Comparison of milk flow rates in milking systems

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Modern conventional milking machine pulsation design has remained relatively unchanged since the 1960s. Studies have been conducted to evaluate the performance of various milking machines to determine characteristics such as machine on-time, completeness of milking, mastitis incidence and milk flow rate.

The milk flow rate achieved by a milking machine also impacts teat health, udder health and performance of automated retracts. A slow completion of milking with one or more quarters partially milked out will delay removal of the machine placing additional stress on teats.

A study conducted by Mein at the University of Wisconsin evaluated milk flow rates achieved by cows milked with conventional milking machines.

This study concluded that cows milked with a conventional milking system achieve a peak flow rate during the first minute of machine attachment.

The peak flow rate was maintained for about two minutes and then began to gradually decline.

The study also shows that the milk flow rate experiences a second flow rate reduction near the end of the milking process. This final rate reduction lasts for about 1.5 minutes.

General observations of cows milked with conventional milking machines reveals that the reduced flow rate during the final 1.5 minutes is typically the result of one or more slower milking quarters.

During this time period the teats that have ceased let down are being dry milked causing stress that leads to liner squall and damage. The liner squall contributes to cross contamination spreading contagious mastitis pathogens.

The CoPulsation milking system design provides a C phase of shorter duration than conventional pulsator designs.

The objective of this study was to determine if the characteristics of this pulsator provide a measurable difference in milking action and performance.

The study consisted of randomly selecting animals from a large herd that have been milked with the CoPulsation milking system for a period of time greater than one year.

The milk flow rate as a function of time was recorded. Milk flow conditions into the cluster were observed.

Material and methods

This study was conducted on a herd of approximately 600 cows milked in a double 16 parlour. The herd had been milked continuously with the CoPulsation milking system for more than one year.

Clusters are removed automatically with an Afikim milk metering system providing real time milk flow rate data.

The CoPulsation milking system was operated at a pulsing rate of 43 pulses per minute with a 60/40 milk to rest ratio. Ten cows were randomly selected from the herd and their milk flow rate monitored and recorded. The data was then plotted as a function of time to determine the flow rate.

The cows milked with the CoPulsation milking system experienced a peak flow rate that lasted for approximately 3.4 minutes. The change in flow rate following the peak was similar to the rate change leading to the peak flow condition.

There was no secondary decline in flow rate following peak flow as is the case with a conventional system.

Visual observations of the milk flow into the cluster revealed that all four quarters finished milking at approximately the same time without the presence of a slow quarter. It was also noted that the milk flow into the cluster fully ceased during each rest phase.

Visual observations of milk flow conditions with conventional pulsation reveals that milk flow fails to cease during the rest phase and continues to flow at a reduced rate.

Fig. 1 provides a comparison of the milk flow rates achieved with a conventional pulsation system and a CoPulsation milking system.

The comparison reveals that cows milked with the CoPulsation milking system will maintain a peak flow rate for a longer duration, will experience a rapid completion of milk out and will complete the milking process in less time.

Conclusion

The closing action of a liner has a measurable impact on milk flow rates, milking duration and milk flow conditions into the cluster. A conventional pulsator provides a liner action that typically results in a pinching collapse about the end of the teat failing to massage the teat and permits the continued, reduced flow of milk during the rest phase.

This action results in swelling and congestion of the teat and teat canal damage.

The long term result is teat canal scar tissue formation that impedes the flow of milk slowing milk flow rates leading to longer milking durations and mastitis. The presence of scar tissue is readily confirmed by lightly pinching and rolling the end of the teat to feel the presence of a small ball of tissue in the canal.

The CoPulsation milking system provides a C phase that is two to three times faster than a conventional pulsator which causes the liner to fully collapse about the length of the teat providing a compressive massaging action.

This liner action permits a true resting of the teat eliminating congestion and swelling. The result is a faster milk out with sustained peak flow rates for a majority of the milking duration.

The teat end is opened approximately 38% fewer times. A visual observation of milk flow into the cluster reveals that the milk flow ceases during the rest phase showing that the teat canal is being rested. ■

Fig. 1. Comparison of the milk flow rates achieved with a conventional pulsation system and the CoPulsation milking system.