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## UTILIZATION OF AUDIOSTIMULATION FOR CONTROL OF TIME PERIOD BETWEEN MILKINGS ON FARMS EQUIPPED BY AUTOMATIC MILKING MACHINES

The utilization of automatic milking machines (AMM) is ever increasing. At the present time these automatic milking machines are installed on more than 10 000 farms all over the world. There was also recorded a rising number of manufacturers producing this apparatus. Since 2003 there are in operation on the farms of the Czech Republic over 100 milking boxes equipped by these machines from 5 producers.

On the farms characterized by utilization of automatic milking machines (AMM) and free movement of dairy cows, we recorded the substantive variability in the length of time period between milkings at individual cows during the day. By means of data obtained from the Lely milking machine used on the farm Selekta Pacov there was determined, that the most frequent length of time period between milkings is 8 hours (11,63% milkings) followed by time period 11 hours (11,42% milkings). Although the half of time periods between milkings lies in the time space 8 till 12 hours ( 50,41%), which correspond to the milking frequency twice or three times a day, relatively significant frequency was as well recorded in case of time periods 5 hours (3,8% milkings), or 15 hours (3,31% milkings). The similar results are mentioned also by de Koning on the basis of data evaluation from two years experiment on the Waiboerhoeve farm. In this case there was the most frequent interval between milkings 8 hours (over 14% milkings). Taking into account the physiological aspect, we can say, that for the milk formation and welfare of a dairy cow there is very important an observance of biorhythm during the feeding and milking.

In the article there are mentioned the first results obtained from experiments with audiostimulation of dairy cows with utilization of milking by automatic milking machines (AMM) based on induction of conditioned reflex by means of sound imitating a movement of concentrated feed granules in milking machine. Technical solution consists in placing of a miniaudiosystem at the ear of dairy cow, which plays in fixed time the appropriate sound.

After application of audiosystem at cow No. 122 there were recorded the positive changes in length of time periods between milkings. The average length of interval decreased from 10,94 hours to 10,42 hours, it means by more than half an hour. There was also decreased a maximal length of interval between milkings and therefore also variability of interval by 4 hours.

The mentioned research is so far in early stage, but the first results indicate, that it is possible to utilize this solution to the control of interval between milkings and creation of a stereotype and optimal biorhythm during the milking of cows on farms equipped by automatic milking machines.

INTRODUCTION

The utilization of automatic milking machines (AMM) on the farms is ever increasing. At the present time these automatic milking machines are already installed on more than 10 000 farms all over the world (DE KÖNING 2010). There was also recorded a rising number of manufacturers producing this apparatus. As we can see on figure 1, since 2003 there are

in operation on the farms of the Czech Republic 117 milking boxes equipped by these machines from 5 producers (on line).
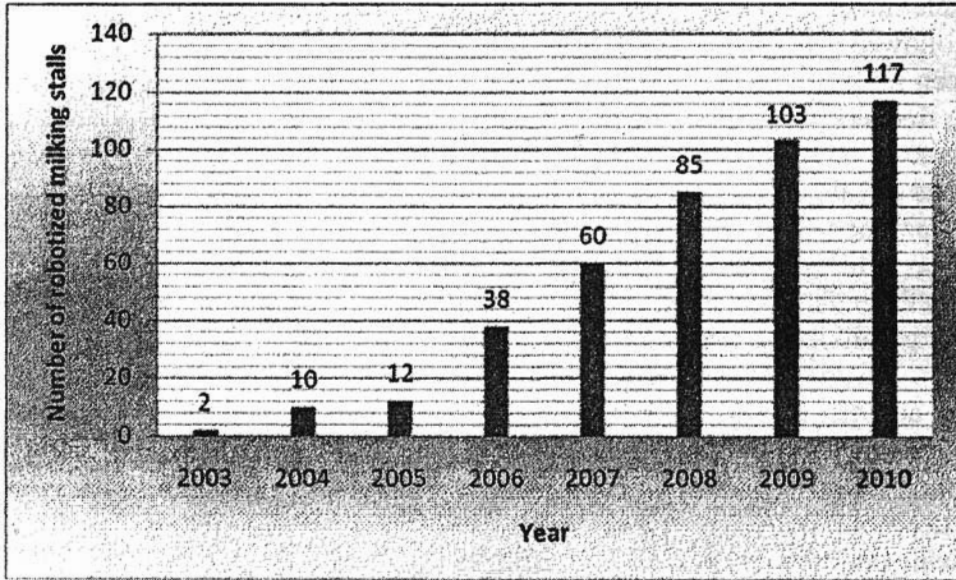


