
The latest knowledge and trends in the development of milking systems

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The most represented trend is characterized by construction of milking unit, quality of used materials increase of transport ways with an aim of vacuum stability and with high volume exploitation of microelectronic and computers for management of milking and also automatic capture of data.

The most remarkable trend were achieved in the development of milking robots (AMS – Automatic Milking System).

Key words: *Milking units, stimulation, milking parameters, automatization, robotization.*

Milking is one of the most important and demanding working operations in dairy cows breeding. It is a complex biological-technological process in which four factors are active: man - dairy cow – machine – environment (Kováč, Š., 1996).

In recent years, the development of milking equipment has continued intensively. Considerable attention has been paid to constructional and technological improvement, quality of materials being used, to design, functionality, technical parameters of milking process automatization (Dolezal, O. *et al.*, 2000) and robotization (Kic, P. and Nehasilová, P., 1997; Vegrícht, J., 1999).

The aim of the latest knowledge and trends in the development of milking equipment has been to reduce the needs of man power, to optimize milking process and achieve data required for dairy cows breeding management.

Summary

Introduction

Materials and methods

The final objective of this development is to fully exclude a man from milking process by exploiting AMS (Automatic Milking System).

Among an important operating step belongs preparation of a dairy cow (mammary gland) before the milking process itself. A fully value stimulation of mammary gland is important for achieving the highest milking intensity possible, reducing the total milking time and achieving full stripping of a cow.

The vibration stimulation is convenient for a quick starting of milk and smooth milking.

The principle of the matter is that at the beginning of milking process pulsation frequency is significantly increased (up to 200 pulses per minute), with actual change of pulsation ratio being 60 : 40 or 70 : 30.

The automatic stimulation is recommended in cows which are milked hard and in those being at the end of lactation period.

By changing dimensional and constructional parameters there is a tendency to decrease nominal value of vacuum from 50 to 45 – 42 kPa (even company AGMECO has been using vacuum 35 kPa).

Simultaneously by decreasing nominal value of vacuum to improve vacuum stability and milk flow velocity results in increased socket and hose diameters (in a short rubber milk hose from 10 to 14 mm, in long rubber milk hose from 16 to 18 mm, the volume of milk claw from the value of 120 – 150 cm³ to 300 to 500 cm³).

An important functional part of milking device is a rubber teat. The standard cylinder shape is replaced by the conical. It is extended an offer for silicone teat rubbers which are distinguished by better surface quality and a longer operating life.

For good milking process it is important that mammary gland should be equally loaded by a milking set. Some manufactures apply an adjusting arm which prevents the milking unit from twisting.

From the point of view of sparing milking extension of suction phase (maximum for 65 to 70 % pulse time) is not recommend. As very important is considered to keep a sufficient time of pressing providing teat massage. High flows tend to prolong suction time by decreasing pulsation rate.

World producers pay a great attention to automation of milking process, to automatic data collection which is based on a systematic monitoring of dairy cows, by measuring physiological parameters chosen (body temperature, milking quantity, milk conductivity, milk colour, weight, pulse frequency, feed conversion, motion activity, number of visits and the time of their staying in a feeding box).

In sanitation of milking equipment the development trends are aimed at decreasing sanitation costs and multiple utilization of sanitation preparations in relation to environment protection.

Research and AMS development (Automatic Milking System) of milking robots has been under way in the world for more than 20 years.

Its goal is to reduce the need of man labour in milking, to remove the need of a man being present during the milking, to provide dairy cows with a possibility of choosing time to be milked, number of milking, what contributes to increase performance (15 to 20 %) and improve the state of health of mammary gland. Using the robot are automatically acquired the data regarding the dairy cows' state of health, by measuring conductivity, temperature, milk colour and the quantity of milk taken as well as motion activity of dairy cows.

Solutions being known so far differ in their concept chosen, in technical solution of individual node elements, number of milking stands operated by a single equipment and by technical solution of setting on teat cups.

According to a number of milking stands and their arrangement (AMS), milking robots can be classified as follows:

1. One-place intended for milking in a single milking box.
2. Multi-place intended for milking in one to four boxes.

Setting on the teat cups of milking robots is solved:

- a) Teat cups are caught up on a special holder and they are set on and monitored individually.
- b) Teat cups are caught up on an operating arm and set on jointly.

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