ECONOMICALLY MOST EFFICIENT EQUIPMENT IN MILKING PARLOURS

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Abstract. Nowadays milk cows are handled loose and milked in a separate parlour or area using stand type equipment. One of the most popular types today is the herringbone type equipment, i.e., where cows during milking stand slanting in an angle of 32° or 50° in relation to the trench. Also side-by-side equipment and tandem location as well as rotary milking equipment are used. Besides, all of them may have different numbers of milking places and the number of the serving milkers can also vary. The present research describes the economically most efficient stand type milking equipment with the herd of 200 to 800 cows. The mathematical model developed by the company "GEA Farm Technologies GmbH" has been applied in the research. It has been stated that for herds with 200 to 800 cows the herringbone type equipment is most efficient but for herds with 400 to 800 cows – the rotary milking equipment.

Key words: milk production, milk yield, herd size, milking time, specific costs.

Introduction

The economic crisis in the recent years has strongly influenced milk production in Latvia. The milk purchasing prices reduced more than two times due to what this sphere of production brought about considerable losses. But at present the milk purchasing prices have risen again up to a rentable production level and stabilizing features can be observed in this branch.

Nevertheless, it must be taken into consideration that in future milk production will be faced by new challenges as it has been planned that starting with 2012 it will not be subsidized any more but from 2015 milk production quotas will be abolished. It means that open market conditions will develop and Latvian milk producers will have to compete with other countries of the world. And surely the strongest will survive in these conditions. Therefore, we should hurry to use the expected time in order to strengthen and up-date milk production through increasing the size of herds and productivity as well as building new or reconstructing old farms and introducing up-dated milk production technology and machinery.

Now it is popular to handle cows loose and milk them in a separate parlour using stand type equipment as well as milking robots that can be located next to the recreation area or in separate premises. Still robots are not so often used as their prices are considerably higher than for the stand type equipment that is meant for a herd of similar size.

Therefore, the aim of the present research was to state the economically most efficient stand type equipment in relation to the size of the herd. The research included also the rotary milking equipment and other types that had become popular exactly in the recent years.

Materials and methods

For the research the most characteristic and often used stand type milking equipment for herds with 200 to 800 milk cows (Table 1) was selected as according to our opinion [1, 2] as well as to the statements of the scientists from other countries [3] such size of the herd is optimal to introduce up-dated technologies and machinery.

For comparison of the milking equipment the mathematical model developed by the company "GEA Farm Technologies GmbH" [4] was chosen by means of which the specific costs of exploitation of the corresponding equipment were calculated. The main initial data were taken according to the present situation in Latvia calculating that the average milk yield is 7000 kg per year, salaries are 3.05 EUR per hour (300 LVL per month), the cows are milked twice per day and the average milking time of one cow is 7.7 minutes [5].

Table 1

Compared milking equipment

Name	Number of milking places	Number of milkers	Guide price, EUR	Notes
Herringbone Parlours 2 x 3	6	1	15 000	Without disconnection automatics
Herringbone Parlours 2 x 5	10	1	24 000	With disconnection automatics but without automatic removal
Herringbone Parlours 2 x 7	14	1	32 000	With automatic removal of clusters
Herringbone Parlours 2 x 12	28	2	45 000	With automatic removal of clusters
Herringbone Parlours 2 x 12a	28	2	60 000	With fast leaving and automatic removal of clusters
Side-by-Side Parlours 2 x 8	16	1	45 000	With fast leaving and automatic removal of clusters
Side-by-Side Parlours 2 x 16	32	2	76 000	With fast leaving and automatic removal of clusters
Side-by-Side Parlours 2 x 20	40	2	96 000	With fast leaving and automatic removal of clusters
Rotary milking Herringbone systems - 20	20	1	130 000	With herringbone location, standard equipment
Rotary milking Herringbone Systems - 32	32	1	180 000	With herringbone location, standard equipment
Rotary milking Side-by-Side Systems P 40	40	1	180 000	With side-by-side location, standard equipment

The time from 2 to 5 hours was assumed to be the optimal milking time per the whole herd as milking longer people get exhausted and in the result the quality of work lowers.

Further research was performed by help of the mathematical model in the following succession.

