INVESTIGATION OF SOME LIMITING FACTORS FOR SELECTION OF HERRINGBONE MILKING PARLOR

Yovka Popova, Vania Dimova, J. Jecov, Verginia Gaidarsca

Abstract: We’ve studied different modified types of herringbone milking parlor - 2x3, 2x4 and 2x5 with single or double milking apparatus. The purpose of this investigation was to establish some limiting factors in selection of different types of herringbone milking parlor. Basic criterion for this selection was that the herringbone-milking parlor was to be controlled by one milker.

The time needed for different milking operations was measured by chronometer and chronography on the farm of the Institute of Animal Breeding in Stara Zagora, Bulgaria.

We have established that:

- The main factor for selection of the herringbone-milking parlor with single milking apparatus is continuity of the process of milking for all herds, including the organization of work.

- The main factor for selection of the herringbone-milking parlor with double milking apparatus is the duration of machine milking of the cows.

Key words: herringbone milking parlor, herd, cow, milk, organization of work

Introduction

Milking is the most labor-consuming process in milk production. According to Krastanov et al. (1980), Stanev et al. (1986), Soliman (1988) and Popova (1997) it takes 14 to 47% of total engagement time for single animal on the farm. Therefore, the work in the milking area must be organized in way to increase the productivity and decrease physical charges for the milkers. In this way the special milking parlors are recommended (Auernhammer, 1982).

Hildegard and Akerhammer (1982), Zahles (1987), Salavatov and Andropova (1983), Ordolf (1984) and Diesperov (1987) have studied the factors influencing the cost of labor in milking - size of herd, capacity and type of milking parlor, degree of automatization, technology (including frequency of milking), effectiveness of milkers, degree of milk productivity and the way of creating groups, velocity of milking status of cows (cleaness, presence of mastitis).

The purpose of this investigation was to establish some of the limiting factors for selection of different types of herringbone milking parlor. Basic criterion for this selection was that the herringbone-milking parlor was to be controlled by one milker.

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Material and methods

We've studied different modified types of herringbone milking parlor - 2x3, 2x4 and 2x5 with single or double milking apparatus.

The duration of one working cycle of different modifications of herringbone-milking parlor cycle was calculated based on the technological operations: $T_1$ - time to change the group, $T_2$ - time to prepare cow's udder, $T_3$ - time to put on the apparatus, $T_4$ - time for machine milking, $T_5$ - time for additional machine milking, $T_6$ - time to take off the apparatus and liberate the cow, $T_7$ - time to go to another cow, standing by the side of the milk duct.

The time necessary for different milking operations was measured by chronometer and chronography on the farm of the Institute of Animal Breeding in Stara Zagora, Bulgaria and shown in table 1.

<table>
<thead>
<tr>
<th>Technological operations / Teknološke operacije</th>
<th>Continuity, sec. / Kontinuitet, sek.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>medium</td>
</tr>
<tr>
<td>$T_1$</td>
<td>10</td>
</tr>
<tr>
<td>$T_2$</td>
<td>30</td>
</tr>
<tr>
<td>$T_3$</td>
<td>15</td>
</tr>
<tr>
<td>$T_4$</td>
<td>330</td>
</tr>
<tr>
<td>$T_5$</td>
<td>40</td>
</tr>
<tr>
<td>$T_6$</td>
<td>10</td>
</tr>
<tr>
<td>$T_7$</td>
<td>5</td>
</tr>
</tbody>
</table>

Results and discussion

The continuity of a working cycle in the herringbone-milking parlor with single apparatus can be calculated in the following way:

$$T = n T_1 + 2n T_2 + 2n T_3 + 2 T_4 + 2 T_5 + 2 T_6 + n T_7,$$

Where:
- $T$ - continuity of one working cycle
- $n$ - number of milking plates on one side of the milk duct.

Table 2 shows the duration of one working cycle for different modifications of herringbone-milking parlor. Each animal takes different time for one operation. For this reason we have made calculations of the continuity based on the longest one. We have analyzed the medium, maximum and minimum time for an operation.

Table 2.Continuity of a working cycle in the herringbone-milking parlor with single apparatus

<table>
<thead>
<tr>
<th>Type of milking parlor / Tip izmužišta</th>
<th>Continuity, sec. / Kontinuitet, sek.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>medium</td>
</tr>
<tr>
<td>2 x 3</td>
<td>1075</td>
</tr>
<tr>
<td>2 x 4</td>
<td>1180</td>
</tr>
<tr>
<td>2 x 5</td>
<td>1285</td>
</tr>
</tbody>
</table>
In case of the herringbone-milking parlor 2x3 – 3 milking apparatus we calculated 1075 sec. (diversion of 727-1415 sec.), 20 cows by 1 hour (diversion of 15 to 29 cows).

