Predicting milking performance by controlling air admission at the cluster

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Abstract

Field experiences have shown that venting a cluster above the ISO recommendations can provide excellent milk flows and milk quality, yet this seems to be dependent on the particular milking system and its built-in limitations of milk flow. The objective of this study is to demonstrate how varying levels of air admission into clusters affect milking performance. Six different levels of air admission were chosen to be evaluated (5 liner vent sizes, and 1 claw vent). Milking performance data (milk yield – YLD, machine on-time – MOT, average flow rate – AFR, peak flow rate – PFR, milk in the first 2 minutes – M2M) were collected for each setting using Afikim®. The three vents providing the least amount of air admission (4.6, 9.2 and 10.6) were statistically equal to each other and ranked ahead of the others in all milking performance categories. This study shows that air admission should be considered when setting up a milking machine, and attention beyond checking to see if it is within ISO Standards can pay dividends in milking performance.

Introduction

It is necessary to provide some level of air admission into a cluster to promote milk flow from the cluster to the milkline. ISO 5707 states that total air admission per cluster needs to be in the range of 4 l/min to 12 l/min. This air admission is provided either by vents in the liners or by a vent in the claw.

Field experiences have shown that venting a cluster above the ISO recommendations can provide excellent milk flows and milk quality. However, the opposite of this has also been observed and seems to be dependent on the particular milking system and its built-in limitations of milk flow.

Objective

The objective of this study is to demonstrate how varying levels of air admission into clusters affect milking performance.

Material and Methods

Six different levels of air admission were chosen to be evaluated (5 liner vent sizes, and 1 claw vent). Milking performance data (milk yield – YLD, machine on-time – MOT, average flow rate – AFR, peak flow rate – PFR, milk in the first 2 minutes – M2M) were collected for each setting using Afikim®. The parlor was a double 12 herringbone which was split side to side with different receivers and vacuum supplies. To avoid cow bias, the herd was split into two groups based on lactation, days in milk, and milk yield (stratified random sampling). This enabled two variables to be tested daily. After all the variables were tested once, they were applied in reverse order to the opposite side of the parlor (opposite cow groups). Milk meters were recalibrated for each variable.

Analysis

A total of 240 cows were used in the analysis, which required records for each of the cows milking on the appropriate side of the parlor for the duration of the study. Additionally, peak flow vacuum measurements were recorded for the same 30 cows for each setting.

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Results

The three vents providing the least amount of air admission (4.6, 9.2 and 10.6) were statistically equal to each other and ranked ahead of the others in all milking performance categories. Figure 1 lists the results of the study categorized by the l/min of each option tested.

An obvious correlation can be seen between measurements of peak flow vacuum and milking performance. Average and minimum vacuum where inversely proportional to the amount of air admitted into the clusters. The results of these measurements can be seen in Figure 2. The greatest difference is seen when comparing minimum vacuum measurements of the 4.6 l/m option to the 24.9 l/m option which was 1.41 inHg. Another notable observation is the variability in the vacuum measurements for each of the venting options. Options providing less l/min had a smaller range of measurements for both minimum and average vacuum during peak flow (See Figure 3).

Discussion

This study shows that air admission should be considered when setting up a milking machine, and attention beyond checking to see if it is within ISO Standards can pay dividends in milking performance. It is apparent from this study that some systems may benefit from using a vent that provides less air admission. Higher milk flows and lower unit on times can be expected in these scenarios.

Parlor configuration is a critical variable that needs to be considered when choosing the correct amount of air admission for optimal milking performance. The parlor used in this study can be considered a system with vacuum limitations. The size of milk hose, type of meters, and change of direction and diameters in the milk pathway inherently expose it to limited milk flow and vacuum drops when compared to a meterless system with larger milk hose and less restrictions.

Field trials have confirmed the results of this study. In instances where a milking system has vacuum limitations, using smaller vents in the inflations or using a single vent in the claw has provided better milking performance than what has been seen with larger venting options.

Figure 1:

Mean values for all milking parameters and venting options measured. l/m indicates measured value for clusters. Values with different superscripts are significantly different (p<.05).

l/min	YLD	MOT	AFR	PFR	M2M
4.6	25.74^{a}	3.83^{a}	6.81^{d}	11.25^{d}	15.29^{d}
9.2	25.77^{a}	3.82^{a}	6.84^{cd}	11.48^{d}	15.26^{d}
10.6	25.52^{a}	3.88^{a}	6.69^{bcd}	10.78^{bcd}	14.71^{bcd}
12.5	25.03^{ab}	3.90^{a}	6.50^{ab}	10.53^{abc}	14.30^{ab}
18.1	24.43^{b}	3.90^{a}	6.35^{a}	10.16^{a}	13.87^{a}
24.9	25.36^{ab}	3.94^{a}	6.54^{abc}	10.33^{ab}	14.35^{abc}

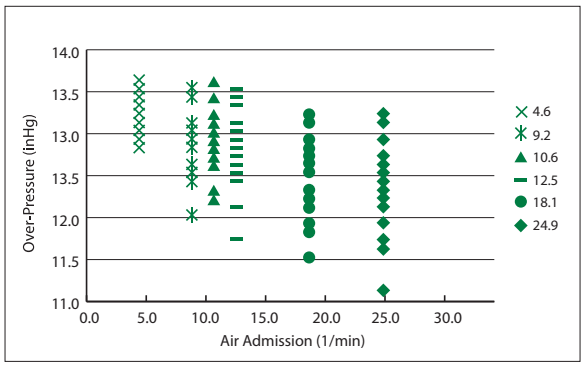
Figure 2:

Mean values for peak flow vacuum for each venting opion (inHg).

l/min	Avg	Min	(Max/Min)
4.6	13.18	12.40	1.97
9.2	12.83	11.85	2.30
10.6	12.94	12.10	2.24
12.5	12.73	11.58	2.54
18.1	12.50	10.86	3.14
24.9	12.41	10.99	2.97

Figure 3:

Variability of peak flow vacuum for different levels of air admission



References

ISO 5707:2007: Milking machine installations – Construction and performance. International Organization for Standardization, Geneva, Switzerland.

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