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Evaluating of Milking Parlor Performance in Turkey

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Abstract: The number of dairy farm with milking parlor in Turkey has been increasing in the last 3 years, because of the subsidization. Evaluating milking parlor performance can be beneficial to improve milking quality and quantity. Therefore, improvement of milking performance or efficiency has been a major focus of milking parlor studies. The data presented in the study was collected on 132 farms that located in Turkey. Values were collected from dry performance testing of milking parlors, each farm's parlor management software report (available for 27 farms) and conversation with dairy farmers. Some of the obtained results were; the mean value for number of cows milked per day was 76, the mean milk production was 21.4 kg/cow/day, the mean system vacuum was 43.1 kPa and the mean pulsation ratio (A+B%) was 59, 9 and some of the milking parameters results were; the mean value for average of milk flow rate was 1.75 kg min^{-1} and the mean value for average milking duration was 6.84 min.

Key words: Milking machine, milking parlor performance, dry test, milk flow rate, vacuum

INTRODUCTION

Milking depends on the interaction between the milker, the cow and the milking machine. Milking can make up over ½ of the labor expended on a dairy farm. Proper planning, construction and operation of the milking facilities can thus, have a significant influence on the profitability of a dairy enterprise.

The only way to conduct a comprehensive evaluation of milking machine system performance is to analyze the system when in operation. Considerable research has been done on the machine factors that influence some milking characteristics. Armstrong and Quick (1986) studied on milking parlor performance. They evaluated effects of parlor type and design, mechanization, equipment malfunction, milk production and milk procedure for determining milking parlor performance.

Some aspects of milking system performance can be evaluated without special test equipment by anyone with observational and analytical skills. Values are taken from dry performance testing (machine running but not milking) and milking-time observations. Vacuum level and Pulsation are read during the dry test. Milking time observation is included cow cleanliness, cow handling, cow grouping, premilking cow, preparation units attachment, unit removal, post-milking management, milking time and average milk flow rate, completeness of milking, teat condition (Reinemann *et al*., 2001). Milking time observation depends upon: type and extent of facilities and equipment, operator ability and number and duration of milking activities and additional or emergency operations (Armstrong and Quick, 1986).

Typically, milking parlor performance has primarily been evaluated using time and motion studies (Armstrong and Quick, 1986). This procedure has also, been used to evaluate the effect of different factors on milking parlor performance (pre-milking hygiene, level of milk production, parlor type, mechanization, type of construction) (Smith *et al*., 1998). The information provided by these studies has been used to implement management procedures to improve parlor efficiency (Michael and Ramos, 2006). Bade *et al*. (2007) were studied evaluating milking performance in Wisconsin and Italy. They were observed cow numbers, production, vacuum levels, pulsation, milk flow rates and teat condition for determining parlor performance and efficiency.

During the last decade like other countries number of family-based dairy farm has decreased in Turkey. Some of dairy farmers have left the business and many remaining producers have increased herd sizes and production per cow as they try to improve production efficiency. Subsidization of new technology and equipment has very big role for this aim. There are >200 milking parlor and cooling tank have founded in dairy farms in Turkey recently. While, it is possible to reduce the cost of production and increase profitability of a dairy operation

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by investing in milking facilities it is also, possible to increase the cost of harvesting milk and reduce profitability. This national trend indicates that the new researches should be done for improve profitability.

Studying on milking parlor performance can be beneficial to research and extension workers, consultants and dairy producers to improve milking quality and quantity. For this, it was needed to evaluate of milking parlor performance in Turkey were aimed in this study. The study makes also to be better understood the relationship between milking machine and management practices on milking parlor performance.

MATERIALS AND METHODS

The data presented in this study was collected on 132 farms in Turkey. Farms were visited by means of dry performance testing of milking parlors. Some data about milking parameters were determined on 27 farms where, used management software system and cow numbers and production was also, noted by conversation with dairy managers.

