Rotary milking planning guide
DeLaval parallel rotary
PR1100 and PR2100
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Welcome to the DeLaval parallel rotary PR1100 & PR2100 planning guide

This planning guide is intended to be a reference point for the dairy farmer who is planning to build a new or upgrade an existing, rotary dairy. The information, ideas and technologies contained in this planning guide come from DeLaval experience in building well over 3 500 rotary milking parlours worldwide.

Building a rotary dairy is a large investment in both time and resources. Spending time using quality information in the planning stages will help to ensure that you make the right decisions for achieving an end result that should meet your needs well into the future.

Whether you are milking 200 or 2 000 cows, DeLaval parallel rotary PR1100 & PR2100 provide optimal milking efficiency, enabling you to have better control of your dairy farming business.

If you require further information when planning your new rotary dairy, please contact your local DeLaval representative.
Rotary milking system benefits
Rotary parlour milking is a proven concept. Rotary parlours are the most labour efficient milking parlours for dairies requiring a high cow throughput per hour. Cows are very calm and seem to enjoy the ride. It is very important to note that the milking routine is the same for every cow, every day.

Rotary parlour operators are positioned in one location for the task being performed and this is like an assembly line. The operators will only leave their station to attend to a cow or machine with a problem. The rotary parlour’s continuous cow flow makes it possible for the operator to work without any interruptions. This is because the operator does not assist the cow flow and can totally concentrate on essential milking tasks. Rotary parlours provide very good working conditions for the operator. They offer a safe and consistent working environment. Rotary parlours offer quality milking and the efficiency of continuous motion. Platform entry, pre-milking work routine, milking unit attachment and cow exit are always constant in a well managed rotary parlour.

DeLaval parallel rotary PR1100 & PR 2100 offer the following features and benefits:

- Cows have a very short walking distance into the stall.
- Cows are brought to the operator. The operator does not waste time walking from cow to cow.
- Operating the platform continuously at a constant speed, controls the pace of the operators.
- Each cow is provided with equal time for milk out.
- Group size is not important. There is no problem with extra cows or small groups.
- Each cow has her own stall. This stall looks the same at every milking.
- The cow is not affected by movements or disturbances caused by the cow in an adjacent stall.
- New cows learn the routine easily. They simply follow the previous cow onto the platform.
- Rotary parlours fit very well into dairy layouts. Cow traffic management is very easy with single entry and exit lanes. The single exit lane makes cow drafting to a treatment area very easy.

Why milk with a rotary?

In a rotary parlour the cow walks onto a rotating platform. Platform rotation moves the cow to the operator position. The operator can then perform the necessary tasks to milk the cows properly. After milking, the cow exits the milking parlour. Cows are constantly entering and exiting the rotary parlour. This continuous flow is the main contributor to the high parlour throughput.
Planning

Building a new dairy is somewhat like building a new house. Some people swear they will never do it again, others get exactly what they want and more are reasonably pleased but would do it better the second time around.

Project planning
Where you fit into this picture is probably a reflection of knowing what you want and having a well planned and managed project. Sounds easy? We probably all believe we can plan and manage well, but problems will occur when planning a new dairy.

It is not an easy task to know what you want or need. You will start out with a reasonably clear picture in your mind, but almost everybody you speak to will have a different view. There are a range of options to consider from yard design, colours, cladding, number of bails, drafting gate system, automation, computerised herd management tools, milking clusters and type of electrical switches to location of refrigeration units and voltage control methods. The list goes on.

Making all the decisions might sound like a daunting task, but it can be enjoyable and very rewarding. Remember that it is likely somebody will be milking in your new dairy for the next 20 years (12000 milkings or 24000 hours), so the success or failure of your planning will be constantly remembered!

One of the secrets for enjoying the challenge and doing it well is to start early. This gives you the chance to look at the options, consider the arguments and make the decisions which best suit you.

Knowing what you want and why, makes it much easier for contractors to deliver to your expectations. They will then know what to do, to what standard and for how much.

This sounds like common sense but in many cases it doesn’t happen. To help ensure it works for you, the project’s main planning points are listed here with some guideline times.

