Milking smarter

Improving the efficiency of milking – rotary

DairyNZ

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Disclaimer

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Introduction

Milking requires a lot of labour – up to 57% of time over a season on a New Zealand dairy farm.

Operating your milking facilities efficiently is an important part of maintaining a profitable dairy business, and can reduce stress on staff.

As herd sizes in New Zealand continue to grow, the need for efficient milking becomes even greater.

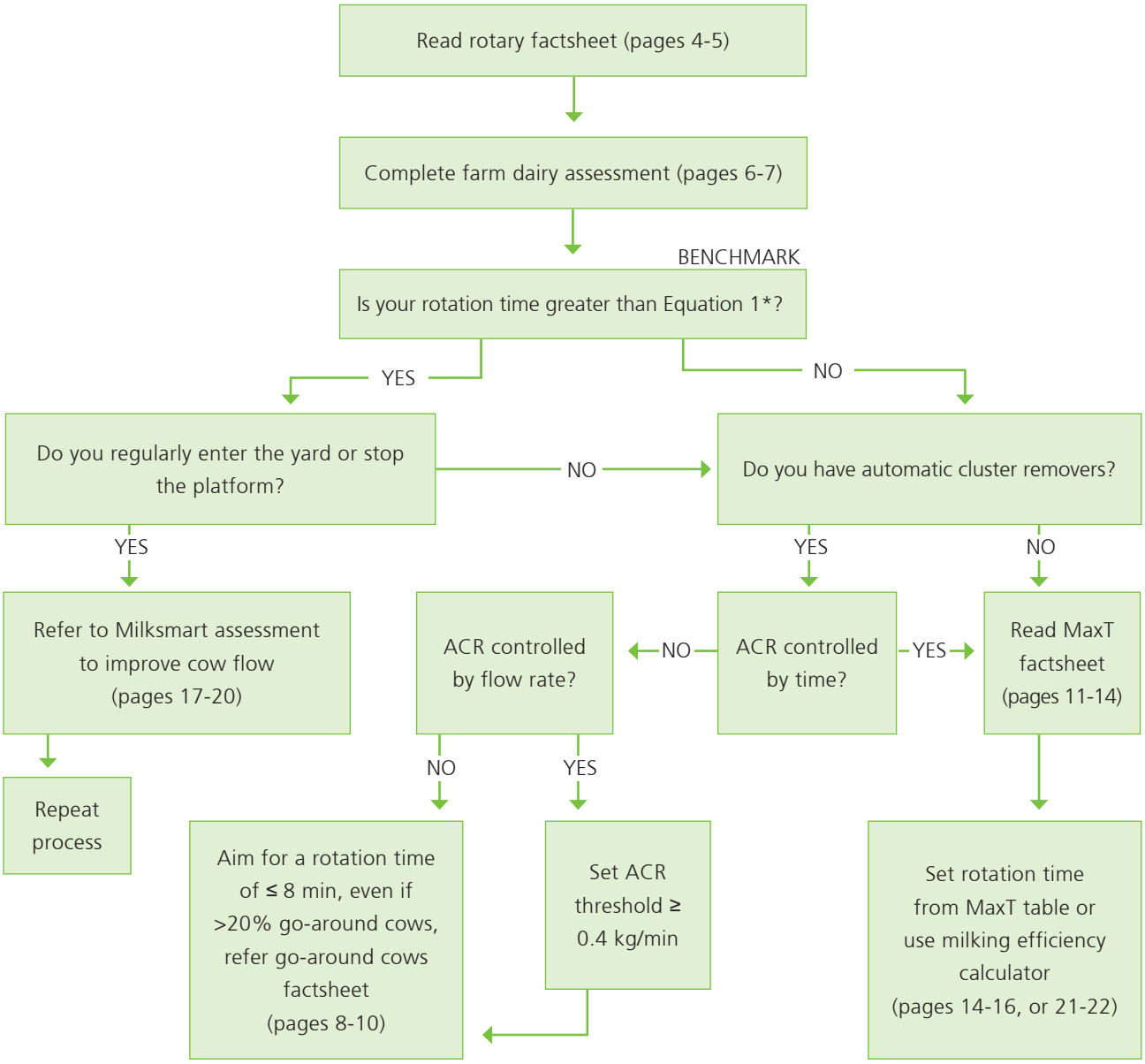
The purpose of this resource is to:

- Guide you through a process to improve your current milking efficiency
- Explain the principles (perfect world situation) behind the operation of rotary dairies (pages 4-5)
- Benchmark your current milking performance (pages 6-7)
- Explain various strategies that can improve your milking efficiency (pages 8-22).

To use this resource:

- Read the factsheet
- Do an assessment to benchmark your milking efficiency
- Refer to the decision tree diagram
- Consider adopting the suggested changes/strategies.

Rotary decision tree



* **Equation 1** = 0.35 × milk yield + 3.3, where milk yield is average litres per cow for a single milking

Rotary factsheet

The rotary is the second most common dairy type in New Zealand, comprising 27% of sheds in 2013. There are three key factors to maximising efficiency in your rotary.

Because rotaries are a significant investment it is important to understand how to operate it at maximum efficiency. There are three key factors that determine rotary performance:

- Size of the rotary (number of bails)
- Rotation speed or work routine time
- Distribution of cows' milking times within the herd.

Rotation speed and work routine time

The maximum number of cows milked per hour in a rotary is determined by the work routine time (WRT) of the operator(s). In rotaries it is typical for cluster removal and teat spraying to be automated and cow loading and exiting to occur simultaneously. This leaves cluster attachment as the core component of the work routine time, although it can also include tasks such as reattaching hoses, controlling the backing gate and idle or waiting time if the platform is rotating slowly. The work routine time is the average time it takes per cow to complete these tasks and is measured in seconds per cow.

The core components of the work routine should remain constant per cow, regardless of the number of bails in the rotary. The maximum number of cows able to be milked per hour can be calculated by dividing 3600 (the number of seconds in an hour) by the WRT.

$$\textbf{Throughput (cows/hour)} = \frac{3600}{\text{WRT (s/cow)}}$$

For example, if your work routine time is 8 seconds, then 3600 divided by 8 = 450. So the throughput is 450 cows per hour.

A shorter work routine can increase the number of cows that can be milked. Visit the cluster attachment page dairynz.co.nz/cupping and watch the videos to ensure you are using the best technique. This is important both for efficiency and to minimise the chance of strain injuries.

