

International Dairy Topics

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Practical information for progressive dairy professionals

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chewing^{the}cud

When it comes to the consumer, what do they actually want from the dairy sector? When it comes to end product consumption there is a variable picture.

In many countries the liking for fresh, whole milk is declining but this is being replaced by semi-skimmed and flavoured milks. Yoghurt consumption is holding up, as is cheese, but the same can not be said about butter.

What are the dictating factors behind these various trends? The answer can be summarised in two words – wealth and health!

Increases in income give more buying power. This is initially seen in an increase in milk consumption, which then evolves into an increasing consumption of value added products like yoghurts and flavoured milks.

That is a traditionalist view, but today, on top of this, we have to superimpose the modern thinking that has evolved over the last two or three decades.

This is encompassed in questions about what we are eating, such as where has it come from and how has it been treated?

This involves issues such as welfare, traceability, transparency, transportation, residues, zoonoses, contamination and antimicrobial resistance.

All of these are products of the thinking of the second half of the last century. Are they the products of logical thinking backed by science? Or is it a case of the devil making work for idle, over-educated minds? This is a question we can debate another day.

What is fact, is that these various issues are now with us and with us to stay – sometimes with quite serious consequences for the farmer. If you do not believe me, just take a look at what has already happened in the pig and poultry sectors.

The same has already started to happen in our industry and soon we will be on par with our pig and poultry cousins. Can we learn from their mistakes?

One key lesson is to always keep your ears and eyes open so you can pick up any changes that are occurring and to do this early enough so that you can effectively respond to and, if appropriate, counter them.

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Cow comfort
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worldfocus

An executive summary of key international issues

Israel

A novel marketing opportunity?

Russia will soon join some three dozen countries, including the USA, Canada, the EU and several in Asia, that permit the importation of Israeli produced dairy products. In most countries these Israeli dairy products are destined for the local Jewish communities. This announcement came after a 36 month evaluation by the Russians of Israeli veterinary practices and the safety and health levels of Israeli farms and dairy production facilities. While Israeli production facilities are considered generally safe, Russia had been concerned that opening the Russian market to the import of dairy products could introduce bacteria or other agents that could harm their local ecosystem.

India

A novel preference for butterfat!

Dairy farming in India is a good example of smallholder dairying, as practised in much of Asia and Africa, but it differs with its heavy reliance on buffalos for milk production. The Indian milk production sector is characterised by a very large number of very small herds. Milk from small herds is collected immediately after each milking at centralised cooling facilities to maintain a cold chain. Also typical of smallholder dairying, the majority of the milk produced (>80%) is distributed as fresh milk or home-based manufactured products through an informal marketing system. The production of milk from buffalos exceeds that from cows. Many Indians prefer buffalo milk because of its higher butterfat content.

Brazil

A novel export opportunity?

Brazil is the world's fourth largest milk producer and the country has millions of hectares of unused land, an abundance of water and proven agricultural ability. Rising capital and operating costs are having adverse effects in other countries. However, Brazil, with its low labour costs and low land prices, is in a good position to capitalise on growing international demand for dairy products. These low costs and the country's willingness to rapidly adopt modern production technologies have enabled the agricultural sector to become a major factor in the economy. Some 40% of the workforce is now employed in agriculture and this sector now accounts for around 40% of exports.

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The use of yeast in ruminant diets as a natural gut flora stabiliser

Yeasts are described as fungi that reproduce asexually by budding or fission. This means that growth results in groups of single cells. *Saccharomyces cerevisiae* is probably the most well-known and researched species of yeast and has many diverse functions in both human and animal diets. There has been much research into the benefits of dietary inclusion of *S. cerevisiae* for ruminant livestock and hindgut fermenters, such as the horse.

by Dr Helen Warren,
European technical manager, ruminants,
Alltech, Ireland.
www.alltech.com

Many different strains of this yeast exist, and all vary slightly in regards to their effects in the animal. Several strains have been the subject of ruminant research, including *S. cerevisiae* CBS 493.94.

As research into yeast supplementation has been extensive over the last few decades, this article focuses mainly on its effects in dairy cattle.