### Planning
- Discussion and preparation of preliminary plans: 4 weeks
- Collect price estimates: 2 weeks
- Preliminary budget/loan approval: 3 weeks
- Preparation of final plans and specifications: 6 weeks
- Collect and finalise quotations: 4 weeks
- Finalise finance and construction approvals: 3 weeks

### Construction
- Site preparation: 
- Building and yard construction: 
- Platform construction: 
- Milking equipment installation: 
- Electrical installation: 
- Water pumps and reticulation: 
- Painting: 
- Commissioning and training: 1 week

### Total Time
- 39 weeks

The above times are indicative and are based on our vast experience of managing successful projects. These times do not include alterations/construction of races, tanker roads and other additional services.
Key points to consider

When planning your rotary system, the most important thing to consider is where you want to be in the future. You need to visualise how you want to run your parlour and what size your operation will be. You can start planning when you have a good understanding of your future requirements.

Primary considerations
How long do you plan to operate your parlour each day? The answer to this question will depend on:
- How many cows do you plan to milk (including expansion plans)?
- How many times will you milk your cows each day?
- What is the average milking time of your herd or specific groups of cows?
- What working routine do you require?
- How many operators do you plan to use in your parlour?

When you have the preliminary answers to these questions, you can calculate what size parlour you need.

Budget considerations
When you know what parlour size is required to meet your requirements, you can start costing your project. How much will the parlour cost? Are you upgrading an existing facility and how much of that facility can be re-used?

Labour considerations
Another important factor to consider when building your new parlour is labour. Labour is an ongoing expense. In many cases automatic cluster removers or a complete herd management system, will support you in reducing additional labour demands. In the table we describe the labour requirement differences between batch parlours (herringbones & parallels, with lowline and midline milking) and rotary parlours.

<table>
<thead>
<tr>
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<td>70 – 80</td>
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NOTE: This table is based on automatic cluster removers being installed. This table is indicative only, as variations will occur based on different milking routines and the milk-out times of the cows.

* Herringbones & parallels, with lowline and midline milking

Site planning
Cow flow is critical to performance and throughput, so the site layout must support free flowing cow traffic. Compromises are often made in this area, without a clear understanding of the impact on parlour performance. Such compromises would not have been made if the impact was fully understood during the planning stage.

Operator and cow environment
This is a very important subject. A good working environment will improve cow and operator performance.
Sizing the rotary system

When designing a rotary parlour, the number of stalls should be chosen to match the expected working routine time and the required time to milk out the cows.

Basic working routines
The working routines in a rotary parlour consist of mainly essential milking tasks. The working routine for the entry operator(s) consists of udder preparation and cluster attachment. The exit operator’s working routine consists of removing the cluster manually if no automatic cluster remover system is used, plus checking the udder and either teat dipping or teat spraying. When cow traffic is well planned, cow entry and exit requires no assistance from the milking operators.

Balanced work routines
To achieve high throughputs the milking work routine elements should be balanced for the entry and exit operators. The time each operator spends with each cow should be similar. Without a balanced routine either the entry or exit milker will be idle for a period of time between each cow.

Rotary parlour sizing

The correct sizing of a rotary will result in:
- Reaching the expected throughput (cows per hour)
- Matching the expected work routine time with the expected milking time
- Using minimal labour
- Not over capitalising your investment
- Not stressing the operators and cows

You can approach the sizing of a rotary from different points of view, depending on your objectives. The result of the “optimum number of stalls” calculations will always be the same, but the way you achieve this result can be different.

The platform should be sized so that the number of stalls matches the expected work routine and the expected milk-out time of the herd. With more than one operator, it is the working routine time of the slowest operator that will influence the platform size and the rotation speed.
Optimum number of stalls

Normally rotary parlours are planned with a minimum stall time of 10 seconds, even for the most agile herds. Higher producing herds may require a minimum stall time of 15 to 20 seconds.

There are a number of non-milking stalls (NMS) on a rotary platform at any one time. These are the stalls passing the entry, exit and operator positions which are unavailable to milk cows. Normally there are five non-milking stalls.