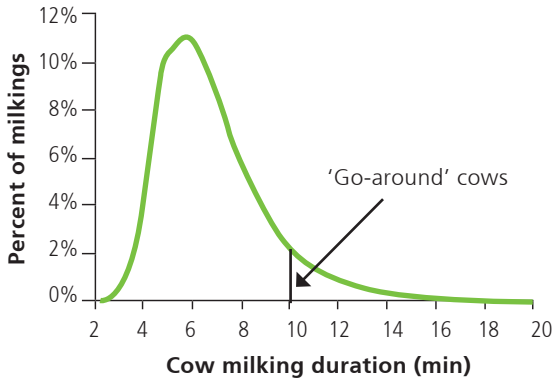
For more information visit dairynz.co.nz/rotary-principles

Limits to throughput

The number of bails, the speed of the rotation and the distribution of cow milking times within the herd determine if the maximum potential throughput of cows per hour can be achieved.

The number of bails in a rotary affects the amount of idle time. Regardless of your rotary size, everyone will be aiming for a similar rotation time (related to the milking time of the herd). This means in a larger rotary there will be less time available per bail. For example, an 8 min rotation time in a 40 bail rotary equates to 12 s/bail; this reduces to 6 s/bail in an 80 bail rotary. This means there is often idle time in smaller rotaries, which must be added to the work routine time, limiting throughput.

Similarly the number of go-around cows affects that amount of milker idle time. An example of the range of milking times within a herd is illustrated below. In this example a 10 min rotation would mean 7% of cows require a second rotation. Many farmers aim for less than 10% of cows 'going-around' when setting their platform speed. This can limit efficiency by adding idle time to the operator's work routine. See rotation time factsheet on page 8-10 or dairynz.co.nz/rotation-time.



In the rotary, the greatest efficiency is achieved when the work routine time of the operator(s) and the platform speed are closely matched.

Improving milking efficiency on my farm

Start with a farm dairy assessment. By answering 8 questions, your current performance can be benchmarked. This will also calculate your average rotation time and work routine time. If your performance is below the benchmark and/or your work routine time is significantly higher than the speed at which you can attach clusters, you can likely improve efficiency by taking one or more of the following actions.

Actions

- Set your platform speed based on the ability of the 'cups-on' operator instead of the number of 'go-around' cows. Go as fast as is comfortable and sustainable for the operator, even if this means 15-20% of the cows are 'going-around'. This is a counterintuitive concept. Visit dairynz.co.nz/rotation-time.
- Apply a maximum milking time (MaxT) which eliminates 'go-around' cows and minimises idle time, allowing the platform speed to approach the maximum comfortable cupping speed. Alternately, if you have automatic cluster removers and are unable to apply a maximum time setting, you can increase the milk flow rate threshold. These strategies can be applied without compromising production, milk quality and animal health. Visit dairynz.co.nz/maxt-rotary.
- Ensure you are using an efficient cupping technique. Videos demonstrating different techniques can be found on this webpage. Visit dairynz.co.nz/cupping.
- If you frequently have to stop or slow the platform because of empty bails, or often have to encourage cows onto the platform, see the design section of this booklet for some simple modifications you may be able to make to improve cow flow. Visit dairynz.co.nz/rotary-design.
- Use the milking efficiency calculator to check what time savings could be achieved on your farm by using a different platform speed, MaxT or an increased automatic cluster remover threshold. Visit dairynz.co.nz/rotary-calculator.

Dairy assessment

Completing a farm dairy assessment will enable you to:

- benchmark your farm dairy's performance against others of similar size and type
- provide a starting point against which you measure the effectiveness of implemented efficiency improvements.

Assessment can also be done online at dairynz.co.nz/benchmark-rotary

Information

Complete the assessment during a normal morning.

1	How many cows milked this morning?	
2	How many bails (cow spaces on the platform)?	
3	How many people are normally at cups-on?	
4	How many people are normally at cups-off?	
5	This milking started at (time first clusters on)	
6	This milking finished at (time last cluster off)	
7	What was the platform speed set at during this milking? (s/bail) *Time the number of seconds for 6 bail spaces to pass and divide answer by 6*	s/bail
8	How many rotations did the platform complete during the milking (full + part rotations)	

Calculation

Simply follow the questions down and use the information from the opposite page and the answers you create whilst completing the form.

For example: take the answer from Question 6 on the opposite page and rewrite into this box:

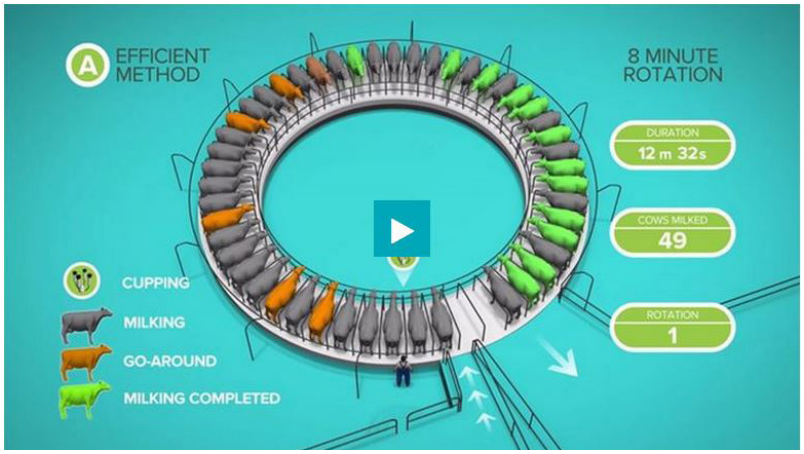
6	This milking finished at (time last cluster off)	08:00 hours	→	Q6

Q6	–	**Q5**	=	**A**	Total milking time (hrs)
Q1	÷	**A**	=	**B**	Cows milked per hour
B	÷	**Q3 + Q4**	=	**C**	Cows milked per hour per person
A	x	**60**	=	**D**	
D	÷	**Q8**	=	**E**	Average rotation time (min)
E	x	**60**	=	**F**	
F	÷	**Q2**	=		Platform speed (s/bail)

Rotary platform speed factsheet

Cows that require a second rotation to complete milking in a rotary dairy are called 'go-around' cows. Many rotary operators use the number of 'go-arounds' as guide for setting platform speed. However, in many situations this can limit milking efficiency.