Fig. 1. Development in number of milking boxes equipped by automatic milking machines on the farms in the Czech Republic

Рис. 1. Динамика количества доильных боксов, оборудованными автоматическими доильными установками в хозяйствах в Чешской Республике
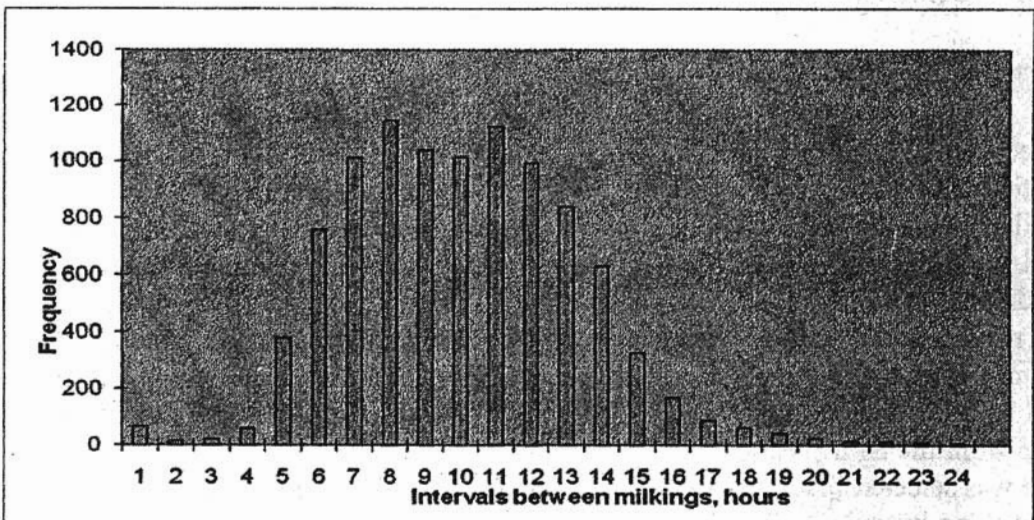


Fig. 2. Histogram of time intervals between milkings at cows milked by Lely automatic milking machine on the farm Selekta Pacov

Рис. 2. Диаграмма временных интервалов между доениями коров при помощи автоматической доильной установкой Lely на ферме Selekta Pacov

On the farms equipped by automatic milking machines and with free movement of dairy cows we recorded the substantive variability in the length of time period between milkings at individual dairy cows during the day (fig. 2). By means of data obtained from database

of the automatic milking machine produced by Lely company on the farm Selekta Pacov there was determined, that the most frequent time period between milkings is 8 hours (11,63% milkings) followed by time period 11 hours (11,42% milkings). Although the half of time periods between milkings lies in the time space 8 till 12 hours ( 50,41%), which correspond to the milking frequency twice or three times a day, relatively significant frequency wa also recorded in case of time periods 5 hours (3,8% milkings), or 15 hours (3,31% milkings). The similar results are also mentioned by de Koning (2010) on the basis of data evaluation from two years experiment on the Waiboerhoeve farm. In this case there was the most frequent interval between milkings 8 hours (over 14% milkings). From the physiological aspect it is very important for the milk formation and welfare of a dairy cow the observance of biorhythm during the feeding, milking and relaxation. In case of conventional milking in milking parlours it is possible to ensure this regularity by observance of work organisation. In the stables equipped by automatic milking machines there is applied the principle of spontaneity. The aim is to learn cows to approach to an automatic milking machine spontaneously, regularly and sufficiently frequently (Hulsen, Rodenburg, 2008). Cow will be milked only on the basis of her own decision. This decision is influenced mainly by two factors:

- growing pressure inside the udder and necessity to get rid of it
- appetite for a delicacy in form of concentrated feeding obtained in milking machine.

