

Robotic Milking of Buffaloes: A Preliminary Survey on Milking Capacity of Automatic Milking Systems

F.M. Tangorra¹, A. Pazzona², L. Murgia², P. Moroni³, S. Leonardi¹, M. Caria², V. Bronzo³

¹ *Università degli Studi di Milano, Dipartimento di Scienze e Tecnologie Veterinarie per la Sicurezza Alimentare, Milan, Italy*

² *Università degli Studi di Sassari, Dipartimento di Ingegneria del Territorio, Sassari, Italy*

³ *Università degli Studi di Milano, Dipartimento di Patologia Animale, Igiene e Sanità Pubblica Veterinaria, Milan, Italy*

Automatic Milking Systems (AMS) represent a steady technology in dairy cows with more than 8500 milking units (MU) installed worldwide, especially in North Western Europe where are located about 80% of the automatic milking farms. Main advantages of AMS in cows are better labor organization, improved animal behavior and increased milk yields (Hogeveen, H., 2001). In dairy buffaloes AMS are a worldwide absolute novelty and the first milking robots (4) were installed in a farm located in South Italy (Campania) since May 2008. Aim of the present survey was to evaluate the milking capacity of AMS in dairy buffaloes.

Materials and Methods

Between February and March 2009 an analysis of milking performances was carried out on a farm of Italian Mediterranean buffaloes located in South Italy (Campania) and equipped with 4 VMS-DeLaval. On the whole 121 animals were managed by the robots partitioned as follows: AMS 1=39; AMS 2=20; AMS 3=28; AMS 4=42. Guided cow traffic was realized by using a pre-selection gate controlled by the AMS: buffaloes with status “milking allowed” (≥ 7 h after the last milking) could go to the milking box, otherwise they were rejected and addressed to the feeding area. Buffaloes were housed on mat-lined free stalls and were fed by Unifeed system. During the experimental period the operating times of the MU were recorded through the management software (VMSSMgmt, DeLaval 2007) and the daily capacity of AMS (de Koning and Ouweltjes, 2000) were calculated as:

- a) maximum number of milking per day using the following formula: $n = \alpha \times (1440/t)$
where: n=milkings number per day; α =occupation rate (% of 24h in which the AMS is occupied by the milking process); t=time per milking visit (total time per milking visit in minutes: handling time plus machine on time); 1440=number of minutes in 24h;
- b) kg milk produced per system/day multiplying animal individual milk production by milkings number per day.

In addition during a week within the experimental period the distribution of the daily visits with and without milking were recorded. Data analysis was limited to AMS 1 (39 pluriparous with an average of 216 DIM) and AMS 4 (42 primiparous with an average of 63 DIM) due the limited number of animals milked by the others two.

Results

Operating times and daily capacity of AMS 1 and 4 are summarized respectively in tables 1 and 2. Low occupation rates recorded in both AMS were mainly due to the small number of buffaloes daily milked compared with a theoretical AMS capacity of 55-60 animals. Refusals came from animals forcing of the pre-selection gate or from erroneous fetching operated by employees. The frequent rinsing of the

milking equipment set up by the breeder increased the percentage of washing time over 24h. On the whole the time without milking reached 9,5h and 7,9h respectively in AMS 1 and 4. Differences in milking parameters highlighted in table 2 were mainly due to different lactation stage and parity of buffaloes milked by the MU. Anyway the milking capacity in kg per day of both AMS was mild and far away from the capability of the system. The average number of visits to the MU during a week within the experimental period are shown in figure 1 and 2. During the milking system cleaning (3 a.m., 1 and 9 p.m.) a reduction of milkings was observed except for AMS 1 at 9 p.m. probably due to an anticipation of the cleaning cycle. During the milking system cleaning, animals were addressed by the pre-selection gate to the feeding area, if they were not allowed to be milked, otherwise to the waiting area in front of the AMS. The highest number of passages through the MU was observed during the feed distribution and feed approach to the feeding-trough (7-9 a.m. and 4-6 p.m.).

Table 1. Operating times expressed as % on 24h

| Actions | Operating times [%] | |
|---------------|---------------------|-------|
| | AMS-1 | AMS-4 |
| Milking | 53,6 | 60,8 |
| Refusals | 0,4 | 0,2 |
| Washing | 6,5 | 5,8 |
| Free capacity | 39,5 | 33,2 |

Table 2. Flow rate, machine on time and number of milkings per day and capacity in kg per day

| Parameters | AMS-1 | AMS-4 |
|------------------------------------------------|-------|-------|
| Animals in milking [n] | 39 | 42 |
| Occupation rate [%] | 53,6 | 60,8 |
| Average individual milk yield [kg per milking] | 2,26 | 4,10 |
| Flow rate [kg/min] | 0,78 | 0,98 |
| Machine on time [s] | 174 | 251,4 |
| Handling time [s] | 368,4 | 306 |
| Stay per milking visit [s] | 542,4 | 557,4 |
| Milkings per day [n] | 85,4 | 94,2 |
| Production of milk per day [kg] | 193,0 | 386,2 |

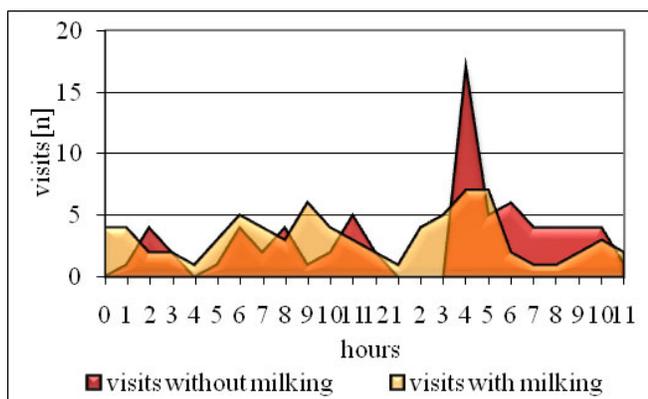


Figure 1. Visits in AMS 1 over 24h during a week within the experimental period

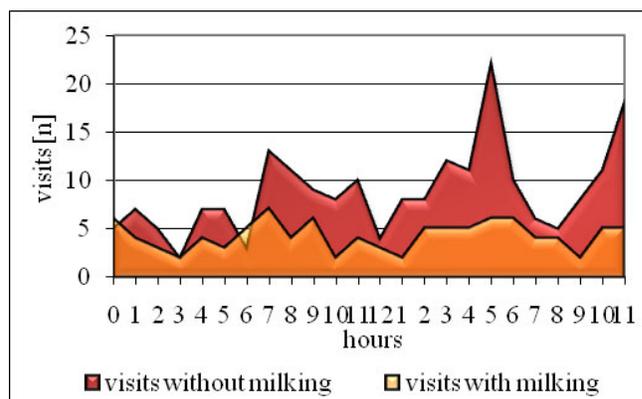


Figure 2. Visits in AMS 4 over 24h during a week within the experimental period

References

- de Koning K., W. Ouweltjes 2000. Maximising the milking capacity of an automatic milking system. In: Robotic Milking, Int. Symp., Lelystad, The Netherlands, 17-19 Aug. 2000, 38-46.
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