The ruminant digestive tract

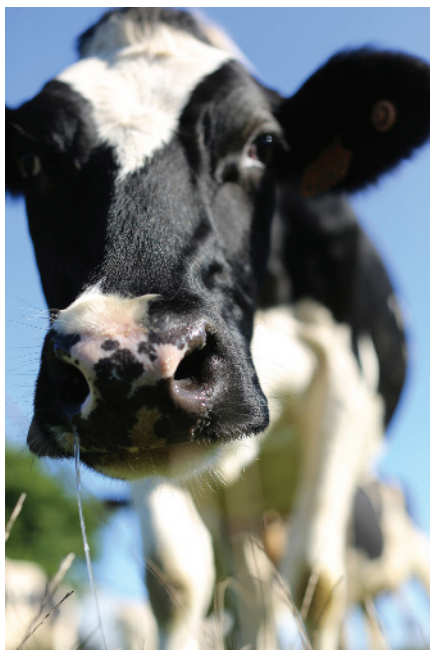
The ruminant digestive tract has evolved to make use of low-quality, fibrous feed material via microbial fermentation in the reticulo-rumen.

The ruminal microbial ecosystem generates sources of energy, nitrogen and other nutrients via the breakdown of dietary ingredients.

Volatile fatty acids (VFA) are the end product of the bacterial fermentation of carbohydrates and are absorbed across the rumen wall as the primary energy source for the ruminant.

It is well-established that diets high in soluble carbohydrates (starch and sugar) can lead to overproduction of VFA, particularly propionate and lactate, and, ultimately, to a drop in rumen pH and sub-acute acidosis (SARA) and/or acute acidosis.

Cellulolytic bacteria operate within a narrow pH range (above 6.0) and can only survive for a relatively short time below



The ruminant digestive tract has evolved to make use of low-quality, fibrous feed material via microbial fermentation in the reticulo-rumen.

this range before their growth and activity is compromised. Thus, fibre digestion is inhibited if rumen pH remains low for long periods.

If the situation is allowed to progress, acute acidosis will result in further compromise of cellulolytic and lactate-utilising bacterial growth, with a concomitant proliferation of lactate-producing bacteria.

This then deteriorates into a vicious cycle, with a continual decline in pH to the point of acute acidosis (pH <5.0) and subsequent animal death.

Yeast in rumen diets

Interest in yeast as part of ruminant diets has been cited as far back as 1925 but its mode of action was not fully understood. Over the last three decades, in-depth investigation has revealed that the main effects of yeast relate to alterations in microbial fermentation in the rumen.

Primarily, yeast, or rather, *S. cerevisiae*, stimulates the activity of cellulolytic bacteria, or those that utilise lactate, particularly *Selenomonas ruminantium*, as well as total anaerobic bacteria, helping to reduce the amount of time the rumen pH falls below 5.5.

The majority of beneficial bacteria in the rumen rely on a stable, anaerobic environment in order to function. Oxygen enters the rumen with feed particles and thus poses a consistent threat.

S. cerevisiae is known to scavenge (respire) oxygen entering the rumen, helping to promote an anaerobic environment and promoting anaerobic bacterial growth.

Additionally, stimulatory co-factors are thought to be involved in increasing bacterial growth, meaning that live yeast is likely to be more effective compared to 'dead' or inactivated yeast. Dawson et al. (1990) hypothesised that heat-labile compounds could also be exerting an effect on numbers of cellulolytic and/or total anaerobic bacteria.

Numerous beneficial effects have been reported on the inclusion of yeast in ruminant diets.

However, the response of animals to yeast inclusion is influenced by several factors, including diet, days in milk and yeast strain.

Stabilising the rumen

Yeast is purported to stabilise the rumen environment, with effects including higher rumen pH, increased numbers of cellulolytic bacteria and reduced lactate concentration.

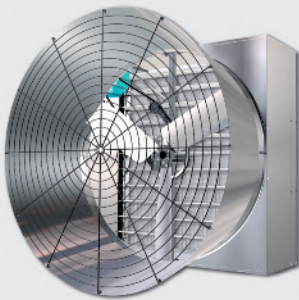
Although it had no effect on rumen pH or cellulolytic bacteria, Erasmus et al. (1992) found yeast reduced peak rumen lactate concentration two to three hours post-prandium in fistulated dairy cows.

