump outputs also increase the air flow rate at the valve, which often leads to greater noise emission. The installation of silencers and other noise-reducing measures allow the noise load in the milking parlour to be reduced.

Design of Milking Systems

ISO 5707 describes minimum requirements for the design of milking systems. Beyond these requirements, the manufacturers try to provide certain reserves in their milking systems. This is a welcome development with regard to the growing biological performance of dairy cows and an increase in work productivity. Generous design and dimensioning also leave leeway for extension

steps. Greater investment-, energy-, and cleaning demands alone set the limits for the milking system.

Pulsation and Stimulation

Independent of the manufacturers, alternating pulsation (changing pulse) and simultaneous pulsation (uniform pulse) have proven themselves. The use of electronics enables most manufacturers to set a wide range of pulse numbers and milking relief phases. Irrespective of fashion trends, factory configurations should only be altered together with experts and based on relevant measurement results. Despite many discussions, a number of 60 double pulses/min at a pulse ratio of 60:40 has proven itself as the best setting in most cases. The use of mechanical stimulation aids is discussed again and again. In combination with an appropriate milking routine, the use of mechanical stimulation aids is recommended. Time- and milk-flow-controlled stimulation are distinguished. Scientific investigations have shown that time-controlled stimulation aids are more efficient.

Milking Units and Teat Liners

The design of the milking units is generally based on the different philosophies of the milking machinery manufacturers. These philosophies are based on different experiences of the manufacturers with different animal material as well as the mentalities of milkers and milk producers worldwide. Whether light milking units with plastic liners or heavy units with stainless steel liners are used also depends on many physical properties of the milking system. The volumes of the collecting units should range between 250 and 350 ml. In Germany, there is a tendency towards anatomically adapted milking units whose capacity is sufficient even for the largest milk flows. Despite some advantages, silicone teat liners have so far been unable to achieve a decisive breakthrough on the market. Food compatibility, long durability, and good adaptability to different teat- and udder forms are no sufficient reasons for many farmers to pay the higher price for this liner. Due to the often enormous selection of different teat liners, farmers are reluctant to use liners which they do not know. Here,

more information from the manufacturer about properties and special applications would be desirable.

Service Arms and Additional Equipment

An important element for successful milking is the optimal positioning of the milking unit (MU). For this purpose, the manufacturers offer various systems. Today, we distinguish simple positioning aids and highly developed service arms. In addition to optimal positioning, the latter are able to facilitate the manual attachment of the MU and to take over udder stripping before automatic removal. In upgraded rotary milking parlours, the service arm also allows the MU to be lowered for cleaning and intermediate MU disinfection.

In larger milking systems, the use of udder stripping aids can be advantageous. They should be controlled by means of milk quantity measurement because only these systems enable the desired threshold values (800 to 1,000 ml/min) to be reliably and constantly observed.

In order to avoid blind milking, the use of an automatic removal system is recommended. New sensors guarantee the good and reliable observance of the desired threshold values and set times. The set threshold values tend to increase to 250 to 300 ml/min. On farms where the cows are milked more than twice a day, the threshold values should be increased by 50 to 100 ml.

Cleaning Technology

In cleaning technology, circulation- and boiling water systems have proven themselves. The decision for the one or the other system can depend upon water hardness or available wattage. Generally, one should follow the recommendations of the manufacturer. Preferably, systems should be used which consume little energy and water while cleaning and disinfecting the unit reliably. Electronic control- and monitoring capabilities are a particular feature of modern automatic cleaning systems.

Milking Parlour Systems

For herd sizes of up to 100 cows, the herringbone milking parlour remains the system of choice. Side-by-side parlours as well as steep herringbone milking parlours (50 to 55°) can also be well suitable in some cases. Growing farms should choose between large



Fig. 1: Service arm PosiMax by WestfaliaSurge

group milking parlours with rapid exiting and the use of a rotary milking parlour.

In recent years, the use of automatic milking systems has developed rather slowly. Even if the manufacturers of milking robots improved their technology, farmers refrained from the purchase of expensive machinery in many cases due to the current milk price development. For the individual farm, however, the purchase of such a system can be the right decision for the future.

In order to achieve optimal throughput, the spatial arrangement of the waiting room, the milking parlour, as well as the exit- and selection area must be given particular attention. The waiting area should be designed such that a fetching aid can be used if required.

The selection of animals after milking for insemination, pregnancy examinations, or treatment allows valuable worktime to be saved. The available selection equipment is either coupled with herd management, or it is currently offered as an insular solution by a company.

Electronic Management

The use of electronic management systems has established itself on growing farms. Optimal training and introduction as well as simple user prompting should be the goal of the developers.

A good management program should meet the following criteria:

- simple user prompting

- good overview
- a large percentage of automatically collected data
- simple monitoring functions for milking-, feeding-, and cleaning systems
- monitoring of animal performance and -behaviour
- good selection possibilities
- good compatibility with feeding, milking parlour, and selection gates

Good management requires comprehensive information, which must be collected by appropriate sensors. In addition to milk quantity data, conductivity measurement also allows information on udder health to be gained.

Optimization of the Workplace

A milking parlour at ground level improves the workplace because it is more directly connected to the milk chamber, which allows all aids to be easily carried into the milking parlour and colostrum which is obtained at the same time to be transported away comfortably and easily. In large milking parlours, a cellar underneath the standing areas can provide advantages because it allows many technical systems to be housed in a protected and clean area outside the milking parlour.

The installation of plastic grids significantly improves the standing comfort of the milking personnel as well as cleanliness in the milking parlour. Hydraulic or manual height adjustment for differently tall milking personnel is possible.

The light in the milking parlour and in particular in the work area underneath the cows should be optimized. Some manufacturers offer technical solutions for this purpose.

Heat Recovery and Pre-Cooler

In recent years, the requirements to be met by modern cooling systems have remained virtually unchanged. Low energy values and good electronic monitoring programmes should be given attention. If the warm water from heat recovery can be used, this technology should continue to be used. Heat recovery should follow actual warm water consumption. On many farms, pre-coolers are establishing themselves. The use of pre-heated water for drinking is not always problem-free. It is important that the storage temperature of the water does not exceed 17 °C and that the heated water is used within a short time. Nevertheless, the use of pre-coolers is profitable in many cases.