The aim of our research is to find another stimulative factor, which would support the two above mentioned main factors and bring in daily routine of a cow more regularity and lower variability of intervals between milkings. In this paper there are contained the first results of checking. In 2011 there will be established an experiment with 20 cows and on the basis of its evaluation it will be possible to determine an effectiveness of proposed solution by means of statistical methods.

## MATERIAL AND METHODS

It was proposed a solution with using of audiostimulation. For this purpose there was created miniaudiosystem, which in time, when it is necessary for cow to approach to the automatic milking machine, plays at her ear a sound inducting a conditioned reflex and a need to be milked by milking machine. As the suitable sound there was selected a pouring of concentrated feed granules into the feeder of automatic milking machine. For sound authenticity in audiosystem at ear of cow and in automatic milking machine this sound was reproduced from recording also at feeder in milking machine at every closure of distributor. Miniaudiosystem was placed on special halter of dairy cows in front of ear (fig. 3) in order not to be heard by around standing cows. Sound intensity measured in closed space on the distance of 30 cm from the audiosystem was 62 dB, the noise in stable was on the level of 62 – 72 dB. There was selected first calf cow No.122 of Holstein breed, which visited the automatic milking machine irregularly. The first checking was carried out from September 9, 2010 on farm of AGROBOS Slatina, Limited Liability Company, where are installed 2 automatic milking machines Lely Astronaut. The pouring sound was triggered three times a day, at 12 hours, 20 hours and at 3 hours in the morning. The visiting times of this dairy cow at automatic milking machine have been recorded in control system of this milking machine and from here downloaded for evaluation. The accuracy of audiostimulator function was controlled every week and from October there was installed on audiostimulator LED diode, which was shining during the sound playback, it means that the control was carried out visually directly at cow. The cow adopted the halter without any problems, there wasn´t recorded any marked changes in her behaviour, it didn´t come even to a decrease in milked milk quantity. After installation

of audiosystem the cow was accompanied 3 days to the automatic milking machine after pouring sound signal and later this cow didn't accompanied.



Fig. 3. Placing of audiostimulator on halter at cow No.122 on farm AGROBOS Slatina, s.r.o.

Рис. 3. Размещение звукового стимулятора на ошейнике коровы № 122 на ферме AGROBOSD Slatina, s.r.o.
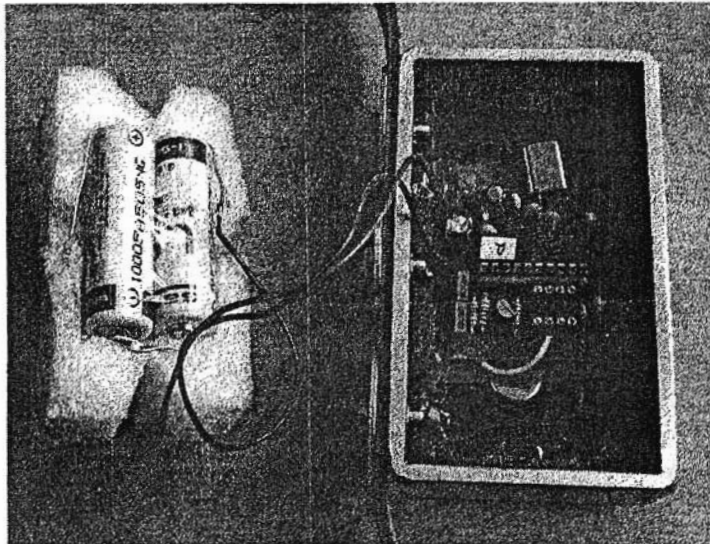


