

Robotic rotary

Tasmanian cows get in a spin

Rebekah Tyler and Nick Dornauf are leading the way
in dairy technology.



The Dornauf family of Tasmania are going “back to the future” with an automated system which allows them to get back to focusing on the cows and the grass. **Anne Lee** reports on their world-first installation.

Nick Dornauf couldn't have put it better if he tried when he described the new DeLaval automatic milking rotary (AMR) system installed on his family's Tasmanian dairy farm as putting “a new spin on dairying”.

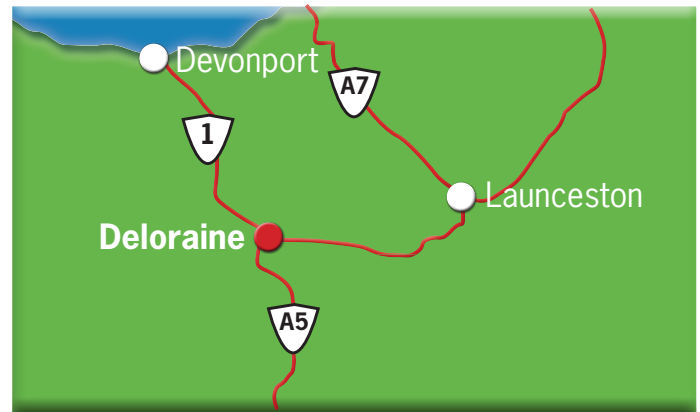
He's the youngest of three generations represented in the family's four dairy farm, 1350-cow business near Deloraine, Tasmania. His grandparents, Ian and Jenny, left their desk jobs in 1964 and bought their first 60ha dairy farm. They're still actively involved in the business that includes a 190ha runoff block and a raspberry farm and café and live on what's now a 210-cow property. Nick's mother and father, Chris and Lyn, are also still very much working in the business with Chris overseeing all dairy on the four farms.

For Nick, 24, breaking new ground in being the first in the world to install the 24-bail robotic AMR on a commercial dairy farm is adding an exciting new dimension to the business. He has an Agricultural Science degree from Melbourne University and has worked as a dairy consultant for well known Australian consultant and nutritionist, Andrew Angelino, while also working on the family's own farms. Nick's partner Rebekah Tyler has a Bachelor of Science, also from Melbourne University.

The Dornauf's high input farming system is very much focussed on best practice grazing management to maximise the utilisation of high quality pasture. And it will be that skill that's put to the test when it comes to encouraging the cows to use the AMR on a voluntary basis as they increase herd size from the 250 cows currently being milked to 600 cows on the 270ha property.

The AMR has been operational since February and cows are still brought to the dairy twice a day for batch milking as the animals and people running it transition to a purely voluntary system. Nick and Rebekah run the farm without any staff and trained the 220 spring calving heifers they started the season with onto the system gradually, cupping them by hand until the robots were fully installed. Since then they've brought in a further 35 mixed-age autumn calving cows and trained them onto the system.

The bails are configured as an internal herringbone so cows come onto the platform and are guided to turn so they face



Location: Deloraine, Tasmania

Owners: Dornauf Family

Area: 270ha

Cows: 255 Friesian cows increasing to 600

Supplements: 2t/cow grain and protein, 500kg dry matter (DM)/cow silage in February to May season dependent

Feedpad: 75m x 15m concrete, central lane feedpad

Grain feeding system: 20-station DeLaval out-of-dairy automated feeding system

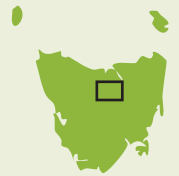
Production: Heifers 490kg milksolids (MS)/cow, mixed age cows 620kg MS/cow

Irrigation: Centre pivots

Farm dairy: 24-bail DeLaval AMR, robotic rotary system, plus one-sided, 15-bail herringbone treatment facility

Milk storage: Two vat buffer system with automatic switch over and vat wash for tanker driver

Reproduction: AI seven weeks with LIC semen, 7% empty after 12 weeks mating.



outwards. The robots are stationed on the inside of the platform and as the cow comes round each robot performs its own task. In the Dornauf's case two robots carry out teat cleaning, and two attach the cups which sit in their own magazine within each bail. Lasers read the topography of the udder on the cow's first visit, storing that information in the computer system so the robots, using lasers each time, know whenever she comes into the bail exactly where to find her teats. Each quarter has a separate milk



Cows have started heading to the dairy on their own.

line and milk meters so analysis such as volume and conductivity and blood is on a per quarter basis.

