Gentle milking?
Production efficiency in dairy farming has increased significantly in recent years. Advances in milking technology have reduced the working hours required per animal, but did not to the same extend reduce the stress on the udder tissue and thus did not contribute to improve animal health. Dairy cows must be milked at least twice a day. This means that cows are connected up to 30 minutes per day to a technical system - as efficiently as necessary and as gently as possible?

Developments in milking technology should especially help to improve animal welfare. A relief of the udder tissue can be accomplished by reducing the vacuum in the teat cup.

Relief by optimally adapted vacuum
A new teat cup will bring relief to the cow’s udder: it adheres to the udder without vacuum and ensures that the teat end is relieved as milk flow decreases. At the beginning of the milking process, the technology that enables to achieve the adhesion function may also serve for massaging the teats.

Our objective was to develop a milking equipment, which enables to adjust milking and holding function separately.

The idea:
A teat cup with smart ’interior’
In a further development of the hitherto known cup types, the new teat cup is equipped with two tube-like, inflatable chambers that can be filled with compressed air (see photo on top).

The inflatable tube chambers of the new patented MeMa-cup allow to hold the cup at the teat when milk flow is low. It requires no or only very little vacuum to hold: the sensitive teat tissue is protected.

With support from

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The prototype
The patented (DE 102012103560) new teat cup has two inflatable chambers built in the form of ring seals which are inserted in designated spaces between the liner and the cup sleeve (figures to the right). This construction with four circular partitions in the upper part of the cup distinguishes the new teat cup from conventionally designed cups. The ring seals are like bicycle tubes in miniature, carrying the valve port outside instead of inside.
When inflated with pressurized air (300 kPa pressure above atmospheric pressure), the swelling tubes press the liner to the teat and keep the cups to the udder.
In addition to a supply pipe for compressed air each teat cup also has an air inlet below the gauge glass (similar to AMS) to allow the optimum outflow of milk.
Compressed air, fresh air and vacuum are supplied by a tube with five strings.

The new cup is ideal for quarter individual milking systems.

In quarter individual milking systems the weight that is to be held at the individual udder quarter is considerably lower. Thus, the holding function of the cup to the teat is significantly improved when vacuum is switched off or severely throttled.

Successfully testet at lab scale
The new teat cup has been successfully tested at ATB’s experimental milking parlor with an individual quarter milking system by using artificial teats and a simulated milk flow (according to ISO 6690, 2007), applying milking vacuum of 0 to 40 kPa and varying air inflation (continuous change of on / off) of the sealing rings.

Results
The teat cup holds to the used artificial ISO teats even without vacuum in the milk tube.

With low milk flow the new teat cup sticks to the udder even without vacuum: 'Blind milking' can be avoided - the sensitive udder tissue is protected.

When milk flow is low - i.e. at the beginning and especially at the end of the milking - the new milking cup sticks to the teat even without vacuum.
'Blind milking' (vacuum assisted milking function, although no more milk flow is present) can be avoided in this way. Thus, the sensitive udder tissue is protected.

Potential for the practice
Testing of the holding functions under practice conditions has just started. Even though real cows differ considerably from animal to animal in terms of teat forms and other characteristics, first test results indicate that the functionality of the new teat cup is basically given, even under practical conditions.
The new MeMa-cup with its enlarged stroke of the ring seals is compliant to cleaning. In long-term field trials the new MeMa-cup will have to prove its durability and marketability.