The farms were not random samples. They all were applied for performance test of milking parlor. Thus, these farms do not represent average. But, numerous trials are more likely of farm, which has been established in Turkey.

Vacuum levels and pulsation measurements were taken during the dry performance test of the milking parlors by using an Exendis Pt V (Fig. 1); electronic vacuum recorder and pulsation analyzer. System vacuum was recorded near the receiver. Pulsation rate, ratio and phase lengths were recorded by inserting a T-fitting in the short pulse tube (ISO 6690, 2005).

Average milk flow rate (kg min^{-1}), total parlor milking rate (kg h^{-1}), milk harvest per milking stall (kg/stall/h), average milking duration (min), turns per hour (turns h^{-1} and Cow flow rate (cows h^{-1}) as milking parameters were calculated by using data, which was collected from each farm's parlor management software report (Bade *et al*., 2007). The average milk flow rate was determined by individual cow's total milk yield divided by the duration of unit attachment for each milking session. The duration of milking is the actual time that milk is being recorded in a milk meter. Turns/h value is the cow flow through the parlor. The cow flow rate is the number of cows milked/h. This value is calculated by stalls x turns/h (Michael and Ramos, 2006).

Fig. 1: Electronic vacuum recorder and pulsation analyzer

RESULTS AND DISCUSSION

General description of the 132 farms was given in Table 1 and 2. All values mentioned in this section were the mean value in the tables statistically.

According to Table 1, average number of cow milked/day was found 76 with very high coefficient variation (59%). It can be explained that number of milking cow in the farms are highly differences. Average of milking production was determined as 21,4 kg/cow/day, which is quite less than the results, which mentioned at the studies of Armstrong and Quick (1986) and Bade *et al*. (2007). As shown in Table 2, the producers have shown interest in construction milking parlors with double 5 (35%) and single 8 (17%) and herringbone parlors being constructed. Single side has become more prevalent for several of the new producers. Two type of single side were mentioned in the Table 2. The first, milk line is one side of the parlors. Since, they were planned to construct other side after their herd size increase. The second, milk line is in the middle of the parlors. Cows were entered both side of the parlors, but they were serviced by a single milk house. Most of producers (96,71 %) preferred herringbone parlors. Like the producers think, Jago *et al*. (2007) were also mentioned that it was felt the herringbone provided better working conditions for the operator.

Results of vacuum and pulsation measures, which were taken from 132 farms were given in Table 3.

Pulsation rate has almost fixed to 60 in the all farms whereas, pulsation ratio was changed according to installer set up (Table 3). According to ISO 5707 (2005), during test condition, the pulsator rate shall not deviate >±3 cycles min^{-1} from the values provided by the installer. And the pulsator ratio shall not differ >±5 units of percentage from the values stated by the manufacturer. Findings of B phase (milking or liner open phase) and D phase (massage, rest or liner closed phase) were also determined in limit of the standard in all farms. They were mentioned in the standard that B phase shall be not <30%. D phase shall be not <15% and not <150 ms.

Results of some milking parameters, which were taken from 27 farm management systems were given in Table 4.

Table 1: General description of the farms

Farms (n = 132)	Median	Min.	Max.	Median	SD	Coef.Var.
Number of cows milked/day	76.0	9.0	254.0	81.0	32.0	59.0
Milk production (kg/cow/day)	21.4	16.4	41.4	23.2	4.6	17.4

Table 2: Type of milking parlors

Side	Type	Number	%
Single 4	Herringbone	1	0.76
Single 5	Herringbone	6	4.55
Single 6	Herringbone	10	7.58
Single 7	Herringbone	2	1.52
Single 8	Herringbone	17	12.88
Single 10	Herringbone	6	4.55
Single 12	Herringbone	2	1.52
Single 15	Herringbone	3	2.27
Single 20	Herringbone	1	0.76
Double 3	Herringbone	1	0.76
Double 4	Herringbone	3	2.27
Double 5	Herringbone	35	26.52
Double 6	Herringbone	9	6.82
Double 7	Herringbone	3	2.27
Double 8	Herringbone	11	8.33
Double 10	Herringbone	7	5.30
Double 12	Herringbone	3	2.27
Double 15	Herringbone	3	2.27
Double 16	Herringbone	2	1.52
Double 20	Herringbone	1	0.76
Double 20	Parallel	1	0.76
Units 6	Round the barnpipeline	1	0.76
Units 8	Round the barnpipeline	3	2.27
Units 10	Round the barnpipeline	1	0.76
Total	-	132	100

