



An innovative milk-flow measuring device for the solution of urging questions regarding official milk recording.

The problems

The official milk recording is an extremely important testing procedure. Nevertheless the following points are becoming more and more obvious:

- a constant cost increase, especially employment costs
- difficulty to find personnel for the recording
- constantly increasing demand for information for the dairy farmers as prerequisite for economic management.

The solution

The LactoCorder® was especially designed and developed for these requirements. It therefore represents a basis for:

- rationalizing the official milk recording (cost and personnel reductions)
- additional service offers for the dairy farmer

The innovation

The LactoCorder® makes use of a completely novel and patented measuring system: First, the milk which is milked in pulses is separated from the carrier air by a centrifugal head, then calmed down and gently passed on to a flow-measuring chamber. The remaining amount of foamed milk still varies between 30 and nearly 100 %.

A probe for measuring the filling level of the milk is installed in the measure chamber directly in front of the vertical measuring slot. It consists of one transmitting electrode

and 60 single electrodes, thus dividing the measuring chamber into 60 equally thick height levels of 1,6 mm each. On each height level the electrical conductivity of the fluid located between the transmitting electrode and the respective layer electrode is measured. This value is put into proportion to the simultaneously measured electrical conductivity of the gas-free milk. This ratio is an exact value for the gas content of the corresponding height level independent from the specific conductivity of the respective milk. The 60 ratio values together form a foam-density profile which is evaluated anew every 0,7 seconds.

This artistic device of running foam-density measurements enables a precise determination of mass flow (kg/min), even with the extremely fluctuating foam-formation of cow-warm milk, by means of a volume measuring device (l/min) without movable measuring elements.

The product

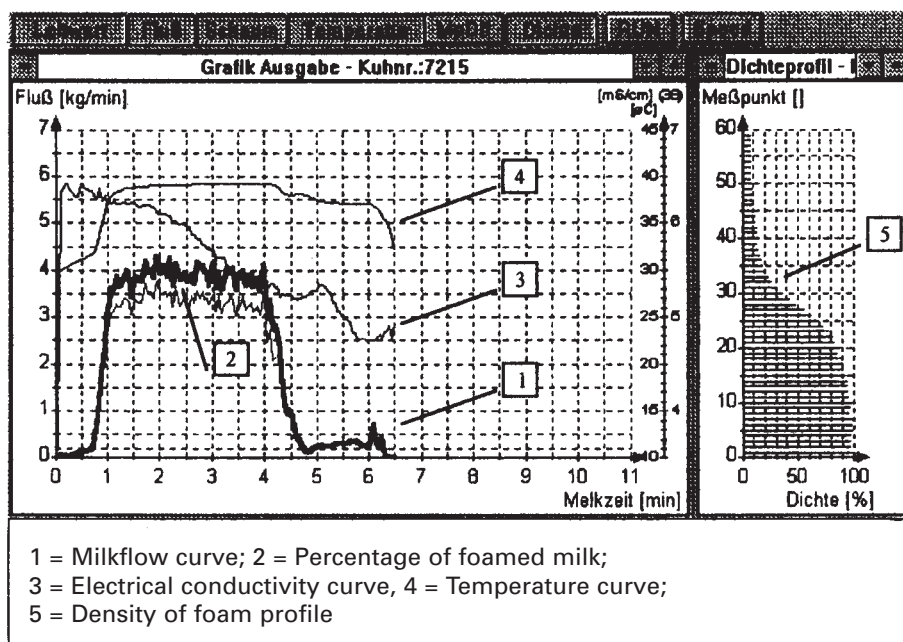
The mobile hand device LactoCorder® only weighs 2,2 kg and is characterized by the following features:

- For the first time highly resolved milk-flow curves of the individual milking processes can be electronically registered in every commercial herd (compare picture). Simultaneously, the course of the amount of foamed milk, of the specific milk conductivity and of the milk temperature are being registered. Beside the standard testing parameter «milk yield», a large amount of information regarding herd management, live stock health and breeding can be gained based on the simultaneous registration of the different parameter courses.
- The large illuminable display board (4 lines with 20 characters each) as well as the alphanumeric keyboard enable a simple, menu-controlled handling of the LactoCorder® which does not interfere with the milking process.