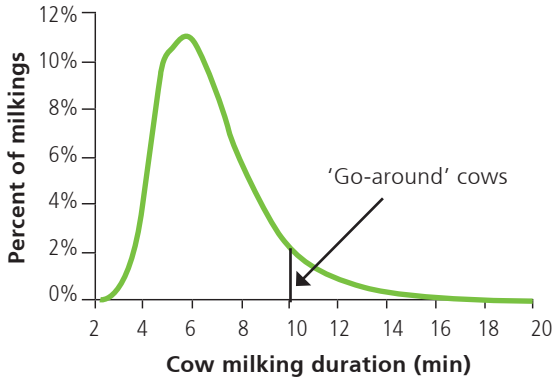
Traditionally, many farmers have aimed for less than 10% of cows 'going-around' on a second rotation. If more than 10% required a second rotation then they would slow the platform speed to increase the rotation time, giving cows longer to milk out prior to the exit point. In fact, counterintuitively, the number of 'go-around' cows does not negatively affect the number of cows milked per hour and aiming for less than 10% may actually limit cow throughput. This concept is illustrated in an animation found at dairynz.co.nz/rotation-time.



Instead, people should set platform speed based on the ability of the 'cups-on' operator. The following explains why.

Distribution of cow milking durations

Within a herd there will be a large range in milking durations – how long it takes cows to milk out. In the figure below, if the rotation time was set at 10 min, then the 7% of cows to the right of the line would 'go-around'.



For more information, including an animation, visit dairynz.co.nz/rotation-time.

Cluster utilisation

Speeding up the rotation will increase the number of go-around cows, but it will also reduce the overmilking time or the amount of time a cluster is idle (if you have automatic cluster removers) and this will improve milking efficiency.

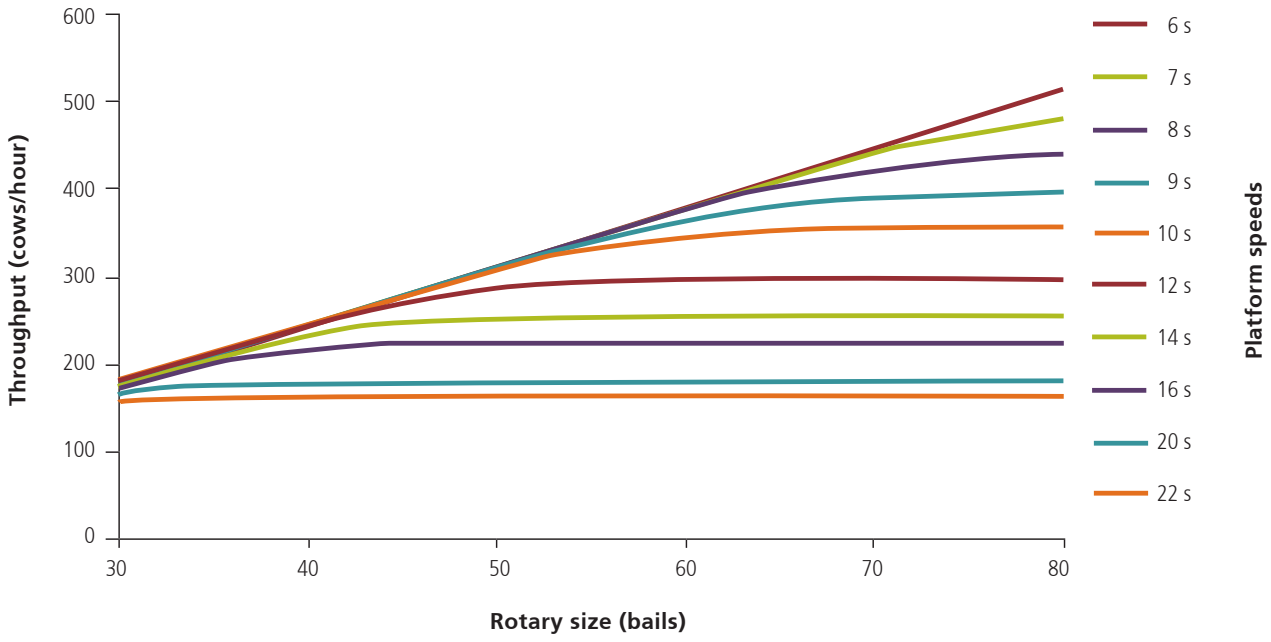
If the herd in the above figure was being milked in a 50 bail rotary with a 10 min rotation time, each cluster would be idle for 3.6 min on average and 7% of bails would be used for 'go-around' cows. This is an equivalent of an extra 0.7 min/cluster idle time. Shortening the rotation time to 8 min would reduce the amount of time clusters were idle for once-around cows to 1.8 min. With 19% of bails now occupied by a 'go-around' cow, cluster idle time would increase by an extra 1.5 min. In total, this makes an average cluster idle time of 4.3 min (3.6 + 0.7) for the 10 min rotation and 3.3 min (1.8 + 1.5) for the 8 min rotation. This is a reduction in cluster idle time of 1 min.

Platform speed

Most operators will be aiming for a similar rotation time, regardless of their rotary size. This means in a larger rotary there will be less time each bail is in front of the operator. For example, an 8 min rotation time in a 40 bail rotary equates to 12 s/bail, and 6 s/bail in an 80 bail rotary. As the rotation time is reduced the number of 'go-around' cows increases.

$$\textbf{Platform speed (s/bail)} = \frac{\text{Rotation time (min) x 60}}{\text{Rotary size (bails)}}$$

The following figure demonstrates the effect of platform speed on the number of cows milked per hour. As platform speed is increased (less seconds per bail), throughput increases. In smaller rotaries faster platform speeds have less advantage because at this point the positive effect of cows being able to exit closer to the point they finish milking is equal to the negative effect of bails being occupied by 'go-around' cows. This occurs when about 20% of cows are 'going-around'. This figure also highlights that if you have a large rotary, it must be operating at a relatively fast platform speed to fully utilise the additional bails. Similarly, if you have a small rotary it is difficult to influence performance by the platform speed alone – instead see the MaxT section.



Practical implementation

There are a few things to consider when increasing the platform speed in your rotary.

