

Why Unit On Time is Important for Your Dairy

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The dairy industry is rapidly changing. Dairies are becoming larger, more productive, and more intensively managed. High-quality labor may be difficult to attract and retain. The recent low milk prices have presented an all too obvious challenge. Consumers are increasingly demanding higher quality and safer products. Legal somatic cell count levels will likely be reduced in the next few years. These changes require technical advances in milking systems to milk cows efficiently in a manner consistent with highest product quality and animal health.

On most commercial dairies, the parlor is a major capital investment. It is also where the primary income source is harvested, where much of the labor is employed, and where the quality of the product is largely determined. For these reasons, parlor performance and efficiency discussions are common in today's dairy industry. The goal of most dairies is to milk as many high-producing cows during each milking while still allowing time for adequate cleaning of the equipment.

Several studies have shown teat condition and teat sanitation prior to unit attachment are key factors in reducing the new mastitis infection rate. Poor teat skin condition decreases the primary protective mechanism from mastitis. Roughened teat end conditions can cause difficulty in cleaning teat ends effectively. These factors can lead to higher new infection rates.

Many herds in the United States have problems with good "milkability". Cows may be more reluctant to enter the parlor in these herds. In a parlor, poor milkability can be spotted early in the milking process when cows move and step excessively during udder preparation practices. Stepping may also be seen soon after the units are attached and/or near the end of milking, often leading to a significant number of units being kicked off during milking.

Excellent milkability is present when cows have excellent milk flow as soon as the last teat cup is attached to the cow, with a steady, visible increase in flow until peak levels are reached. Peak flow should last 60 to 120 seconds, depending on the production of the cow. With excellent milkability, milk flow will drop off rather quickly after peak milk flow is over. As the end of milking nears, milk flow should suddenly drop to very low levels. If equipment settings are proper, the unit will then be

promptly removed. There should be minimal stepping and kicking throughout the entire milking process.

Good milkability requires adequate oxytocin prior to units being attached to cows. However, this creates a major dilemma in the industry. To achieve better performance from a parlor, the goal often becomes focused only on milking more cows. When more cows are milked, there may not be enough time allowed to properly prep cows for effective cleanliness and maximum oxytocin letdown. Unit on time (duration) is a key factor of parlor performance that has been largely ignored until recently.

Unit on time is dependent on the amount of milk and the average claw vacuum under peak milk flow conditions. Adjusting systems to achieve average claw vacuum levels between 12.5 to 12.8 inches under peak milk flow conditions will decrease the unit on time. Adjusting take off settings to remove units promptly upon completion of the milking will also significantly reduce the unit on time.

Research in both Europe and the United States has shown the key factor to reducing teat end hyperkeratosis is unit on time. To appreciate how unit on time contributes to reduced teat end hyperkeratosis, it is important to understand the normal pattern of milk flow from cattle during each milking. Immediately after the unit is attached to properly stimulated cows, milk flow increases rather rapidly until it reaches a peak milk flow rate. This peak flow rate is variable and depends to a great extent on the amount of milk actually given during a milking. After a period of peak milk flow, milk flow drops rather quickly. Depending on how the milking equipment is set, there can be a long period of extremely low flow and relatively higher vacuum exposure of the cows' teats. The longer the period of relatively low flow, the longer high vacuum and increased pulsation cycles will be applied to the teat ends. This will lead to increased hyperkeratosis and a reduction in skin condition teat scores. Adjusting take-offs to remove units sooner will simply shorten the low flow/high vacuum phase at the end of milking. Removing units sooner and at a more appropriate time is important to improve teat end condition and teat end scores. However, earlier removal of units is in opposition to one of the oldest dogmas of the dairy industry: Under-milking the cow (no matter how

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slight) will cause new mastitis infections. This dogma in fact is not true, but this perception is very difficult to overcome on some dairies.

An extensive database is being established at the University of Minnesota to monitor parlor performance during normal milkings for selected United States and Canadian herds with automated parlor data collection systems. The information is presented to the dairyman using DairyCOMP305 software for management purposes while the raw data is being sent electronically to the university for more detailed research purposes.

Early trials with a group of these dairies show there is no decrease in milk production when vacuum level and take-off settings are changed. Several of the herds experienced an increase in milk production as adjustments were made to both take-off settings and vacuum levels to decrease unit on time. The herds in one study all showed significant reductions in unit on time as take-off changes and vacuum levels were altered. The herds in the study and many other herds have experienced changes of over one and one-half minutes average unit on time on a per cow basis.

Reducing unit on time will improve teat end condition. Reducing unit on time will also allow time to properly prep cows to ensure the teats are clean, dry and well stimulated when units are attached. Proper udder preparation allows cows to milk quickly, completely and evenly, all of which are key factors to improving milkability in the herd. Improved milkability will improve the attitude of milkers because fewer units will require readjustment or reattachment. Clearly, reducing unit on time offers distinct advantages to any dairy farm.

An example of results that can be achieved on real farms is a dairy milking approximately 800 cows in a double fifteen parlor. The average claw vacuum was maintained at approximately 12.7" under peak milk flow conditions measured between the first and second minute after the units are attached. During a 30-day period, the take-off setting was changed from 1.4 pounds per minute flow rate to 1.8 pounds per minute flow rate. In addition, the delay time was reduced from 2 seconds to 1 second during this same 30-day period. The result of these changes was the average flow rate per minute of unit attachment increased from a base of 5.5 pounds per minute to 6.1 pounds per minute. The average unit on time decreased from 5.1 minutes to 4.8 minutes. The average milk weight on this dairy increased 1.6 pounds per

milking during the same 30-day period. These results show unit on time can decrease even in the face of increasing production.