Table 3: Result of vacuum and pulsation measures

Vacuum/pulsation measures	Mean	Min.	Max.	Median	SD	Coef. Var.
System vacuum (kPa)	43.1	40.8	47.2	43.4	1.7	4.2
Pulsation rate (ppm)	60.0	58.2	62.3	60.4	0.4	3.5
Pulsation ratio (% A+B phase)	62.1	57.1	66.2	62.6	6.4	12.5
Pulsation B phase (%)	56.5	51.4	58.7	55.8	12.6	11.7
Pulsation D phase (%)	32.6	30.5	36.8	33.3	5.8	9.3
Pulsation D phase (ms)	324.0	311.0	386.0	322.0	6.1	10.3

Table 4: Results of some milking parameters

Parameters	Mean	Min.	Max.	Median	SD	Coef. Var.
Average milk flow rate (kg min^{-1})	1.75	1.02	2.85	1.76	0.42	15.36
Total parlor milking rate (kg h^{-1})	370.84	160.25	1580.40	390.65	134.67	56.42
Milk harvest per milking stall (kg/stall/h)	38.83	27.34	61.58	37.73	8.51	22.71
Average milking duration (min)	6.84	4.30	11.36	6.40	0.51	14.07
Turns per hour (turns h^{-1})	3.65	3.27	4.61	3.90	0.35	8.48
Cow flow rate (cows h^{-1})	39.28	15.80	163.81	41.64	14.08	34.68

According to results in Table 4, the mean value for average milk flow rate to be 1.75 kg min^{-1} was less than values, which were mentioned Armstrong and Quick (1986) and Bade *et al*. (2007). It can be explained that the mean milk production to be 21.4 kg/cow/day was less than theirs. Average milk flow rate is a good indicator of the efficiency of milking. Low average milk flow rates or longer milking times can result from interference with the letdown response due to uneasiness of the cows, inadequate cow stimulation, improper timing of unit attachment in relation to milk letdown, milking machine problems or over milking, because of improper detachment procedures (Reinemann *et al*., 2001). The mean total parlor milking rate (370.84 kg h^{-1}) is directly related to milking parlors construct that have mostly 8-10 stalls.

The mean value for average milking duration to be 6.84 min is the most common expected for cow, which milked by machine. The mean turns per hour was found to be 3.65. These numbers utilized are slightly more conservative than most equipment dealers advertise, but have been documented on efficiently operating dairy facilities. Additionally, this assumption has been verified by checking the cow flow rate per milker (Michael and Ramos, 2006).

CONCLUSION

Evaluating milking parlor performance can be beneficial to improve milking quality and quantity. For this aim, 132 dairy farm in Turkey were investigated in the study. The farms were visited by means of performance testing of milking parlors. Vacuum levels and pulsation values were taken from performance test. Some data on milking parameters were determined on 27 farms that had management software system. The mean of number of cows milked/day was 76 and the mean of milk production 21.4 kg/cow/day were determined as general description of the farms. Result from dry performance test were, the mean of system vacuum was 43.1 kPa and the mean of pulsation ratio (A+B%) was 59,9. Some results of milking parameters were; the mean value for average of milk flow rate was 1.75 kg min^{-1} and the mean value for average milking duration was 6.84 min. It was hoped that this data will be beneficial to research and extension workers, consultants and dairy producers for the aim of improving milking quality and quantity.

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