- It was stated: what time is needed for milking herds with 200, 300, 400, 500, 600, 700 and 800 cows using every of the milking equipment given in Table 1.
- It was found out what milking equipment ensured milking of the corresponding herd within 2-5 hours.
- The specific milking costs, cents per kg of milk, for every milking equipment in the range determined beforehand for it were calculated.
- The results were summarized and analyzed.

Results and discussion

The length of one milking for different herds using the milking equipment included in the research is shown in Figure 1.

The figure shows that the milking length is influenced by the size of the herd as well as by the productivity of the milking equipment. Besides, the lowest productivity is observed for the herringbone type equipment, the highest – rotary type. So, for instance, at the herd size 400 cows the length of one milking time using the rotary milking equipment with side-by-side location of cows and

40 milking places is 2.13 h, but using the herringbone type equipment with 2x5 milking places it is 7.75 h. In turn, choosing the side-by-side location 2x16 the same herd will be milked in 3.25 h.
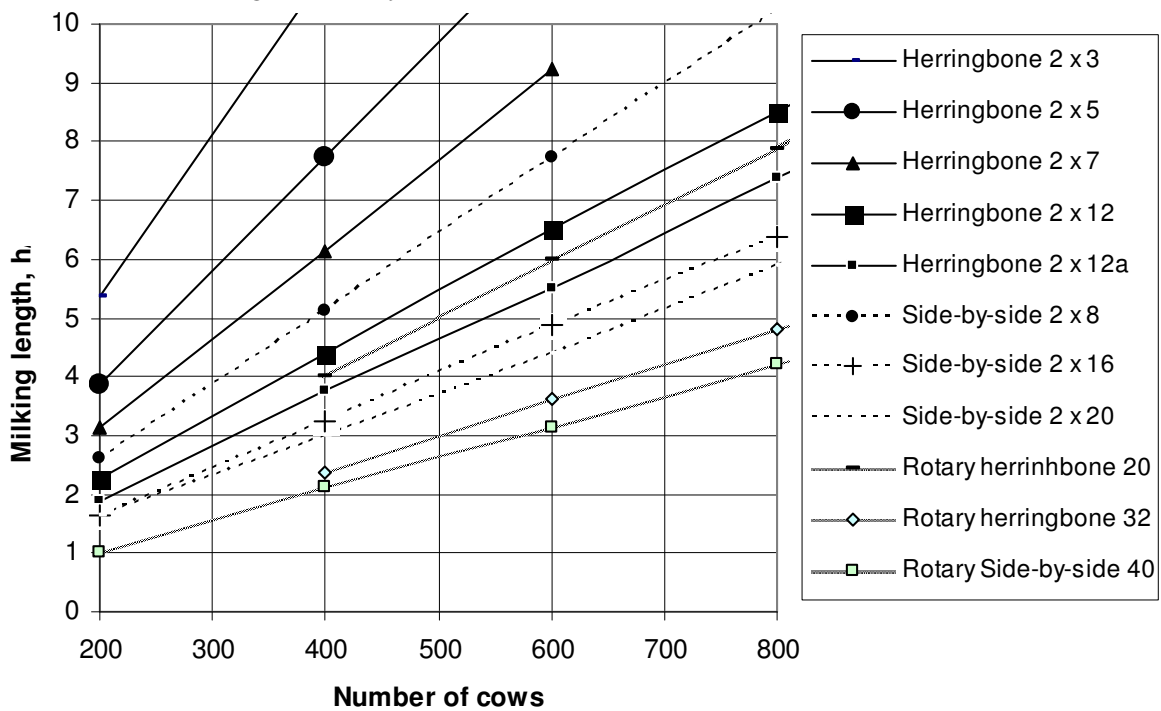

Fig. 1. **Milking length, h, depending on the size of the herd and the equipment used**

But considering that according to our statements the optimal working time of the milkers is 2-5 h (otherwise people get tired and their quality of work lowers) only two of the described equipments are suitable for milking of the corresponding herd. It means that with increasing of the number of cows more productive and expensive equipment should be used as otherwise it is not possible to fall within the previously defined working time interval.