Fast alerts

All of the information collected at each milking is displayed on a computer in the dairy office. By programming limit levels into the system Nick and Rebekah can receive alerts across a range of parameters. For instance if a cow's volume suddenly drops off or if milk conductivity changes, an alert is posted. If they've set it up that way those cows will be drafted off either at that milking or prior to the next milking when they come into the yard and go through selection gates.

Nick's been amazed at the ability of the system to pick up cows with mastitis prior to any clinical signs being evident.

"If I get an alert in the morning, sure enough by the afternoon a big percentage of the time she will have gone clinical," he said.

Average somatic cell count levels (SCC) have been 54,500cells/ml with a 2% mastitis rate.

'From an engineering point of view it's about working with cows' preferred behaviours rather than forcing them into anything.'

A robot is stationed at cups off to carry out the teat spraying there while a cup flushing module also washes each set of cups before they're attached to the next cow. If a cow hasn't milked out on each quarter, or if she's kicked the cups off or the robot failed to attach the cup to one quarter, she can be diverted in the yard to come back around again. On the second time around cups will only be attached to the quarter that failed to milk out.

Nick can adjust the parameters for that decision so if she's done a large percentage of her typical volume from that quarter she may not be directed back in.

To date they've found around 8-12% of cows come back for another spin around the platform.

Once they've finished milking, cows are directed to a DeLaval out-of-dairy feeding station. The Dornaufs have a 20-station feeder which reads the cow's transponder as she puts her head in the manger. The computer then allocates her a ration of a grain and protein mix that Nick's pre-set based on her production. In April, cows were being allocated a ration of between six and 12kg/day with this split between each milking. It's trickle fed so if the cow doesn't eat all of her allocation it's not wasted. It also prevents other cows from getting access to her grain rations.

The computer also records how much she's consumed which can act as an alert to something being amiss. She can then be diverted back to a holding yard so they can take a closer look at her, depending on how Nick sets the criteria.

The first day cows were introduced to the automatic feeding system 65% had at least one consumption period for the day



Ron Mulder – working with the cows.

and within three days it was 98%. Not one cow has had to be physically trained to use it.

"Now if one hasn't used it then there's something wrong with her," Nick said.

Feeding cows out of the dairy has its advantages with no dust, vermin or noise; it also means cows with larger rations aren't rushed.

A new feedpad has just been completed where silage and lucerne can be fed out too. The lure of the supplementary feed is what will drive the cows to the farm dairy once they move into a voluntary milking system later this season. They have to move through the farm dairy and be milked before getting their feed reward.

The robotic rotary system was developed in Australia at the Camden research facility as part of an industry and government funded FutureDairy Project (*Dairy Exporter*, December 2010, page 8).

Cow thinking

Former DairyNZ scientist Dr Kendra Kerrisk has led the project at Camden and been involved in helping the Dornaufs take the research prototype to a commercial level, along with New Zealand-based DeLaval AMR specialist Ron Mulder. She had input into how to lay out the laneways and where to position the smart gates which usher the cows to where they should be. Everything in the design and engineering of the system is done with cow behaviour in mind. Setting it up has meant thinking like a cow.

"From an engineering point of view it's about working with cows' preferred behaviours rather than forcing them into anything," Ron said.