Definitive
ICAR-Approval

- Hardly any influence on the milking efficiency due to minimal pressure losses (even at high-line only 36 % of the ISO-standard).
- Automatic filling of a representative milk sample during milking directly into standard analysis bottles (approx. 50 ml). The sample-taking is controlled in the LactoCorder® by means of the measured actual milk flow and the storable expected milk amount of the individual cows.
- Barcode identification of the individual analysis bottles by means of an integrated barcode scanner and automatic assignment to the measured results.
- All measuring-, ordering- and technical control data, as well as time and date, are stored in the device as an independent data block for each cow. The storage capacity of the LactoCorder® in the standard version is sufficient for approx. 200 individual milkings.
- Storage of additional herd- and cow data is possible.
- Data transfer is carried out by means of a V.24-optocoupler. A specially designed data pack, tailor-made for the use under barn conditions (mechanically robust, water- and air proof) is available as data carrier for the transfer of data. It is based on flash technology without backing battery. The storage capacity is 96 kB (for approx. 150 milkings) or 448 kB (for approx. 670 milkings).
- Accumulator-driven; sophisticated charging intelligence in the LactoCorder® for avoiding the memory-effect and for an increase in durability of the accumulator. The high capacity of the accumulator allows a measuring time up to 10 hours: Capacity display and quick charging via mains supply or in the car: 0,5 hours of charging equals 2 hours measuring time.
- Multi-functional docking station for: Charging of accumulator; data transfer by means of data pack or direct transfer to the computer; future add-on devices (e.g. telemetrical cow identification, end-of-milking process identification with automatic milking unit take-off via vacuum sensor).
- Patented cleaning system guarantees maximum turbulence during CIP operation.



- The stored self-control data, as well as the analysis of the registered foam density profiles, enable a running automatic remote control of the LactoCorder®. This leads to a markedly reduced time consumption for routine accuracy tests, compared to other devices.
- The solid design and the fact that hardly any movable parts (wearing parts) are used, are the first essentials for follow-up costs that are reduced to a minimum.

A rational and safe official milk recording

Based on its concept, the LactoCorder® is, besides for the A-method, also most suitable for the cost-reduced AT- and B-control and for combined proceedings. The following features should be outlined:

- The simple, menu-controlled operation of the device;
- The sample-taking directly into the standard analysis bottle, including the barcode registration;
- The high data safety by means of operational data being loaded before the test-milking (such as expected cow-numbers and names) as well as time protocol during measurements, and individual milk flow curves as a «finger-print» of each cow;
- The use of the LactoCorder® as data registering computer;

- The simple, efficient and safe data handling with the data pack.
- Over three years of practical experience with 10 LactoCorder® prototypes within the framework of a pilot project of the Institut für Physiologie (Dr. habil. H. Worstorff) of the Technical University München/Weihenstephan in cooperation with an important milk recording organization (DHIA – Bavaria/ Germany).
- Definitive ICAR-Approval.
- Up to now more than 10 000 LactoCorder® sold.

Noval service offers for the dairy farmer (compare annex)

The multitude of information offered by the LactoCorder® paves the way for an unprecedented potential of help for the dairy farmer. For the first time, inadequacies of the milking routine or milking technology can be automatically deduced from the normal milking process. Inadequacies during milking mostly lead to a drop in efficiency and to medium-term health problems of the udder. Both lead to economical losses and – in case of udder diseases – to an additional expenditure of work. When the dairy farmer regularly receives suitable information for enhancing his milking processes and technology, together with the standard results of the official milk recording

ding, he is effectively prepared to ensure milk quality and livestock health which eventually results in economical efficiency.