In case of the herringbone milking parlor 2x4 – 4 milking apparatus the overall mean of single working cycle was 1180 sec. (diversion of 797 to 1547 sec.), 24 cows per hour (diversion of 18 to 38 cows).

In case of the herringbone milking parlor 2x5 – 5 milking apparatus we calculated 1285 sec. (diversion of 867-1679 sec.), 28 cows by 1 hour (diversion of 21 to 41 cows).

Kassaliyski (1983) determined in his research that the best results were registered with 6 apparatus and only one milker is enough for this.

The limiting factor for selection of herringbone milking parlor with separate milk apparatus in the time of milking of the entire herd according to the organization of work and the number of cows.

Organization of work with double milking apparatus in confirming of one working cycle can be presented by:

\[ T = n T_1 + 2n T_2 + 2n T_3 + T_4 + T_3 + T_6. \]

In table 3 the continuity of one working cycle with double milking apparatus is presented.

*Table 3. Continuity of a working cycle in the herringbone-milking parlor with double apparatus*

<table>
<thead>
<tr>
<th>Type of milking parlor / Tip izmuzišta</th>
<th>Continuity, sec. / Kontinuitet, sek.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>medium</td>
</tr>
<tr>
<td>2 x 3</td>
<td>680</td>
</tr>
<tr>
<td>2 x 4</td>
<td>780</td>
</tr>
<tr>
<td>2 x 5</td>
<td>880</td>
</tr>
</tbody>
</table>

For the herringbone milking parlor 2x3 – 6 milking apparatus, we calculated 680 sec. (diversion of 467-902 sec.), 31 cows by 1 hour (diversion of 23 to 46 cows).

In case of the herringbone milking parlor 2x4 – 8 and 2x5 with 10 milking apparatus the overall means of single working cycle were respectively 780 sec. (diversion of 537 to 1034 sec.) and 1285 sec. (diversion of 867-1679 sec.), respectively 24 (diversion of 18 to 38 cows) and 28 cows per 1 hour (diversion of 21 to 41 cows).

It is necessary to know that in these cases:

\[ T_4 - [(n - 1)(T_2 + T_3)] \geq n(T_2 + T_3). \]

When we use type 2x3 with 6 milking apparatus this dependence is full when then continuity of time for machine milking is not longer than 435 sec. For the milking parlor 2x4 – 8 milking apparatus this time must not exceed 345 sec., and for type 2x5 - 10 milking apparatus 255 sec.

So, the limiting factor for the seats in milking parlor with double apparatus was the time of milking one cow, but it depended also from the milk productivity.
Conclusions

1. The main factor for selection of herringbone milking parlor with single milking apparatus is continuity of the process of milking for all herds, including the organization of work.

2. The main factor for selection of herringbone milking parlor with double milking apparatus is the time of machine milking of the cows.

ISPITIVANJE NEKIH OGRANIČAVAJUĆIH FAKTORA PRI IZBORU IZMUŽIŠTA ZA KRAVE TIPA "RIBLJA KOST"

Yovka Popova, Vania Dimova, J. Jecov, Verginia Gaidarsca

Rezime

Ispitivali smo različite modifikacije tipove izmužišta za krave tipa “riblja kost” - 2x3, 2x4 i 2x5, sa jednim ili dvostrukim aparatom za mužu. Cilj ovog ispitivanja je bilo utvrđivanje ograničavajućih faktora pro izboru različitih tipova “riblja kost” izmužišta za krave. Osnovni kriterijum za selekciju je bio da izmužište nadzire jedan radnik.

Vreme neophodno za izvođenje određenih operacija muže je mereno hronometrom i hronograforem na farmi Institut za stočarstvo, Stara Zagora, Bugaska.

Utvrdili smo sledeće:

- Glavni faktor za izbor “riblja kost” izmužišta za krave sa jednim aparatom za mužu je kontinuitet procesa muže za celo stado, kao i organizacija rada.
- Glavni faktor za izbor “riblja kost” izmužišta za krave sa dvostrukim aparatom za mužu je trajanje mašinske muže krava.

Ključne reči: “riblja kost” izmužište za krave, stado, krava, mleko, organizacija rada.

Literature