They also found a lower rumen ammonia concentration following yeast inclusion, which, they hypothesised, resulted from greater incorporation of nitrogen (N) into microbial protein. A study in dairy heifers also picked up reductions in rumen ammonia N concentration.

In this experiment, dairy heifers supplemented with a live yeast culture exhibited increased VFA production and a

Continued on page 9

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Continued from page 7

possible stimulation of N uptake by rumen bacteria.

Similarly, Al Ibrahim et al. (2010a) also noted a reduction in ammonia N concentration but with little effect on other rumen parameters.

The lack of effect in the Al Ibrahim et al. (2010) study is likely to be related to the performance of the control group, making it more difficult to find a difference between supplemented and un-supplemented animals.

In contrast, Bach et al. (2007) noted an increase in average rumen pH across time in dairy cows when yeast was added to the diet. These authors used a pH meter resident in the rumen for a period of two weeks, and they stated that a beneficial effect of yeast could potentially be seen as early as one week after supplementation.

Erasmus et al. (2005) commented that yeast increased propionate production but elicited only a modest effect on biological efficiency.

Apart from dairy cows, Kumar et al. (1997) did note a significant improvement in rumen parameters in buffalo calves fed a high-forage diet.

Rumen pH and cellulolytic bacterial count were increased and rumen ammonia N decreased relative to control animals.

Again, beneficial effects were seen after only one week of supplementation. It is interesting to note that these positive effects were seen on a high-forage diet, when other studies highlight a greater response in more starch- or concentrate-based diets. In a study investigating the effect of yeast on bulls fed a barley beef diet, both total VFA and acetate production was increased without any effect on propionate or the acetate:propionate ratio.

This, together with the improved dry matter intake (DMI), suggests an increase in fermentation rather than a shift in fermentation patterns. The increased DMI did not translate to increased performance.

Similarly, Williams et al. (1991) noted a reduction in lactate concentration together with a concomitant increase in pH when yeast was added to the diet of steers.

In a linked experiment, they also noted increased DMI and subsequent milk yield in Friesian dairy cows, whereby yeast effects were more noticeable at higher levels of concentrate in the diet, supporting evidence for dietary influence over yeast effects. Overall, the majority of yeasts are accepted as gut flora stabilisers.

Yeast benefits

In a recent meta-analysis of the effects of live yeasts in ruminants, Desnoyers et al. (2009) noted that across 157 experiments, yeast inclusion increased ruminal pH, VFA production and organic matter digestibility (OMD), while reducing lactate concentration.

It was highlighted that dietary composition played an important role in the magnitude of the effects. This is in agreement with Robinson and Erasmus (2009), who noted that higher dietary neutral detergent fibre (NDF) and acid detergent fibre (ADF) resulted in a lesser response to yeast supplementation.

Increases in milk production have often been numerical, rather than statistical. Kalmus et al. (2009) demonstrated a 5.8% numerical increase in milk yield, similar to the 6%, non-significant increase noted by Erasmus et al. (1992).

Milk composition has been shown to be affected by yeast supplementation. Significant increases in milk fat and/or milk protein have been demonstrated in several dairy studies as well as numerical increase.

Benefits appear to be more obvious during early lactation, when negative energy balance (NEB) is an issue. Al Ibrahim et al. (2010a) noted little effect of yeast supplementation in early lactation Holstein Friesians on milk performance parameters, including milk yield and composition as well as DMI.

Despite this, there was a numerical increase in milk yield, which would have been of importance from a financial aspect. In the Desnoyers et al. (2009) meta-analysis, a 1.2 g/kg body weight (BW) increase in milk yield and a 0.05% increase in milk fat was found.

Performance in terms of product output is not the only potential use for yeast cultures. Al Ibrahim et al. (2010b) noted that, although there was no effect on NEB in dairy cows post-partum, yeast supplementation improved serum insulin, the peak in oestradiol prior to ovulation and the size of the first ovulatory follicle post-partum. The authors suggest further investigation into these effects.

Additionally, Yuan et al. (2015b) evaluated the effect of an enzymatically hydrolysed yeast on immunity in transition cows.