The farm dairy has to have a level of artificial intelligence to cope with the variations and permutations it comes up against, unlike a robot in a manufacturing situation where its subjects are more constant. The time difference between Australia and DeLaval's base in Sweden allows the engineers and software developers in the northern hemisphere to download an array of data from the Dornauf's system overnight, carry out diagnostics on-line and tweak anything they need to remotely. The local DeLaval dealer and trained service technicians are also on hand as needed.

While the robotics, circuitry and computer technology in the farm dairy are impressive it's how the cows will be managed out on the farm to create the voluntary cow flow that will test the grey matter of most farmers. The farm is set up with three-way grazing, as developed at the DairyNZ Greenfield site, which allows all cows to move to three grazing areas over a 24-hour period. That means they'll move through the farm day twice over that time frame.

It'll be up to the smart selection gates and central computer to direct cows to where they need to be.

Nick's challenge is in being able to allocate the pasture so each group reaches the desired, low residual at the right time to distribute the milkings and have cows flowing through the farm dairy so they're utilising the 24-bail platform well without having cows standing around on concrete waiting for too long.

He's installed automatic timer release Batt-Latches on the gates in the paddocks and around 2/3 of cows are already heading to the dairy for milking on their own. The latches could be a way to help distribute cow movements around the farm as they move to the voluntary system and could remain a good tool to smooth out cow flow.

Unlike the individual box robots or voluntary milking system (VMS) the AMR can handle larger groups of cows making it easier to manage a larger pasture grazing herd. Ron said the system requires a change in mindset by the farmer and takes a little time for them to get their head around how the grazing management will work.

Co-ordination needed

At any one time there will be cows coming in to milk from any of the three grazing areas but as long as the grazing allocation calculations are right it will be a matter of trusting the system to know where to send cows to next.

"It's a bit like a railway station and the yard is the interchange area," he said.

"Cows will be going through the gates and they'll be sending them to where they should be. Sometimes I think you'll just have to walk away and let it do what it's supposed to. If a farmer

intervenes all the time cows could learn to expect that intervention."

Because milking is voluntary higher producers will be free to come to the dairy more frequently with a percentage of cows expected to visit three times a day. For those cows their daily ration will also be high and the three visits/day means their ration will be split into thirds.

"Their feed intake over the day is going to be more consistent and that's got to be good from a metabolic point of view, especially early in lactation," Nick said.

It will also mean less strain on udders and hopefully greater longevity for the higher producing cows.

Nick and Chris warn that farmers need to be very sure of why they want to move into robotic milking before they take the plunge and commit to the significant capital investment. Although DeLaval doesn't quote an off the shelf price for the system because each farm will differ in the number of components they want to include, setting up a 24-bail rotary robotic system will cost more than a 54-bail rotary with all the bells and whistles currently available for conventional milking, such as milk meters, automatic drafting and automatic cup removers (ACRs).

However, it will be less of a cost than trying to milk a large number of cows using the individual VMS robots that sell for around \$250,000 each and can cope with 60-90 cows/day depending on the intensity of farm system.

"If it's simply to get out of the dairy, then robotics probably isn't for you," Nick said.

Closer focus

He and Chris see the system as not only giving labour efficiencies but also opening up a means to focus closely on individual cow needs in a larger herd situation.

The information provided through the system means cows get individualised attention and means Nick can focus on management that's going to drive the greatest returns out of their system.

"The bigger our systems are getting the more a farmer's job becomes managing staff and not cows and grass. We can get back to that with this type of system," Chris said.

He has long been an innovator, using LIC semen since the 1960s, selecting the highest ranking bulls available to Australian farmers. Both he and Nick have looked across the Tasman for new ideas to push their pasture-based system and have visited Sweden to look at DeLaval's robotics.

"I've been concerned for the industry and where the next labour force is going to come from as farms get bigger," he said.

"We're competing with other industries for labour and if we're not seen as user friendly and more sexy we're just not going to get the bright young things."

DeLaval has set up a pilot farms support group for those venturing into robotic milking that includes Ron and Kendra as well as other farmers and specialists so farmers can glean advice.

Everyone is still learning and in a way they're writing the textbook together. ■



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