In order to evaluate the optimal working time of the milkers in our further research in accordance to Figure 1 we determined which milking equipment is suitable for what herd of cows. After that by help of the mathematical model the specific costs of using the milking equipment in the corresponding sizes of the herds were determined. The results are summarized in Figure 2.
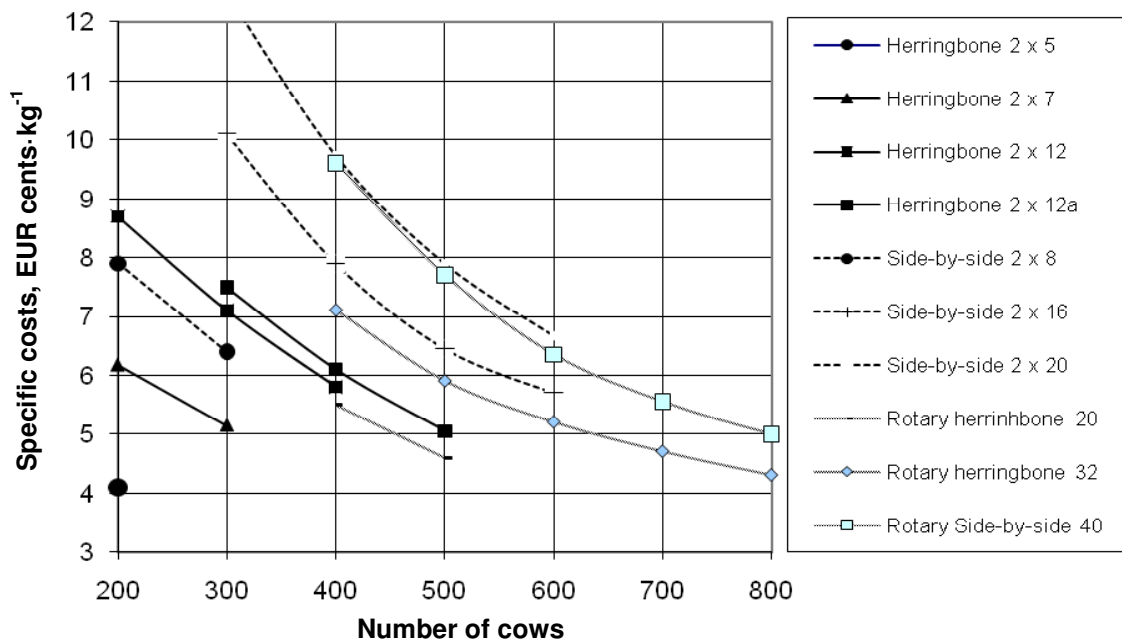

Fig. 2. **Specific costs of application of milking equipment depending on the size of the herd**

The research results show that considering the economic efficiency it is advisable to load the milking equipment as possibly longer as in this case the specific costs reduce. If, for instance, the rotary milking equipment S 32 is used for milking 400 cows the milking length of the herd is 2.38 h (according to Figure 1) and the specific costs are 7.1 cents per kg of milk (according to Figure 2), but using it for milking of 800 cows the corresponding figures are 4.8 h and 4.3 cents per kg.

In turn, Figure 2 shows that it is economically efficient to use every milking equipment for different sizes of the herd. So, for instance, the herringbone type milking equipment is economically more efficient for the herds with up to 400 cows, but in the range from 400 to 800 cows the rotary type milking equipment is more rentable. Besides, it is possible to prognosticate that the rotary type milking equipment is most efficient if there are more than 800 cows in the herd but by now in our research this version has not been described.

Figure 2 shows also the specific costs of the side-by-side milking equipment. Though these costs are comparatively higher than for the herringbone and rotary equipment, according to our research the side-by-side milking equipment is not enough efficient economically.

Conclusions

1. It is rational to apply the mathematical model developed by the company „WestfaliaSurge" GmbH in the economical research in the milking equipment.
2. Every separate milking equipment is to be used for a definite size of the herd what depends on the productivity of the equipment and the time planned for milking.
3. If the size of the herd is in the range from 200 to 400 cows the herringbone type milking equipment is more efficient, but if it is in the range from 400 to 800 cows – the rotary type milking equipment.

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