They noted an improved humoral immunity in conjunction with a modulatory effect on uterine and mammary gland health. While response to yeast appears varied and inconsistent in the literature, overall, there are trends of improvement as described above.

However, not all yeasts are the same and

not all commercially available products are comparable 'gram for gram'. Commercially, there are numerous yeast products, such as Yea-Sacc (Alltech Inc), available for use in ruminant livestock and other species. All are based on different strains. Probably the major distinction between them is whether the yeast is alive or dead.

Registration depends on demonstration of both safety and efficacy of the product in various ruminant species and types (for example, dairy vs. fattening animals vs. calves).

As dosage for live yeasts can often be reported as colony-forming units (CFU)/kg dry matter (DM) or as CFU/d, each different commercially available product will have its own minimum effective dose that is not directly comparable with other, similar products.

This is an important factor to consider when comparing yeast studies, as levels used for one yeast may not be sufficient to elicit responses from another yeast.

Conclusion

In conclusion, yeast cultures of *S. cerevisiae* have been used both commercially and experimentally in ruminant diets for several decades. There are many different strains, all of which differ in regard to their effects in the animal and their minimum effective doses.

The likely mode of action is concerned with oxygen scavenging to promote an anaerobic, more stable environment for ruminal bacteria. However, it is also likely that stimulatory compounds are generated by the activity of the yeast.

Key effects appear to be an improvement in rumen fermentation with a decrease in lactate, reducing the risk of acidosis. Improved DMI has been related to improved performance, albeit numerical, in many studies. Though care needs to be taken when interpreting results from different strains of yeast, the use of yeast in ruminant diets appears to have a place as a natural gut flora stabiliser. ■

References are available from the author on request.

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A practical guide to differential diagnosis

8 – Subacute ruminal acidosis (SARA)

by Luis Cardo, PhD, Technical Ruminant Manager, Biomin.

Though not easily detected, subacute ruminal acidosis (SARA) can have a serious impact on milk production, general health and longevity. It is caused by an imbalance between production of volatile fatty acids (VFA) and their absorption by the rumen walls and the buffering mechanisms of the rumen.

Technically, a bout of SARA occurs when rumen pH drops below pH 5.8 for at least three hours, or pH 5.6 according to other authors. Fibre digestion is reduced and noticeably affects production. It can also result in lower feed intake, lower feed efficiency, and hoof problems (laminitis).

Rumen effects

SARA will affect feed efficiency, therefore increasing feeding costs, due mainly to the decrease of fibre digestibility.

When pH drops below 6.0, the populations and growth of cellulolytic bacteria and the ruminal fungi decline, impairing fibre digestibility. According to several sources, every 0.1 decrease in pH reduces fibre digestibility by 3.6%. Poor fibre digestibility and lower feed efficiency resulting from SARA translate into increased feeding costs for producers.

One study showed that short bouts of SARA (less than 30 minutes) did not reduce neutral detergent fibre (NDF) digestibility, while repeated bouts of four hours did so. These findings support the use of TMR and free 24-hour access to the feed bunker as key management tools to control SARA.

Main causes of SARA

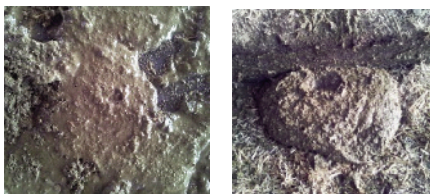
- Poor adaptation of rumen microflora to diet changes. Common at calving, pairing with other metabolic diseases such as ketosis and related conditions.
- Improper feeding patterns and cows selectively choosing their feed.
- Inappropriate forage size.
- Formulation mistakes.

Feed intake effects

SARA commonly causes erratic eating patterns and reduces feed intake. When pH drops, the cow reduces its feed intake, decreasing the production of acids and driving the pH back to normal levels. Then the cow will resume eating, resulting in another bout of SARA and repeating the cycle. This variation will not only decrease production due to the lower feed intake, but will also reduce the efficiency of the rumen fermentations due to the variation of the nutrients supply, causing further economic losses.

Faeces assessment

A heterogeneity of faeces in a cow's group in the same lactation stage can be caused by SARA. In this situation some faeces will be normal and some too loose. You can use the 1 to 5 scoring system to assess them.