• Milk flow curves

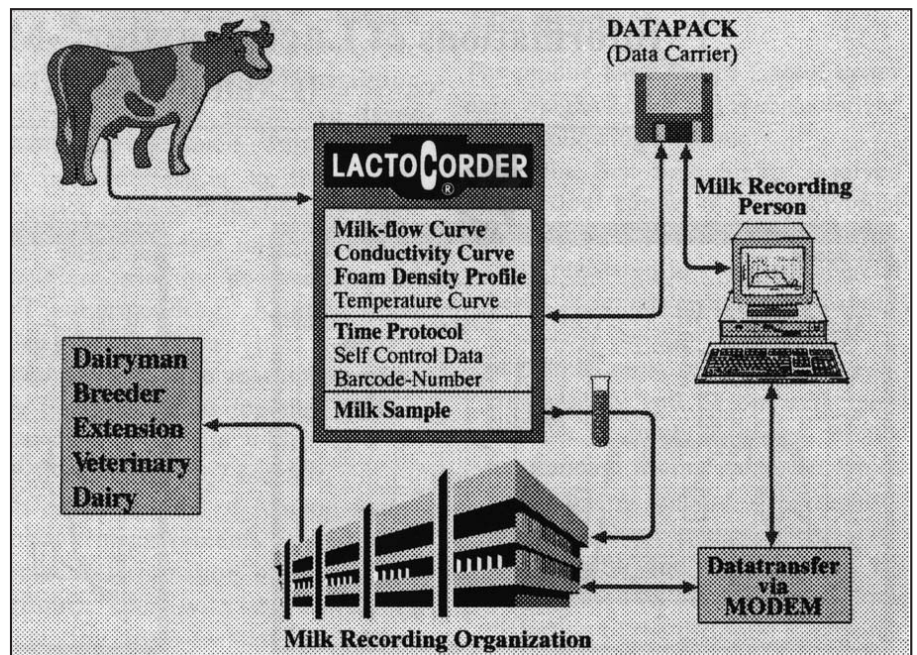
So far milk flow curves have only been stationarily recorded in a few institutes with special milking facilities with the help of a continuous weighing technology (wire strain gauge). This technology was only applied for scientific purposes. Although the milk flow curve as such had already been discussed for more than ten years in professional circles, up to now this new instrument could not be used relevantly in commercial herds due to lack of practically oriented measuring devices.

• Monitoring of milking inadequacies

Main routine inadequacies during milking, e.g. a lack of pre-stimulation (recognizable as a time-delayed increase in the milk flow at the beginning of the milking process), over milking (milk flow less than 200 g/min) or a lack of machine stripping, can be determined and evaluated with the help of highly resolved milk flow curves.

On the other hand, e.g. a milk flow curve typically oscillating in the physiological rhythm (of about 15 seconds) indicates optimal tonus relaxation and so a cooperative cow under very good milking conditions. If the milking process is basically entrusted to the technology, e.g. mechanical pre-stimulation, automatic switchoff, take-off, and stripping, the functional quality of the technology can be monitored by means of milk flow curves.

The identification of air entry during milking offers another possibility to technically monitor the milking process. Frequent air entry usually occurs due to old or unfitting liners, or when the cow tries to get rid of the milking unit, which is mostly the result of a too high nominal vacuum.



Air entry (liner slip) also leads to a backspray-phenomenon, enabling prathogene germs to afflict healthy udder quarters.

• Evaluation of milkability

Milk flow curves also provide detailed information on the milkability of cows, the fact of which is important regarding udder health condition and work routine of the milking process. Important milkability features, such as maximum flow level, quarter-milk delivery, duration of milking or strip yield are constantly available without additional monitoring and cost expenditures, if the milk recording is performed with the Lacto Corder®.

