

Efficient parlor throughput with milk quality in mind

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Introduction

Parlor throughput has always been a task that all dairymen must consider in order to be efficient and be able to get the maximum number of cows through their facilities without compromising milk quality. There is a very fine line when it comes to make such decision. If milk quality is a top priority, then you will have to slow down the speed but if milking as many cows as possible is the goal then your milk quality will suffer.

Fine tuning your parlor settings, milking procedures and facilities can make a tremendous difference and you would be able to get the best of both worlds.

Some of the most important accelerating factors will be discussed.

Loading speed: How fast you can get your parlor banks loaded is important, but here are several factors that can maximize your cow flow. First one and probably the most important one is cow handling. Your employees need to understand cattle stockmanship, make sure you train your people correctly, so they understand the cow's language and keep cow flow without any interruptions. The second factor will be parlor flooring. Rubber mats will speed up the process, cows like to get on them and they feel safe so therefore move faster. In other hand bad flooring can be either slippery or too rough on their feet, increasing lameness and decreasing loading speeds. On top of this, it makes it difficult to detect clinical mastitis. Good parlor lighting will also help cows and employees to see better, and it will speed up the loading process. Size of parlors obviously affects efficiency but for the most part is something that once the parlor is built there is not that much you could do about it. Once parlors get bigger than double 35, they start losing efficiency because of the walking distances.

Unit on Time: Many parlors' settings affect unit on time.

Pulsation settings: B and D phases are the ones that make the biggest difference. The B Phase is the milking phase and length should be around 500 mS. The D phase is the resting phase, and it should be around 200 mS. These two phases are important when it comes to efficient and safe milking process. If the B phase is not long enough the teat will get congested and therefore it will slow down the milk flow. Phases A and C do not change that much with different pulsation settings these are more dependent on vacuum chamber size and liner material.

Pulsation is there to make sure the cows are milked out as fast as possible without affecting teat end health. The pulsators alternates vacuum with atmospheric pressure this allows the liner to open and close. With each cycle the liner will bend around the teat, applying a mechanical force at the teat end. Liner thickness and tension are some of the factors that can make a liner more or less aggressive on the teat ends.

Vacuum level at the teat end is another factor that will increase or decrease unit on time. The higher the vacuum the higher the milking speed UP to a point. Nothing good happens to a Teat end above 12.5 inHg (42 kPa). This vacuum level should be measured at peak flow by either inserting a needle in the short milk tube getting the needle inside the claw or by using a T-piece at claw outlet. Vacuum fluctuations at the teat end will not cause a direct effect on mastitis incidence but will certainly

increase the risk of liner slips which can be a really important factor in terms of mastitis transmission. The minimum claw vacuum influences milking performance independent of the level of the system vacuum causing low milk flow and long milking times. (Besier, 2016)
Small vacuum fluctuations will help reducing unit on time and will increase milk flow rates. High vacuum and B phase will increase peak flow but at the same time high vacuum will also increase liner compression. High liner compression will increase hyperkeratosis. (Bade, R.D. 2009)

Liners: There are hundreds of different liners in the market. Find the liners that fit your cows the best. Some are faster than others.

Liner compression, liner tension, liner thickness and Over-pressure are different factors that affect milking performance. The system should be adjusted to the liner, simply follow the manufacturer's recommendations; those will make the liners to perform adequately. Generally speaking, silicone liners because of the material are slower milkers this is usually compensated by setting the system at a higher vacuum and adjusting pulsation settings accordingly. Aggressive liners can cause excessive teat end congestion and therefore hyperkeratosis, this does not mean you cannot use them, is just a matter of making all adjustments in terms of milking procedure and system settings so unit on time can be as short as possible and avoiding overmilking both at the start of the milking process as well as at the end.

Automatic take offs: Probably one of the most important settings that can help on reducing unit on time and therefore reducing excessive exposure to vacuum. Long unit on times are directly related to higher risk of hyperkeratosis. Flow-rate thresholds should be adjusted to be around 2 lbs/min (900 cc/min). These adjustments need to be done slowly making small changes both on the flow and delay times. Make adjustments weekly and check strip yields. It is Ok to have residual milk volumes up to 400 cc. it has been documented that this volume will not affect SCC nor milk production. (Rasmussen 1993, Stewart 2002, Jago 2010) the main benefits of early unit removal are a reduction of unit on time, teat barrel congestion and hyperkeratosis. (Mein and Reinemann 2014).