Above left, liquid faeces score 1; above right, score 3.

Lameness

Lameness is a major concern in modern dairy and beef production, due to implications for welfare and profitability.

There is a clear link between acidosis and the inflammation of the lamellar tissue of the hoof, a condition known as laminitis that not only causes problems by itself, but is also a predisposing factor for other conditions such as sole ulcers and white line haemorrhages.

Although the mechanism of laminitis is not yet totally clear, it is thought that the condition is due to lower systemic pH during acidosis and substances such as histamine (involved in immune response) and endotoxins entering the bloodstream.



Lameness, in its turn, can exacerbate SARA as cows suffering this condition will change their feeding patterns due to the lower number of meals caused by the pain suffered when moving to the feeding bunker.

Two detection tips

- Check feeding patterns on TMR. If cows are selectively choosing their feed – evidenced by lots of holes in the TMR – then the ingested fibre and concentrates can differ considerably from the theoretical ration.
- Routinely assess and document indicators of possible SARA: butterfat content, manure assessment, laminitis, and individual feed intake patterns.

Steps to address SARA

SARA control aims at improving adaptation of rumen papillae and microflora and optimise effective fibre intake. Here is a list of management practices to mitigate the risk of SARA:

- Ensure proper rumen adaptation especially at calving when shifting cows from the dry group to the lactation group.
- Control ingredients' palatability.
- Ensure homogeneity of TMR and proper forage length cut. Keep records of maintenance of mixer (balances, knives).
- Ensure proper access to the feed bunks and an adequate supply of water.
- Avoid stressful situations such as moving animals too much between production groups.
- Keep first calving heifers separated from older cows when possible.
- Resting. Ensure good layout, maintenance and bedding. Insufficient lying time will cause cows to change their feeding pattern.
- When formulas or forages are changed a smooth transition is highly advisable. ■

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by The Technical Team,
Animat Inc, Québec, Canada.
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When cows are standing or walking, they have to support their whole weight over a very small surface, their hooves.

To ensure that each of these weight-bearing small surfaces is effective, a good cushioning system is needed. In a cow's anatomy, this task is performed by the foot's digital cushion, the fat cushion between the digital bone and the hoof itself and by the digital ligaments appended to the bone in an elastic manner.

In the natural environment, the cow's natural cushioning system does its job with help from the ground's shock absorption capacity.

The consequence of cow confinement is

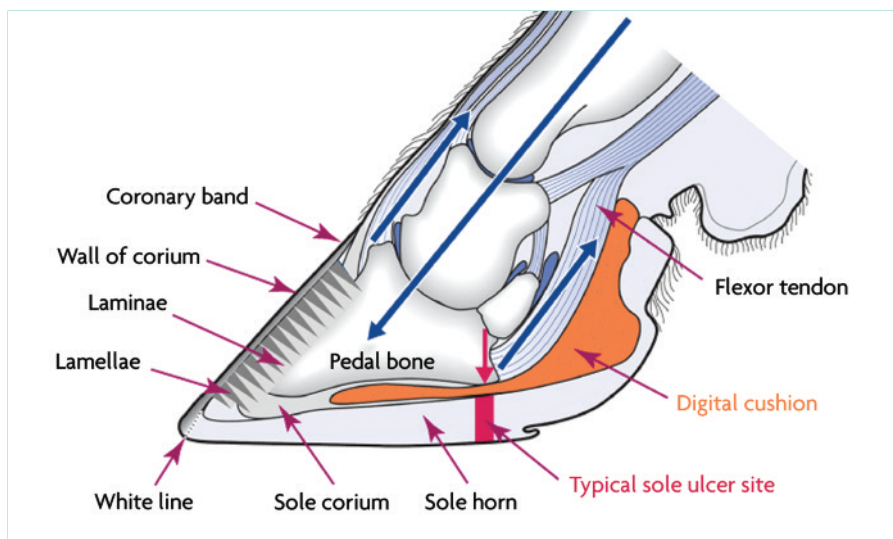


Fig. 1. Cow hoof.

that, for all their productive lives, animals have to walk and stand on concrete floors that have no shock absorption capacity at all.