- Increasing platform speed will mean the 'cups-on' operator has less time to attach clusters. Instead of setting platform speed by the number of 'go-around' cows, a better approach is to set the platform speed according to the ability of the 'cups-on' operator even if that means more than 10% of cows 'go-around'. Ensure operators are using an efficient cupping technique. Visit dairynz.co.nz/cupping.
- Increasing platform speed gives cows less time to walk on and off the platform. Check your entry and exit area design (pages 17-19) to give yourself the best chance of good cow flow and fewer empty bails. The fastest cows can consistently walk on is about 5 s/bail.Visit dairynz.co.nz/rotary-design.
- If you don't have automatic cluster removers, increasing the platform speed will decrease the overmilking overall, but will result in an increase in the number of cows experiencing significant overmilking (the 'go-around cows'). Consider also applying MaxT to prevent this – and further improve efficiency. Visit dairynz.co.nz/maxt-rotary.
- If you have an in-bail feeding system that will feed a 'go-around' cow a second time, consider applying MaxT. Visit dairynz.co.nz/maxt-rotary.

MaxT factsheet

FOR HERRINGBONE AND ROTARY DAIRIES

The MaxT milking strategy can be used by farmers who want to shorten herd milking times without changing shed infrastructure, compromising milk production and quality or udder health.

What is MaxT?

MaxT is a strategy in which cows are milked to a pre-determined end-point – either to a fixed time point, or set milk flow rate threshold. Using the fixed time point the idea is to estimate when approximately 80% of cows would have completed milking and simply to remove the clusters from the 20% still milking. If you have ACR that are unable to apply a maximum milking time, another option is to adjust their low-flow threshold. By default most ACR have a low flow threshold of 0.2 kg/min (or equivalent) which can be increased to 0.4 kg/min, achieving a similar result to the fixed time end-point.

In most cases, milkers don't need to wait for slow milking cows to milk out. Research has shown that the implementation of MaxT can increase the number of cows milked each hour in many New Zealand dairies. The research has also demonstrated no loss of milk yield and no increase in mastitis or somatic cell count.

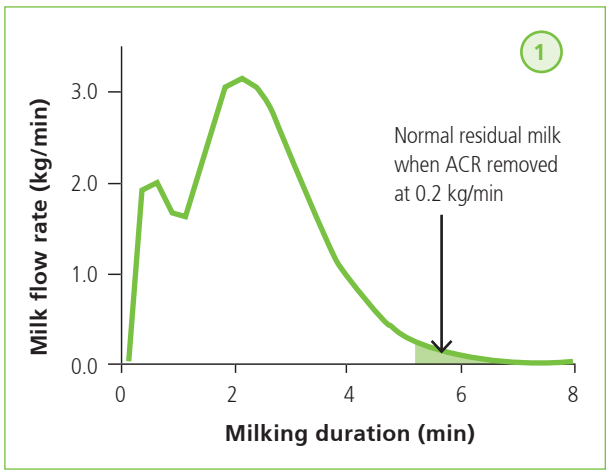
Research results

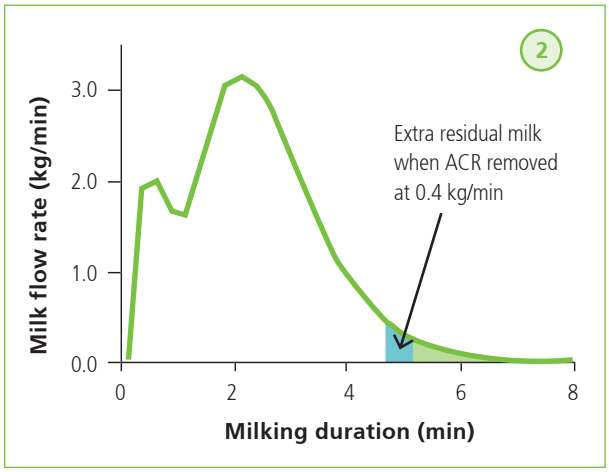
Leaving residual milk in the udder goes against a long held industry belief that it will reduce production and cause mastitis. Firstly, it's important to understand some basic physiology. Milk is held in two compartments of the udder; the cistern (a bag above the teat) holds around 20% of the milk, and the alveoli (the cells where the milk is made) hold the remaining 80%. When clusters are attached, the milk harvested in the first few minutes is from the cistern; then the milk ejection or let-down reflex is triggered. This causes the remaining milk to move from the alveoli into the cistern where it can be harvested by the machine.

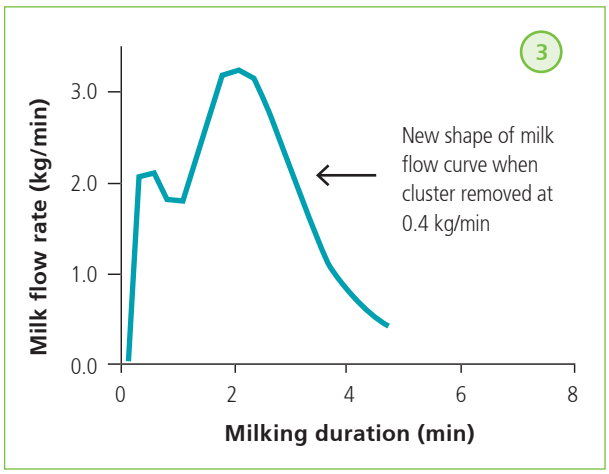
Cows whose clusters are removed early show a greater milk flow rate during the first few minutes of the following milking compared with 'fully milked-out' cows. In other words, there is more milk being held in the cistern from the previous milking ('residual milk'). As this milk is harvested immediately at the next milking, without waiting for milk letdown, there is no net loss in milk production or increase in somatic cell count. Essentially, the residual milk is retained until the next milking when it can be harvested more efficiently.