This herd continued to make changes to their take-off settings. In early July of 2000, the take-offs were set at a 2.3 pounds per minute flow rate with a 1 second delay. On this date, 817 cows were milked with an average milk production of 26 pounds. The average flow rate was 7.3 pounds per minute. The average duration for the herd was 3.6 minutes.

This dairy was equipped with a BouMatic 2050 ProVantage parlor controller and software to export data to DairyCOMP305. The exported data allows calculation of flow rates in discrete time intervals in the early stages of a milking. This dairy achieved calculated flow rates of 2.7 pounds per minute in the first 15 seconds. This increased to 6.8 between 15 to 30 seconds and was 7 pounds per minute between 30 to 60 seconds. Peak milk flow rates defined in this software as between the first and second minutes after unit attachment was 9.3 pounds per minute. Fifty-seven percent of the milk was produced in the first two minutes on this dairy.

Another example of the effects of take-off changes and the vacuum level can be seen in a start-up herd milking approximately 460 cows in November 1997. The take-off settings were 1.0 pound per minute with a 1-second delay. The herd was averaging 23 pounds of milk from 462 cows. The average flow rate was 4.5 pounds per minute with an average duration of 5.7 minutes. In April 1998, the herd size was 451 cows and production was 26 pounds per milking. The average on time was 5.3 minutes with an average flow per minute of attachment of 5.0 pounds. In July 1998, the take-off settings had been increased to 1.6 pounds and 1 second. The herd now consisted of 693 animals milking an average of 23 pounds of milk. The average flow rate was 6.5 pounds per minute of unit attachment. The average duration was 3.7 minutes. This dairy is currently milking approximately 750 cows with unit on times between 3.8 and 4.1 minutes on a daily basis. Take-off settings are currently at 2.0 pounds per minute with a 1 second delay and average milk production has been in the mid 20 pound range with 3X milking.

Vacuum level is also an important factor in driving unit on time. I visited a herd in California on June 8, 1998, with 2,405 cows milking 36 pounds on 2X milking. The average unit on time was 7.0 minutes. The average flow per minute was 5.4 pounds. The take-off settings were 1 pound per minute with a 5-second delay. Management made adjustments to the take-off settings and vacuum levels over a 4-week period. On July 12, 1998, the herd had 2,402 cows milking 36 pounds. The average unit on time

was now 5.3 minutes with a flow rate of 7 pounds per minute. The take-off settings were 1.2 pounds per minute and 1 second. The vacuum on the system had been raised 2 full inches during the adjustment period. The changes to the vacuum were made in ½ inch increments at approximately 6- to 7-day intervals. Reducing milking times by 1.7 minutes would allow adequate time to properly prep teats at any dairy without sacrificing parlor performance or efficiency.

An 850-cow 3X dairy on the east coast was checked in 1999. The take-off settings were 1.3 pounds per minute and 2 seconds (Note: These are already significantly higher than the equipment manufacturer’s factory takeoff default levels of .9 pounds and 12 seconds). The table outlines the setting changes and results.

Most companies offer end of milk point and delay times. If your system has both end of milk point and delay times, the delay times should be reduced first prior to increasing the end of milk point. Once the end of milk point is above 1 pound per minute with a short delay time, the vacuum level on the system can be increased if necessary to achieve peak milk flow claw vacuums of approximately 12.5 inches. Systems equipped with milk metering systems and interfaces with DairyComp305 allow making fine tuning changes to the take-off settings and vacuum levels while monitoring the results on parlor performance summaries. The goal is to maintain or increase the pounds of milk produced on a per cow basis while increasing the flow rate per minute of unit attachment. This, in turn, will reduce the unit on time.

Unit on time can be easily listed with most automatic milk meter systems. Caution is necessary when interpreting the reported times, as some manufacturers report it as the time from first dump of milk to last dump of milk. We are attempting to standardize the definition of unit on time as being the total time from vacuum on at the claw to vacuum off at the claw. Unit on times can also be checked

in DHI herds by monitoring on times either the day before or after testing. An achievable goal is for the first 25 pounds of milk at any milking to take 4.25 minutes or less. Each additional 10 pounds of milk should require 0.75 minutes or less.

I believe the goal for all dairies should be to maximize the amount of milk produced by every cow at every milking. In addition to maximizing milk yield, all milk from the dairy should be of the highest quality possible on every day of the year. Fine-tuning take-off settings and vacuum levels will allow time for excellent premilking udder preparation to achieve clean, dry, stimulated teats before units are attached to minimize unit on time and maximize udder health.

Number of Cows	Milk Weight	Takeoff Flow	Takeoff Delay	Ave Flow Rate	Ave Duration	Date
864	25	1.3	2 s	4.8 #/min	5.2 min	Jan 99
873	25	1.5	1 s	5.2 #/min	5.0 min	Feb 99
864	26	1.6	1 s	5.4 #/min	4.9 min	Mar 99
1098	31	1.7	1 s	6.7 #/min	4.7 min	Apr 99
1078	29	1.9	1 s	7.2 #/min	4.1 min	Jun 99