All shock absorption efforts must come from the cow's shock absorption system, its digital cushions and ligaments. In the long term, this is a risk factor for fatigue in those cushioning elements. The aim of placing rubber mats on concrete floors is precisely

to reproduce natural conditions, by providing a softer floor to take some of the pressure off the cow's anatomical cushioning structures.

Growth and wear balance

The shape of a hoof is the consequence of growth and wear. If there is more wear than growth, the result is a thin sole. Risk factors are abrasive concrete, the abrasive effect of sand bedding, long-distance walking (parlour), aggressiveness (pushing and shoving), high humidity causing soft hooves, and poor horn quality.

On the other hand, if there is more growth than wear, the consequence is excessive growth. This is a minor problem that can be addressed by frequent hoof trimming. Under ideal conditions, the hoof's growth and wear balance out.

Hoof wear and physical impact stimulate peripheral blood flow at the hoof's white line, and thus increased horn growth to ensure the protection of live claw tissue.

Again, when a hoof bears weight on a soft surface, there is less wear, less physical impact, and thus less extra keratin is produced.

Walking on soft surfaces may lead to horn

Continued on page 14

Table 1. Locomotion scores and description (adapted from Sprecher et al., 1997).

Score	Description	Signs
1	Normal	Stands and walks normally, all feet placed with purpose.
2	Mild	Stands with a flat back, but the back arches when the cow walks; gait is slightly abnormal.
3	Moderate	Stands and walks with an arched back; short strides with one or more legs.
4	Lame	Arched back standing and walking; one or more limbs favoured but at least partially weight bearing.
5	Severe	Arched back; refuses to bear weight on one limb; may refuse to move or has great difficulty moving from lying position.

Continued from page 13
overgrowth. In reality, when cows have limited movement and they are walking on rubber mats, there is a slightly greater horn overgrowth compared to cows on concrete; nothing that can not be solved by a regular hoof-trimming program.

Locomotion is beneficial for animals; the more cows walk, the better their hoof shape, but the integrity of their hooves must always be checked.

Hoof infectious diseases

To minimise dermatitis digitalis, it is important to:

- Address it while the calf is young.
- Keep the alley clean.
- Promptly detect and individually treat new cases.
- Implement a functional hoof-trimming program.
- Adopt an efficient footbath program.
- Ensure good barn ventilation.
- Provide comfortable bedding to ensure maximum lying time.

If rubber mats are installed, one must adopt an effective alley-cleaning system by flushing or scraping, and making sure that the remaining waste is minimal to prevent puddle formation.

Behaviour and early detection

Lameness is a sign of pain and a cow will walk in a different way to avoid this pain; she will limp. When a cow stands or walks on a soft surface, the pressure on a lesion is less, and so is the pain. With the same type and size of lesion, cows show more obvious signs of lameness on concrete than they do on a soft floor.

A lame cow with a locomotion score of four on concrete will probably have a locomotion score of three on rubber. Over the short term, the advantage of rubber is obvious; with the same lesion, a cow will experience less suffering. However, over the long run, this can turn into a disadvantage since it takes longer for the farmer to realise that the cow is in pain, so detection may be delayed, and the advantages of rubber lost. A good farmer must develop skills to detect this sign of pain; this is known as having a clinical eye.

Another key issue to fight lameness, as important as prevention, is early detection and treatment to restore the cow's health and minimise losses. To benefit from all the advantages of rubber mats, farmers must improve their skills in lameness detection.

From our experience in lameness and cow welfare consultation around the world, once farm workers understand the importance of early detection and pay attention to it, they can detect foot lesions

on rubber mats at an early stage and benefit from the full cow-comfort advantages of a soft floor.

A world class manufacturer

Animat is a recognised world leader in the manufacture of heavy-duty, long-lasting comfortable rubber mats. With its distribution network of specialised dealers, the company is present in 44 countries worldwide.

After more than 30 years of research and development, it continues to seek ways to improve cow comfort and productivity by producing the highest quality rubber flooring available. Over the years, it has invested millions of dollars in developing and manufacturing cow mats that meet the specific requirements of today's dairy farmers and incorporate the latest technological advances in the industry.

Rubber mats for dairy cows will provide optimal comfort for your herd and Animat offers the best quality/price ratio on the market thanks to its unique design, product research, development, manufacturing techniques and quality control process on inputs and outputs.