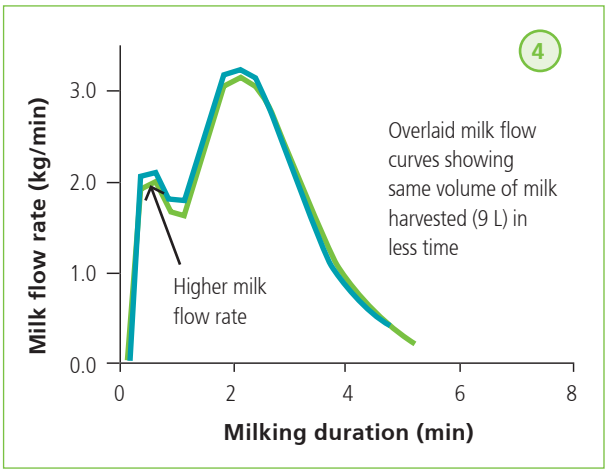
Figures 1 to 4 show the effect of removing the cluster earlier on a cow's milk flow curve. In this example the comparison is of an ACR set at 0.2 kg/min (red) and 0.4 kg/min (blue), but the same principle applies using a fixed maximum milking time. Figure 1 shows a typical milk flow profile when clusters are removed at 0.2 kg/min. In this situation a strip yield or residual milk of 200 mL can be expected. Figure 2 shows an additional 200 mL (for a total of 400 mL) could be expected to be left in the udder when removing the cluster at 0.4 kg/min, with a time saving of 30 s. Figure 3 shows the shape of the new milk flow curve when removing the cluster at 0.4 kg/min and Figure 4 shows the before (red) and after (blue) milk flow curves overlaid. Even though the differences look small, the area under both curves is 9 L, with a 30 s time saving when clusters are removed at 0.4 kg/min. This is due to the greater milk flow rate at the start of milking and a higher maximum flow rate.

For more information, including an animations, visit dairynz.co.nz/maxt-rotary.









Can MaxT help me?

MaxT can be implemented in any dairy type but it will not suit all situations. Whether it works will depend on the rate limiting factor. MaxT improves milking efficiency by helping to reduce row or rotation times. This means the operator(s) must be able to speed up their work routine for MaxT to improve efficiency – typically done by eliminating idle time from the work routine. This is easiest to achieve in dairies with a low cluster-to-operator ratio and can result in savings of over an hour per milking.

In a herringbone, if the time it takes you to complete your routine is shorter than the milking time of the slowest cow, you will be 'idle' or waiting. This is often the case in dairies with a low cluster to operator ratio or around peak lactation. In a rotary, operators have traditionally set platform speed so that 10% of cows 'go-around'. This normally results in platform speeds slower than efficient operators can attach clusters at, i.e. idle time. Using MaxT to minimise idle time will help milk the herd in a shorter time.

Table 1 shows the effect of applying a fixed maximum milking time for a 770 cow herd in a 40-aside herringbone with a herd average milk yield of 12 L/cow (e.g. a morning milking). A reduction in herd milking time of over 70 min can be achieved for two operators. This is simply because there is so much idle time in a 30 s/cow work routine.

Table 1. The effect of two end-of-milking criteria on milking efficiency for herringbone dairies.

End-of-milking criteria	Waiting for slow cows	MaxT
Row time	11 min	7.4 min
Operators	2	2
Work routine time per operator	33 s/cow	22 s/cow
Cows milked per hour	220	324
Cows milked per operator per hour	110	162
Herd milking time	3:40	2:28
Saving		72 min

Table 2 shows the effect of increasing ACR threshold to 0.4 kg/min or applying a fixed maximum milking time for a 770 cow herd in a 50-bail rotary with a herd average milk yield of 12 L/cow (e.g. a morning milking). When increasing ACR thresholds it is important to simultaneously reduce rotation time.

Table 2. The effect of two end-of-milking criteria and platform speed on milking efficiency.

End-of-milking criteria	Normal	ACR Threshold		MaxT
		0.4 kg/min	0.4 kg/min	
Rotation time	9 min	9 min	7.5 min	8 min
Go-around cows	12%	4%	16%	0%*
Available cupping time	12.1 s	11.3 s	10.4 s	9.6 s
Cows milked per hour	298	319	345	375
Herd milking time	2:35	2:24	2:13	2:03
Saving		11 min	22 min	32 min

** 23% would have 'gone-around'*

Practical implementation

It is recommended that the herd cell count should be below 200,000 cells/mL because it is a higher priority to improve this before focusing on efficiency. It's also important to identify any elite cows (yield >30% above herd average), as you may want to mark these and cup them early in a herringbone or let them 'go-around' in a rotary. Similarly, if there are any cows, typically older animals, with odd shaped udders that have issues with milking out, you may want to treat them separately. It's not desirable to under milk cows to a significant amount (i.e. leaving litres in the udder).

- Start by using the milking efficiency calculator. By entering some basic farm details you can select different end-of-milking strategies and assess which strategy best fits your individual situation. Visit dairynz.co.nz/rotary-calculator.
- MaxT is easy to apply in a herringbone; simply perform the normal routine and don't wait for the last 20% of cows to finish milking, e.g. don't wait to remove the last 8 clusters in a 40-aside. Visit dairynz.co.nz/maxt-herringbone.
- In a rotary, the appropriate MaxT time for the herd is determined by the herd milk yield for the fortnight. This can be looked up from the MaxT table – it's easiest to do this from peak lactation when the yield is known. This then becomes the rotation time. Visit dairynz.co.nz/maxt-rotary.
- Some models of automatic cluster removers can be set to a maximum milking time. Increasing the low flow threshold from 0.2 to 0.4 kg/min will achieve a similar result. If you are unsure how to change your ACR threshold, contact your ACR manufacturer.
- An efficient work routine, cupping technique and dairy design help to realise the full benefit of MaxT. Visit dairynz.co.nz/cupping and dairynz.co.nz/rotary-design.

Calculating MaxT

FOR HERRINGBONE AND ROTARY DAIRIES

MaxT is determined using Table 1, which is based on the average yield of a group of cows at that milking. Basing the MaxT on the average yield is important. For labour productivity benefits, cows that have an individual yield that is higher (or lower) than the average, need to conform with the time taken to milk out the majority of their herd mates.

Individual cows producing 30% more than the average yield are classed as 'elite' and may be significantly under-milked if subjected to the same Max T as the group. However, it is also counterproductive to set MaxT based on a high yield that is not achieved by most cows in the herd. A good solution is to give 'elite' cows a separate MaxT based on their individual yield.

Calculating MaxT – Basic steps for all dairy types

Step 1. Determine the mean daily milk yield per cow

The aim of Step 1 is to determine the average yield (litres) per cow per day. To do this, calculate the average milk yield in litres of the highest producing group of cows for a milking. Milk statements or a prediction of expected yield at peak are needed. Calving pattern will have some bearing on the correct yield to use. Refer to Table 2.