• Electrical conductivity

In addition to the classic number of somatic cells, the course of the electrical conductivity of the milk, recorded simultaneously to the milk flow curve, is a further parameter for the health situation of the udder. This enables a safer evaluation of the health status as well as an immediate reaction to hints pointing to udder diseases after each milk recording. Among such hints for diseases in

one or more udder quarters are considerable changes of the electrical conductivity level during milking. (For special purposes the Lacto Corder® is prepared for the internal connection of four quarterconductivity sensors).

Electrical conductivity together with the milk flow course can be used to evaluate the stimulation status of cows. An increased electrical conductivity at the beginning of milking is a hint pointing to insufficient pre-stimulation and is not directly connected to the health situation of the udder.

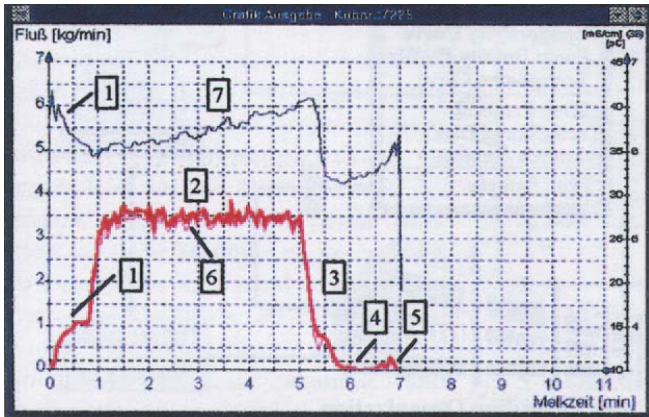
• Foam content

The content of foamed milk is a yardstick for the average gas content in the milk. Air leaks in separate milking units (leaking tubes) lead to a permanent increase of the foam content which can be clearly determined.

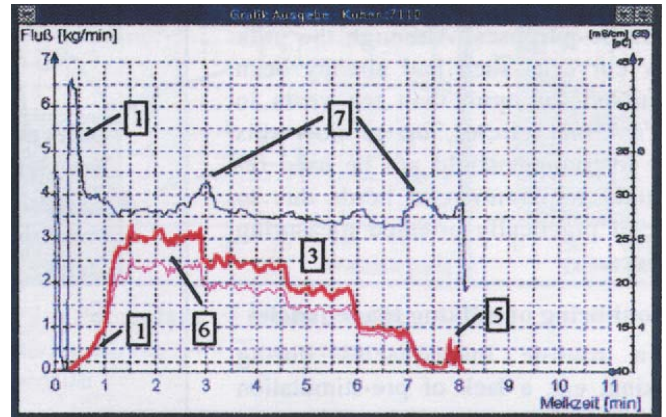
There are also hints pointing to the fact that the foam content is linked to the health situation of the udder. Milk of sick cows produces less foam during milking than milk of healthy cows.

Technical changes reserved

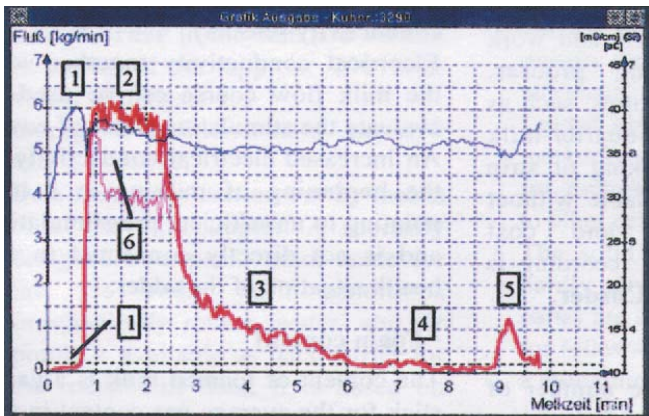
Informations of LactoCorder®-Measurements (Examples)