Using the principal outlined here, the optimum number of stalls \( n \) in a rotary can be calculated as follows:

\[
n = \frac{\text{AMT} \times 150\%}{\text{WRT}} + \text{NMS}
\]

The steady state throughput (SST) or actual milking routine in the parlour per hour can be calculated as follows:

\[
\text{SST} = \frac{3600}{\text{WRT}}
\]

The rotation time (RT) in minutes can be calculated as follows:

\[
\text{RT} = \frac{n \times \text{WRT}}{60}
\]

\( \text{WRT} = \) Working routine time
\( \text{AMT} = \) Average milking time
\( n = \) Optimum number of stalls
### The ideal size of rotary parlour with one entry operator

<table>
<thead>
<tr>
<th>WRT (sec)</th>
<th>Average milk-out time per cow (min)</th>
<th>Steady state Throughput in cows per hour</th>
<th>Number of cows</th>
<th>Steady state milking session* Time (hr)</th>
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<td>1.7 4.2 8.3</td>
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</table>

**Notes:**
- Work routine time (WRT) for the slowest operator.
- Longer WRT may be needed for less agile herds at entry and exit.
- Five NMS used for one entry operator.
- Throughputs and milking session times are approximate. They assume a steady state, no stoppages and slow cow milking times no more than 50 per cent above average milking time.
- SST milking time excludes shutdown rotation, set-up and cleaning time.
- Where the calculated number of stalls falls between two available sizes, the next largest size has been chosen. This may give a slight over capacity, but it ensures the required WRT and milk-out times can be met.
Milking time

The average milking time of your herd will vary depending on the breed, time of year, feeding regime etc. It is important to know the milking time for each individual cow. In the tables provided in this planning guide, a correction factor of 1.5 has been included to account for slow milking cows.

In other words, if we select an average milking time of six minutes, the calculation will assume that the slowest cows do not exceed a milking time of nine minutes (6 x 1.5 = 9). If there are an excessive number of slow milking cows in the herd or group, a higher milking time may have to be selected.

It is very important to understand the effect of a slow milking cow. A cow with a milking time of 13 minutes could slow the entire milking down. To minimise this disruption the slow cow should be sent on a second rotation.

The solution to the problem is calculating an accurate average milking time and grouping the herd so that cows with long milking times are milked separately from the faster milking herd.

Number of operators (staff cost)
In general terms an efficient way to increase throughput is to reduce the working routine. A quick cross-reference to the calculation table will show that if the working routine is cut in half, the throughput will double. While the theory is correct, it is very often not the case in practice. For the theory to hold true, the working routine must be balanced between the operators. The duties performed by the operators sharing various attachment duties will seldom balance exactly and the time taken by the operator with the longest work routine must be used in the calculation.

In conclusion, adding extra milkers significantly improves parlour throughput if the rotation time is reduced.

Milking routine and its impact
As discussed above, a reduction or increase in working routine time has a direct effect on rotary parlour throughputs. In some extreme cases a critical working routine time – perhaps with either pre- or post-milking teat dipping or spraying – can mean the selected rotary parlour size is outside the DeLaval parallel rotary PR1100 & PR2100 range.

In some cases the routine may exclude the selection of a rotary parlour, regardless of size. If this is the case and high throughputs are required, look seriously at the selected work routine.

The critical factor here is that the working routine for each operator needs to be as closely balanced as possible. So no matter if you are considering two entry milkers and one exit milker or any other combination, the work routine for the shared milking work needs to be balanced as closely as possible.
Factors to consider for achieving high throughputs

- Adjusting rotation time – The speed of the platform must be adjusted to suit the milk-out time of the different cow groups, the herd and seasonal variations.

- Grouping – For better management of feeding and cow breeding, cows can be grouped according to daily production or stage in lactation. We can group large herds based on milk-out time and increase throughput.

- Double rotations – It is possible to prevent slower milking cows from leaving the platform before they have finished milking. This is achieved by using a manual or automatic cow retention device to ensure these cows stay on the platform for a second rotation and complete their milk-out.

- Avoid interruptions in the rotation – It is necessary to match the rotation time to the operator’s capacity.

- Time savings in clean-up and set-up – One of the many advantages of a rotary is that after the last cluster is attached to the last cow, the entry operator(s) are free to begin clean up tasks. This only leaves cleaning of the milking machine and part of the parlour area after the last cow finishes milking. Similarly, in a rotary with an exit operator, during the first rotation this operator can be completing some of the set-up tasks.

Planning for operator safety

All DeLaval parallel rotary PR1100 & PR2100 platforms are supplied with a complete safety package. This package optimises the safety of both the operator and the cow.