For example: In a seasonally calving herd, if the cows have a fairly uniform milk production, the average yield per cow per milking of the herd can be used as the basis for determining MaxT. In early lactation use the average yield expected at peak. After peak, use the average yield figures calculated from the daily bulk milk tank volume.

Step 2. Work out the am and pm milk yield

The MaxT for the AM and PM milking may be different if the yield expected at these two milkings differs. Table 3 shows the litres of milk that can be expected at AM and PM milkings over a range of different daily yields and inter-milking intervals.

Using Table 3:

- Identify the average milk yield per cow for the herd (from Step 1).
- Identify relevant milking interval for your operation.
- Read off the average yield that is expected for the AM and PM milkings.

Step 3. Determine MaxT for am and pm milkings

Look up the MaxT applicable for the AM and PM milk yields using Table 1. This is the longest time that a cluster should be on a cow, with the possible exception of 'elite' cows. Check fortnightly for changes in production and adjust the Max T accordingly if required.

Step 4. Identifying 'elite' cows (optional)

Don't assume that a high yielding cow must be excluded from MaxT. Many 'elite' cows with exceptionally high production will often milk-out within the allocated MaxT based on the average yield. This is because these cows also tend to have high milk flow rates.

As a general rule an 'elite' cow is defined as one that has a milk yield (litres) greater than 30% above the group average yield. These cows can be identified from a recent herd test or using milk meters. Some farmers may wish to make exceptions for 'elite' cows, excluding them from the MaxT milking regime, or giving them a separate MaxT of longer duration. If this is so, it is advisable to exclude their yield results from the mean milk yield calculation for the rest of the herd.

NB. Information in Table 1 and Table 3 is derived from Australian research. New Zealand research to date supports Australian findings and suggest these figures are just as relevant of New Zealand herds.

Tables for calculating MaxT

Table 1. Estimator of maximum milk out times.

Yield per milking (l)	**MaxT** (min:sec)	**MaxT** (decimal minutes)	**Yield of 'elite' cows**
7	04:51	4.8	9+
8	05:20	5.3	10+
9	05:48	5.5	12+
10	06:15	6.3	13+
11	06:42	6.7	14+
12	07:07	7.2	16+
13	07:32	7.5	17+
14	07:57	8.0	18+
15	08:21	8.3	20+
16	08:44	8.4	21+
17	09:07	9.2	22+
18	09:30	9.5	23+
19	09:52	9.8	25+
20	10:14	10.2	26+

Table 2. Herd groups used in setting MaxT.

Calving pattern	**Stage of lactation**	**MaxT to be based on…**
Seasonal	Lead up to herd peak	Average yield per cow per milking expected at peak
	Peak and post - peak	Average yield per cow per milking
Split calving	Lead up to peak	Average yield per cow per milking of the most recently calved group, expected at peak
	Peak and post - peak	Average yield per cow per milking of the most recently calved group
Year round	Mixed (early & late)	Average yield per cow per milking of the most recently calved group, expected at peak.

For more information visit dairynz.co.nz/calculating-maxt.

Table 3. Morning and afternoon yield (estimated from daily yield at different milking intervals).

Daily milk yield (L/day)	**Milking Intervals** (hours) *(from start of milking)*									
	8	**16**	**9**	**15**	**10**	**14**	**11**	**13**	**12**	**12**
	evening	morning	evening	morning	evening	morning	evening	morning	evening	morning
8	3	5	3	5	3	5	4	4	4	4
9	3	6	3	6	4	5	4	5	5	5
10	3	7	4	6	4	6	5	5	5	5
11	4	7	4	7	5	6	5	6	6	6
12	4	8	5	8	5	7	6	7	6	6
13	4	9	5	8	5	8	6	7	7	7
14	5	9	5	9	6	8	6	8	7	7
15	5	10	6	9	6	9	7	8	8	8
16	5	11	6	10	7	9	7	9	8	8
17	6	11	6	11	7	10	8	9	9	9
18	6	12	7	11	8	11	8	10	9	9
19	6	13	7	12	8	11	9	10	10	10
20	7	13	8	13	8	12	9	11	10	10
21	7	14	8	13	9	12	10	11	11	11
22	7	15	8	14	9	13	10	12	11	11
23	8	15	9	14	10	13	11	12	12	12
24	8	16	9	15	10	14	11	13	12	12
25	8	17	9	16	10	15	11	14	13	13
26	9	17	10	16	11	15	12	14	13	13
27	9	18	10	17	11	16	12	15	14	14
28	9	19	11	18	12	16	13	15	14	14
29	10	19	11	18	12	17	13	16	15	15
30	10	20	11	19	13	18	14	16	15	15

On and off the platform

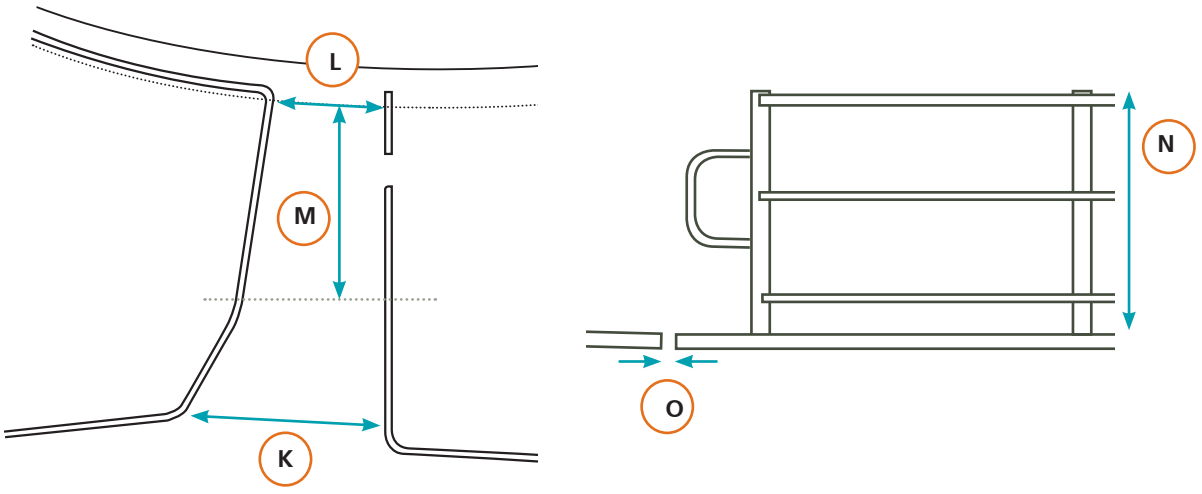
Use this resource to assess the setup of your dairy. Where your specifications differ significantly from the guideline figures, consider whether this is affecting cow flow, and if so devise a plan to take remedial action.