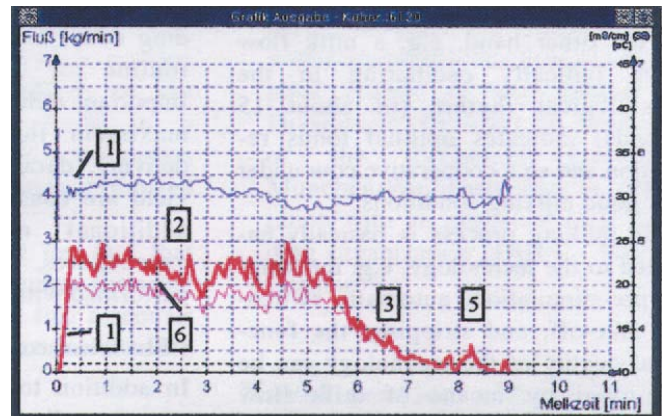
1 = lack of pre-stimulation; 2 = favourable peakflow level; 3 = equal milk removal of the udder quarters; 4 = overmilking; 5 = little machine stripping yield; potential udder health problems because of range of electrical conductivity (7) and low percentage of foam (6)



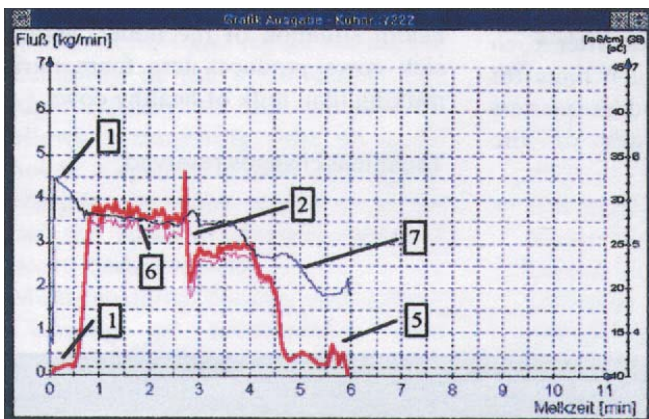
1 = lack of pre-stimulation; 3 = extreme unequal milk removal of the four udder quarters; 5 = low machine stripping yield; 6 = high percentage of foam; 7 = increase of electrical conductivity at the end of quarter milk removal



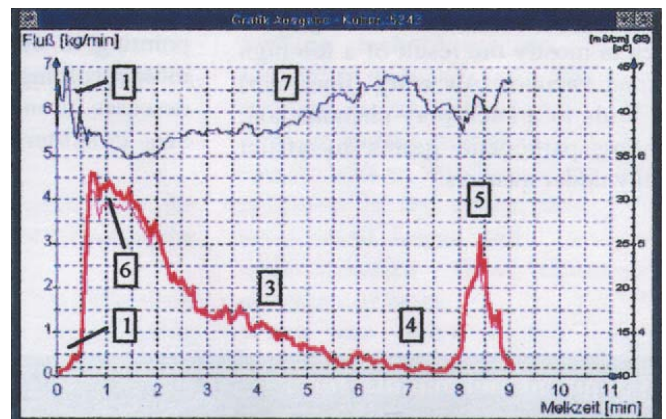
1 = lack of pre-stimulation; 2 = unfavourable peakflow level; 3 = unequal milk removal of the udder quarters; 4 = extended overmilking; 5 = normal machine stripping yield; (6) high percentage of foam



1 = sufficient pre-stimulation; 2 = oscillating milkflow in the physiological rhythm (ca. 15 s) as a sign of a relaxed cow; 3 = unequal milk removal of the udder quarters; 5 = low machine stripping yield; 6 = high percentage of foam



1 = lack of pre-stimulation; 2 = air leakage (old or unsuitable liners); 5 = low machine stripping yield; potential udder health problems because of range of electrical conductivity (7) and low percentage of foam (6)



1 = lack of pre-stimulation; 3 = unequal milk removal of the udder quarters; 4 = overmilking; 5 = high machine stripping yield; potential udder health problems because of range of electrical conductivity (7), low percentage of foam (6) and high stripping yield (if not removed)