Included in this package are non-latching type reverse buttons, where the operator must keep his or her finger on the button when reversing the platform. Safety switches and full hazard warning signs are also included as standard.
DeLaval parallel rotary **PR1100 & PR2100**
platform dimensions

<table>
<thead>
<tr>
<th>Number of stalls</th>
<th>Platform diameter (m)</th>
<th>Building width (m)</th>
<th>Building length (m)</th>
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### Rectangular yard size

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J = Jersey cows  FXJ = Friesian/Jersey Cross  F = Friesian
DeLaval parallel rotary PR1100 & PR2100 foundations

Good parlour planning is essential because the rotary platform is totally integrated into the parlour building and requires a number of specific services such as power and water. In addition to the specific parlour requirements, it is necessary to consider overall cow traffic as this is a critical factor to operating an efficient parlour.

A complete set of planning material is supplied with each DeLaval parallel rotary PR1100 & PR2100 milking system. Foundation, drainage and electrical ducting drawings are provided to ensure your builder and electrician can complete their part of the project efficiently and on time. A comprehensive set of operating and maintenance instructions are also supplied.
Internal excavation phase
The initial excavation phase has been completed and work has stared on the critical pit/roller foundation.

Foundation and service duct preparation
Once the pit wall has been completed, it is necessary to lay all the service ducts in the correct position before the parlour floor is cast. Future requirements for ducting should also be considered at this stage.
DeLaval parallel rotary PR1100 & PR2100
typical foundation plan
System integration

A DeLaval parallel rotary PR1100 & PR2100 platform and a DeLaval milking machine fit together like a hand and glove. Because the platform and the milking machine are designed to work together, they provide a seamless milking operation. It is this seamless integration that gives the complete system improved cluster alignment, low stable vacuum and the easy adaptation of automation equipment. Overall, this solution gives superior milking performance.

DeLaval parallel rotary PR1100 & PR2100 platforms and DeLaval milking equipment have been designed to keep equipment protected from the harsh milking environment, while being easily accessible for routine maintenance. DeLaval PR1100 and PR2100 bails have been designed to allow you to take full advantage of current and future advancements in milking equipment and herd management technology.

Platform options

PR1100
A galvanised steel pipe or bow bail used as a solution for farmers who require no or little milking automation equipment. The bail’s low profile yet sturdy construction promotes superior cow flow, on and off the platform. The low milk tube connection point allows for excellent cluster alignment.

PR2100
A galvanised or stainless steel cabinet bail engineered to house the latest milking automation and herd management systems provides the ideal operator interface. The bail’s low profile yet sturdy construction promotes superior cow flow, on and off the platform. The low milk tube connection point allows for excellent cluster alignment.

Deck materials
You can choose between three different deck materials:

- Concrete
- Steel
- SuperDek

Concrete
The concrete deck is 100 mm thick and consists of 40 Mps, high performance MICROPOZ™ reinforced concrete.

Concrete is an acceptable deck material for this application, but consideration should be given to the required duty of the platform when making this decision. The concrete deck will provide good service in moderate duty operations, but concrete is not flexible so some cracking may occur.

Benefits of a concrete deck platform include:

- Quiet milking environment
- Good cow flow from concrete bridge to concrete platform
- Does not need sanding and painting
Steel
The steel deck is made of 5 mm thick, mild steel chequer plate. The top side is sandblasted and primed for protection. A special epoxy coating is applied to extend the steel deck’s life. The steel deck platform will provide good service in heavy duty operations.

Benefits of a steel deck platform include:
- Proven material for 700 Kg cows
- Lightweight to reduce load on rollers and drive units
- Easy to modify/upgrade

SuperDek
SuperDek is a high chromium alloy steel that has the appearance and qualities of stainless steel. SuperDek is corrosion resistant and virtually maintenance free. The SuperDek platform will provide good service in heavy duty operations.

Benefits of a SuperDek platform include:
- Proven material for 700 Kg cows
- Lightweight to reduce the load on rollers and drive units
- Does not require expensive surface coatings
Herd management systems

The right decision at the right time
A herd management tool is essential for all farmers who are interested in maximising production and profits. DeLaval ALPRO™ herd management system is a modular concept that allows you to manage drafting, feeding, milking and breeding as one integrated business operation. This optimum herd management solution keeps track of each animal, monitors trends, predicts problems and evaluates options. ALPRO™ provides full access to the daily information which is essential for successfully running a modern dairy farm.