Rotary bail entry – bridge

The entry should allow cows to move freely on to the platform without fear. It should allow 2 cows to queue in single file in front of the platform and be fitted with an auto stop mechanism to prevent crush injury.

	QUESTION		MY FARM	COMMENT
1	How many bails does the rotary shed have?			
2	What is the width at the start of the entry race leading to the platform? *Guide: The preferred width is around 1200mm.*	K	mm	
3	What is the width of the race at the platform edge? *Guide: The preferred width is around 900mm.*	L	mm	
4	What is the length of the entry race? *Guide: The minimum preferred length is around 2500mm from the platform edge.*	M	m	
5	What is the entry race fence height? *Guide: The preferred height is 1200mm.*	N	mm	
6	Is the entry race likely to injure cows? *Note: Install rails on cow side of posts to avoid hitting hip bones.*		YES / NO	
7	What is the gap between the edge of the platform and the bridge? *Note: Gap should be no more than 40mm to avoid injury to cow's feet.*	O	mm	

Key rotary bail entry measurements:



For more information and photos visit: dairynz.co.nz/rotary-entry

Rotary bail area

The bail should allow the largest animals to stand comfortably in the milking position and provide safe, milking access. If feed troughs are used they should be positioned below the height of the breast rail.

	QUESTION	MY FARM	COMMENT
1	How wide is the gap between the bail dummies? *Guide: The preferred gap is no less than 650mm.*	mm	
2	What is the breast rail height? *Guide: The recommended height is approx 800mm.*	mm	
3	If present, what is the feeder trough height? *Guide: The recommended height measured to the bottom of the feeder is 200mm lower than breast rail.*	mm	
4	What is the bail length, measured rump rail to breast rail? *Guide: Normally approx 1500mm – 1650mm but depending on cow size. If too large it allows heifers too much space.*	mm	
5	Is the platform surface slippery?	YES / NO	
6	What is the distance between the 'D' gate support post and the platform edge? *Guide: The preferred distance is around 500mm.*	mm	
7	Will the 'D' gate operate correctly? *Note: The D gate should swing back 90 degrees and forward approx 30 degrees to minimise risk of injury.*	YES / NO	

Cups on position

	QUESTION	MY FARM	COMMENT
1	Are controls in a convenient position?	YES / NO	
2	Can the cows in the yard be easily seen? *Note: Being able to see the cows in the yard from the cups-on position will avoid the cups-on milker leaving the milking area.*	YES / NO	
3	How far can the milker step back alongside the entry race to encourage a cow on to the platform? *Guide: It is recommended that the cups-on milker be able to step back alongside the entry race at least 2 m.*	m	
4	What is the distance from the entry race to the steps up into yard? *Guide: The preferred distance is at least 2m to avoid operator disturbing cow flow on to platform.*	m	

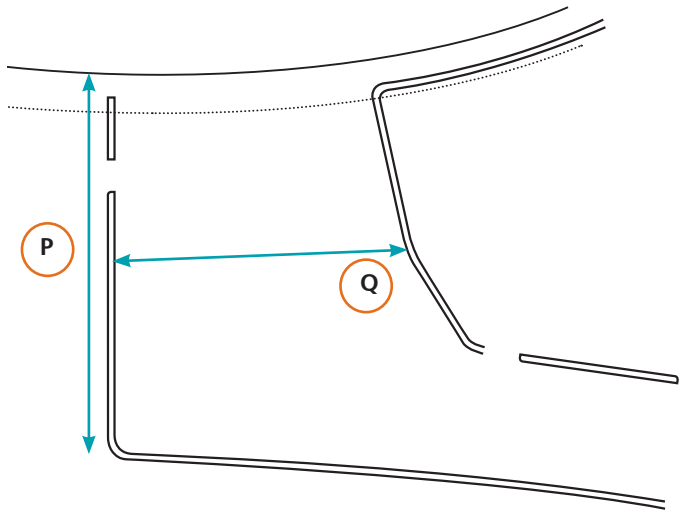
For more information and photos visit: dairynz.co.nz/rotary-bail

Rotary exit

The entry should allow cows to move freely on to the platform without fear. It should allow 2 cows to queue in single file in front of the platform and be fitted with an auto stop mechanism to prevent crush injury.

	QUESTION	MY FARM	COMMENT
1	What is the signalling device 1? *Guide: The device should warn cows of the upcoming need to exit the platform.*		
2	What is the signalling device 2? *Guide: The second device should provide a more forceful incentive to leave the platform.*		
3	What is the distance from the platform edge to yard fence? (P) *Guide: The recommended distance is no less than 3m.*	m	
4	What is the exit width at 1.5m from platform edge? (Q) *Guide: The recommended minimum width at 1.5m from the platform edge is 2.5m.*	m	
5	Is the exit/turnaround surface slippery? *Guide: The exit area must not be slippery. A mat to turn around on may improve cow comfort and reduce risk of lameness.*	YES / NO	
6	Are there any obstacles or distractions in the exit area?	YES / NO	
7	Can the yard be easily accessed? *Note: Steps and squeeze gaps should be located for easy entry to yard but not disrupt cow flow.*	YES / NO	
8	What is the condition of the end of the exit race to main race? *Guide: The race end should be firm and even, a step down or a mud hole slows cows.*		

Guide to correct exit construction:



For more information and photos visit: dairynz.co.nz/rotary-exit

Tips to improve cow flow

General

- Maintain races to avoid bottlenecks, sharp corners, steep areas, poorly drained areas, and unsuitable surfaces
- Eliminate all parts of the farm dairy that can hurt cows, e.g. protruding hinges, sharp edges. Keep pipe rails on the cow side of posts wherever practical
- Set up the yard entry race so stones do not get on to yard
- Use steps rather than steep ramps. As a guide – 800mm long and 120mm–150mm high
- Eliminate slippery surfaces everywhere
- Delay moving the backing gate until about two rows or two rotations have been milked to allow the cows to sort themselves out into their milking order
- Other than in an emergency do not enter the yard
- There should be no stray voltage at any position likely to affect a cow. If in doubt, get it tested and faults corrected. Identify other factors causing discomfort that may be confused with stray voltage, e.g. faulty milking machine settings
- Where practical, even out the lighting and minimise shadows
- Keep noise to a pleasant low level avoiding any jarring high-pitched sounds. Cows find milkers shouting and whistling equally stressful
- Given the opportunity, spend time with the cows, moving quietly through them aiming to reduce their flight zones
- Always consider possible changes to people behaviour needed to minimise the effects of design faults, e.g. timing of actions, quiet talking, moving slowly
- Use improved training methods so cows are not scared of getting hurt and move confidently.