At the time of checking strip yields, this assessment should include volume (equally distributed in all four quarters), teat congestion, teat end health, cow behavior like kicking and resistance to the touch.

Mouthpiece vacuum (MPV) increases when milk flow decreases or when liner fit is poor, in both cases barrel congestion will be elevated. At the end of the milking process the milk flow is lower and the teat becomes longer, this affects MPV. In other hand when the teat cistern is empty it follows the pulsation cycles increasing the risk for reverse pressure and increasing the risk of bacteria entering the teat canal.

Milk path: This is another important part of the system. We should apply enough vacuum to the teat in order to extract milk, once this happens this milk should flow to the milk line by gravity and not pulled by vacuum. Make sure there is a downhill path from the udder to the milk line without any type of restrictions. A common one is when the system uses shutoff valves that apply pressure to the hose. These will create memory on the hose and therefore a dramatic restriction on the flow. Long milk hoses will create a loop and then the milk will not flow by gravity to the line but instead vacuum has to pull slugs of milk that will increase teat end vacuum fluctuations. These slugs will act as a piston.

Milking procedure: Timing is the key.

Prep time will influence teat stimulation, it should be 10-20 seconds long with firm movements and pulling 3 to 4 strings of milk per quarter. This part of the process not only helps identifying clinical cases of mastitis which is absolutely critical when it comes to good quality milk and udder health but also will send a strong signal to the hypophysis for oxytocin release which directly affects milk letdown. Not only the prep time is important but the *prep lag time* which starts at the time of physical contact with the teat until unit attachment. This time varies depending on parity, times per day cows are milked

and stimulation time. Many milk quality consultants would recommend a prep lag time of 90 to 140 seconds.

Where I see most of the overmilking is not at the end of the process but at the beginning because of poor stimulation or prep lag times either too short or too long. In my opinion stripping cows is a must.

Milk flows are very important, at least 9 lb/min (4 kg/min) at peak flow and the cow should produce at least 15 lbs in the first 2 minutes. The truth of the matter is that peak flows are not as important as low flows when it comes to unit on time. Avoid overmilking cows at all cost. Do not allow cows to see low flows, here is when automatic take off settings really need to be adjusted. When prep lag times are too short the cows will show bi-modal let downs this by itself elongates unit on times increasing exposure to vacuum. After hundreds of cows being graphed with an electronic flow meter, I have noticed that poorly stimulated cows will not have a long plateau at peak flow and therefore their unit on times will be longer.

Unit alignment plays a very important role in terms of even and efficient milking. In other hand if alignment is a constant issue in the parlor this will limit milk production, increase the number of liner slips, uneven milking speeds at the quarter level and slowdown cow flow dramatically. Use alignment systems that make the milking process simple. Arms, chains, ropes, silicone blocks can all be useful if they are used correctly. The goal is to use a system that does not need any extra effort to make corrections and that it does not get in the way of the employees, either making a complicated procedure or creating a risk for injuries. Bad unit alignment will truly and consistently affect parlor throughput. Liner slips are detrimental to milk quality because of high-speed air admissions to the claw. Turbulence is created inside of the claw and milk droplets can be propelled to teat ends increasing the risk for intramammary infections. Squawks are always bad, but they are significantly worse at the end of the milking time when milk flow is low and there will not be any flushing effect.

Cow cleanliness is an important factor in terms of mastitis risk, and it also affects milking speed. If cows are coming in with dirty udders it will take more time for the milkers to clean those teats and the odds of attaching units on dirty udders will go up rapidly, causing higher bacteria counts and higher incidence of mastitis.

There is no perfect milking procedure; the key is to make a protocol that benefits both employees and cows. Always take into consideration walking distances for the milkers. When they are doing long shifts this amount of walking will go against the quality of the job. At the same time make sure timing is adequate in terms of contact time for the teat dip, prep time and prep lag time. In my opinion the best milking routine is territorial where each milker has a defined zone where he/she will be responsible for all parts of the process. A full routine (strip, dip, wipe and attach) will be essential for better udder health, milk flows and better milk quality. Some people could argue that cutting corners in the routine could make the parlor faster, the answer is yes but the end result will affect milk quality. Try to find that combination where cows are milked fast, gently and completely without affecting milk production, udder health and milk quality.

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