Drafting cows
In day to day farming there are a number of reasons for separating a cow. Medical treatment, artificial insemination, hoof treatment, dry-off or simply changing a group are day to day tasks. Automatic sorting is possible when herd management information and automatic cow identification are available. This is integrated into the software and hardware of the ALPRO™ system. Cows can be drafted through automatic criteria from the system or on demand during milking.

You can even identify a cow in the paddock in your handheld computer (Palm) and synchronise it with ALPRO™ for Windows® in your PC – to have that cow drafted at the next milking.

Feeding for profit
Cows’ requirements, grass availability and grass quality tend to vary every season. This is when supplementation inside or outside the milking parlour becomes a key strategy for improving yield and milk solids. In today’s pasture based dairy farming, nutritional aspects are being considered more and more by farmers, veterinarians and dairy consultants.

The ALPRO™ system is an excellent tool for accurately helping you supplement your herd according to its specific needs and production targets. ALPRO™ can feed your animals with small rations on a frequent basis (out-of-parlour feeding modules) or dispense the appropriate amount of concentrate feed while the cows are being milked (in-parlour feeding).

The power and control of yield recording
Knowledge is a powerful tool, especially when it helps you anticipate what will happen next. The ALPRO™ system gives you total control over each cow’s yield. If any cow deviates from its usual production, you will know at once. Having all the information allows you to make the right decisions at the right moment, rather than when it’s too late. Receiving timely, accurate information from the ALPRO™ system means you can immediately solve problems involving cows that are sick or yielding less milk than usual. Daily milk yield measurements minimise your production losses and improve your profitability.

The ALPRO™ system is the dairy farmer’s best decision making tool. It provides rapid access to correct information, which makes it easy for you to make the right decisions. This saves working time and increases profitability.
Cleaning and hygiene

Milk quality is most commonly affected by two factors – cow health and the ability to properly clean milking equipment. If either of these two areas are neglected, milk quality will be adversely affected.

Water is the key element for ensuring these factors work together to achieve a satisfactory cleaning result. The water flow in the milk pipeline is usually created by drawing water from the wash trough/tank into the pipeline system during various cleaning cycles.

DeLaval offers several cleaning system options for cleaning milking machinery. They include automatic cleaning systems, semi-automatic liquid dosing systems and manual dosing systems. These can be combined with our range of chemicals – powder or liquid – to determine the strength and dosage that will best suit your milking situation and environmental needs.
**DeLaval InService™**

Maintain reliability and optimize performance in your parallel rotary with DeLaval InService™. This is a complete and flexible service program, with emphasis on regular monitoring and preventive maintenance to make sure your rotary continues to deliver top performance and to minimize the risk of unplanned downtime. Different parts of your rotary system will require servicing at different intervals, and maintenance schedules will reflect that.

Experienced DeLaval trained service technicians equipped with unique professional tools follow company protocols to service your installation – so it will carry on providing fast efficient milking that protects milk quality and udder health. Naturally we maintain reliability with on-time delivery of original parts, liners and tubes. And of course emergency service support is always available.

InService™ brings together knowledge and innovation to provide an efficient and effective service solution.
Conclusion

In this planning guide we have presented DeLaval parallel rotary PR1100 & 2100 milking systems. We have focused on a number of key elements and components that we believe are interesting and important to our customers. We have highlighted the benefits of certain aspects of the system and encourage you to investigate these issues and any other points of interest you may have.

Any new parlour and especially a rotary parlour is a major project with a long-term future. Here at DeLaval we have all the necessary information and resources to help you plan your installation and to optimise parlour performance and efficiencies. We also have all the necessary plans, detailed drawings, and information to equip you to run your project right from the first planning stages to the final implementation. DeLaval project managers and support staff are well trained and are ready to assist you wherever you are located.

We realise that customer needs are varying and extensive. We have developed DeLaval parallel rotary PR1100 & PR2100 to cater for a wide range of needs and are certain we can meet your requirements, but we recognise that we may not have addressed all your concerns in the scope of this planning guide.

Should you have any further requirements please contact your nearest DeLaval representative who will be happy to answer any questions you may still have.
Rotary Plus+

DeLaval rotary milking systems are renowned for high throughput, operating efficiency and cow comfort. With the introduction of Rotary Plus+ we are taking dairy farming to the next level.

Read more about Rotary Plus+
www.delaval.com/rotary_plus