In the dairy

- Set up an overhead mirror[s] so the operator can monitor the position of the backing gate easily to ensure a regular flow of cows to the platform
- Set up backing gate controls in a convenient place and use little and often
- Put any steps, located near the cups-on position and leading up to the yard, at least 2m away from the bail entry race
- Narrow the entry so that at least one cow can stand ready to step on to the platform and be unaffected by other cows. This single cow race should be roughly 2.5m long
- Where practical to do so, keep the space near the entry bridge clear so the cups-on milker can move close alongside and to the rear of any cow reluctant to enter the bail
- Adjust the height of breast rails and feeders so cows stand comfortably
- Shift the position of the hanging cluster to the leading edge of the dummy to reduce the chance of clusters getting pulled off as cows enter or exit
- Ensure the 'D' gate and safety switch both work without any possibility of jamming a cow
- Set up warning devices to alert cows to get off. Make sure these do not distract or disturb the entering cows
- Cup roughly 2 cows away from the entry quietly and methodically without rapid movement that may distract the entering cows.

For more information visit: dairynz.co.nz/moving-cattle, dairynz.co.nz/dairy-environs and dairynz.co.nz/tracks-yards

Using the milking efficiency calculator

FOR HERRINGBONE AND ROTARY DAIRIES

The Milking Efficiency Calculator was designed to allow you to estimate improvements that can be made to your milking efficiency by changing your milking routine, applying a maximum milking time (MaxT) or increasing automatic cluster remover thresholds in herringbone and rotary dairies.

The calculator can be used in two ways. By entering your current details, the calculator will predict a herd milking time. If this number is significantly less than your current herd milking time it highlights that improvements to your milking routine can be made, e.g. cow flow. Use Milksmart resources for possible solutions. Secondly, you can use the calculator to estimate the size of the improvement to milking efficiency you can make by modifying your milking strategies (e.g. MaxT).

Download the calculator from dairynz.co.nz/rotary-calculator.

- Start by selecting the rotary or herringbone worksheet in the bottom left hand corner.
- Enter in your farm details in the dark grey boxes (herd size, shed size etc.). Note you may need to click "enable editing" in the yellow ribbon across the top of the window.
- All the dark grey boxes in the left hand column must be filled in. Roll the mouse over the cell (red triangle) for a more detailed explanation of each box.
- Select the post-milking strategy you use at each milking. If you operate a rotary dairy, give your average rotation time.
- The light grey boxes in the middle and right hand columns are a prediction of key measures for the morning and afternoon milkings. Focus on the cows/operator/hr as this determines the total labour hours.

Understanding the results

Start by doing a quick logic check of the results – are there any improbable results? e.g. a herd milking duration of 10 hours. If so, check the input boxes. Note that the number of operators is predicted by the model and cannot be entered. In the herringbone, the model estimates a cow milking time based on the milk yield for each milking as determined by what has been entered in box c) and d). It then compares the time it will take an operator to complete the tasks, as determined by boxes b) and e). If this time is greater than the milking duration of the slower cows, then it assumes a second operator is required. If you believe the model is overestimating the number of operators, then this indicates you may be overmilking cows, or you can adjust the core work routine down until you get the desired result. In the rotary, a similar process occurs, comparing the cupping time and the rotation time entered.

The model determines a maximum potential using the values that have been entered, so it is likely that your actual performance will be slightly lower e.g. due to empty bails in a rotary. If the actual performance is well below what the model has predicted, then it is possible that poor cow flow may be reducing efficiency. See the Milksmart assessment form (page 17-19) to help diagnose design problems.

Next, explore different end-of-milking strategies (and rotation times for rotaries) to determine if your milking efficiency can be improved further. The graphs at the bottom of the page give you an indication of the range in potential performance for a number of situations. Pay particular attention to the yellow box – total labour hours. This is a combination of the estimated time to milk the herd and the number of operators required.

Suggested things to try:

Herringbone

- If the model has estimated there is significant idle time, try changing the end-of-milking strategy. Applying MaxT or increasing the ACR threshold will help reduce idle time. Note that for MaxT, the model assumes that the slowest 20% of cows will have milkings shortened. This may result in another operator being added. In practice, it is likely to be more appropriate to only shorten the slowest 10% of cows rather than adding another operator. Or, if you believe that the operator's milking routine can be streamlined as well, then adjust this value down to remove the additional operator. Compare the number of total labour hours in your new scenario compared to what you started with. Refer to the factsheets on MaxT and efficient milking routines for more information.

Rotary

- Start with the end-of-milking criteria. If using ACR milk flow rate thresholds, then select a rotation time in which about 15-20% of cows are going-around. Then check the number of operators required. If reducing the rotation time has meant an additional cupper is required then consider whether cupping technique can be improved (reduce box e), or increase the rotation time slightly as it is unlikely the increase in throughput will justify adding another cupper. If selecting MaxT as an end-of-milking criteria then select a rotation time in which 20% of cows will have their milkings shortened i.e. not allowed to 'go around' on a second rotation. The number will go red if go-around cows are greater than 20%. As with the previous example, it may make sense to shorten the milking duration of less than 20% of the cows if it avoids needing another operator. Compare your new scenario's total labour hours with what you started with. Refer to the factsheets on MaxT and 'go-around' cows for more information.

Finally, try out the new scenario at the next milking. The great thing about these changes is that you can get immediate feedback on its success.

For more information and to download the calculator visit dairynz.co.nz/rotary-calculator.

Notes

Notes

dairynz.co.nz