Fig. 4. View into box with audiostimulator

Рис. 4. Коробка со звуковым стимулятором

RESULTS

After application of audiosystem at cow No. 122 there were recorded the positive changes in length of time periods between milkings, as it is evident from diagramme on fig. 5. The average length of interval decreased from 10,94 hours to 10,42 hours, it means by more

than half an hour. There was also decreased a maximal length of interval between milkings and therefore also variability of interval by 4 hours.
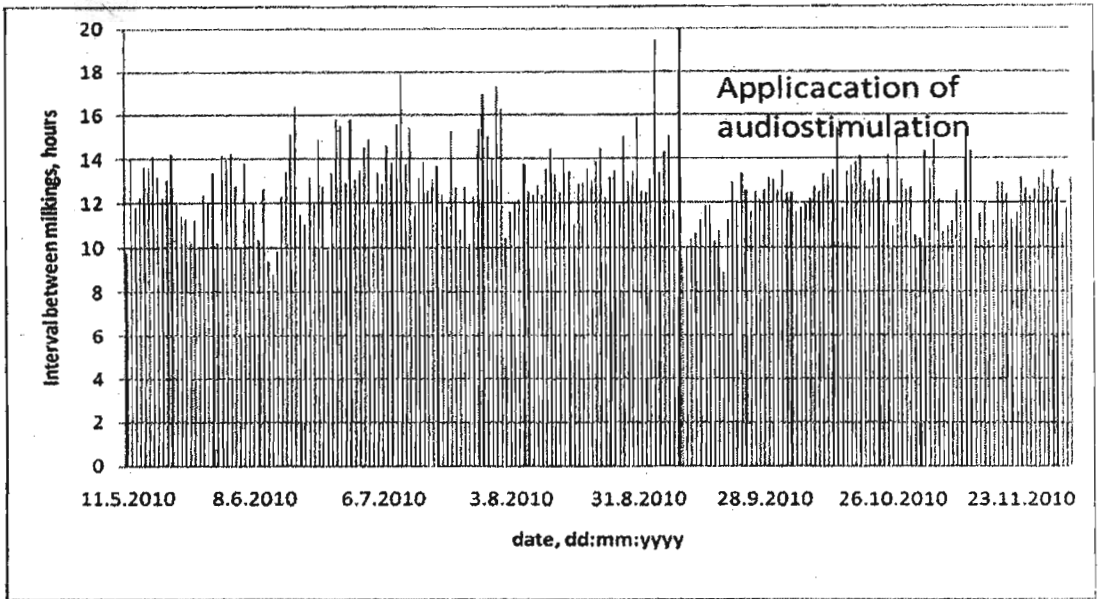


Fig. 5. Intervals between milkings before and after application of audiostimulator

Рис. 5. Интервалы между доениями до и после применения звуковой стимуляции

Таблица 1

Основные статистические данные по интервалам между доениями
до и после применения звуковой стимуляции

Tab. 1

Basic statistics of intervals between milkings before and after application of audiostimulation

| | Statistical parameters of intervals between milkings | | | |
|---|---|---|---|---|
| | Number | Average, hours | Maximal value, hours | Standard deviation |
| Before application of audiostimulation | 273 | 10,94 | 19,42 | 3,09 |
| After application of audiostimulation | 237 | 10,42 | 15,4 | 2,49 |

DISCUSSION

The research of possibilities of dairy cows audiostimulation to a visit of automatic milking machine is only at the beginning. However, already the first testing of audiostimulator showed, that it is possible to change behaviour of a dairy cow by this way. It would be ideal, when a dairy cow could react immediately after sound signal, or, at least up to one hour. However, in stable equipped by automatic milking machines the cow behaviour is influenced by many factors. The basic condition for effective utilization of this system is minimal number of disturbing factors, good health state, cow welfare and kind staff.

## CONCLUSION

The presented research is in initial stage, but already first results show, that it is possible to utilize this solution for influencing of dairy cow behaviour leasing to a variability decrease in time period between milkings and creation of stereotype and optimal biorhythm during the milking of cows on the farms equipped by automatic milking machines. Another research will be aimed at determination of optimal length of audiostimulation and hledání vhodných zvuků, which improve the effectiveness of system.

## REFERENCES

1. DE KÖNING C.J.A.M. 2010, Automatic milking: management and milk quality, *International workshop: The future of the quarter individual milking*, Bornimen Agrartechnische Berichte, heft 76, Potsdam - Bornim 2010, p. 81- 98. ISSN 0947-7314

2. HULSEN J., RODENBURG J. 2008, *Robotic Milking*, Zutphen: Roodbond Publisshers

3. 2008, 52 p. ISBN:978-90-8740-043-9

4. [on line] URL:< http://www.dojeni-roboty.cz/ > [cit.2010-12-27]

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