Cow mats provide unparalleled comfort for your dairy herd and are the only products that come close to replicating the natural conditions of pastures. ■

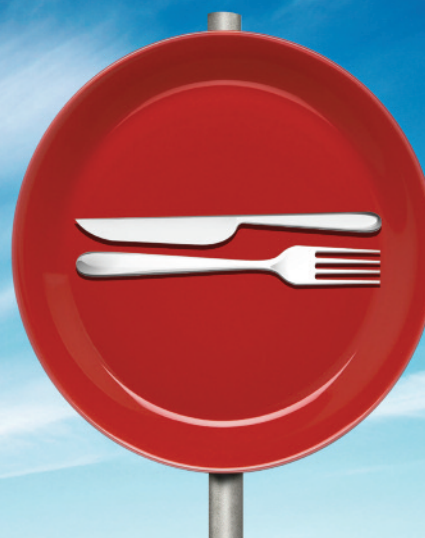
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milking parlours

SUPPLEMENT

International Dairy Topics

Making the right decision to secure future investment

Dairymaster, Ireland

Does parlour type make a difference to business performance? A DairyCo report published has revealed that choosing a rotary parlour as opposed to automatic milking systems (AMS) can have as much as 5.7 pence per litre difference. Take a farm with a herd of 200 cows with an average yield of 9,000 litres – this can make a difference of £102,600 in margin alone.

Somewhere in the UK right now there is a farmer with a very important decision to make, which milking parlour do I invest in for the next 20 plus years? Which parlour will make the most financial sense by reducing labour, increasing efficiency through automation and provide the necessary backup and support needed? We believe the super-efficient Dairymaster Swiftflo Revolver Rotary milking parlour is the answer! Three years ago David Burroughs, a farmer from Suffolk in the UK, had to ask himself these questions, here's what he had to say:

"We fell in love with rotary parlours and after looking at every rotary parlour out there, Dairymaster was the parlour we chose, we loved the stainless steel side of it, you can keep it clean, lovely pulsation on it. The other big thing is the backup, because we are as East as we can possibly be in the British Isles we needed a backup, it was a big decision on why we picked Dairymaster and they certainly have delivered."

There are numerous benefits to milking in a Dairymaster parlour, better udder health, maximise milk yield by typically 5% more, typically milk each cow one minute faster, overall you are increasing output while reducing labour which, in the long run, makes farming a lot more profitable.

Mark Chetwynd is a Welsh dairy farmer who also had a tough decision to make this year, he had a different make 60-point rotary parlour, it was

inefficient and costing him money so he began to explore solutions. Would it be possible to upgrade to a Dairymaster Swiftflo Rotary Parlour and more importantly, if he did would he really experience that Dairymaster difference? Here's what Mark had to say:

"The biggest change and difference I have seen in my cows is the fact that the cows seem a lot more relaxed. We must have had probably 10 or a dozen cows out of 650 who would kick and we had to use a kick bar occasionally on them, since we have been in a Dairymaster we have not used one. The let-down is a lot quicker, it is quite clear to see. My yield has gone up, it is unbelievable because we haven't changed any ration, the rations have stayed the same. I would also say we are milking 30 minutes per shift quicker now to what we were. It is a joy to milk in the parlour."

Dairymaster's milking equipment has been designed to have the lowest levels of liner slip, excellent milk out and lower shear forces on teats which is much better for udder health. Research has shown Dairymaster to have the most stable milking vacuum, while applying a very low vacuum in the rest phase. This results in better teat ends by milking the way nature intended!

As herds are increasing in size the need for advanced automation and efficiency in milking has never been more important. The Dairymaster Swiftflo Revolver Rotary Parlour milks more cows, in less time, with less labour. Dairymaster's intelligent automation increases efficiency by controlling all functions from milking to feeding to drafting and even seamlessly integrates with their health and fertility monitoring system – MooMonitor+. Dairymaster are also world renowned for their incredibly fast installation. Dairy farmer, Seimon Thomas discusses the amazing five-day installation of his stainless steel state-of-the-art 70 point Dairymaster Swiftflo Rotary Parlour:

"Having stainless steel means that it will last forever. That's why we went for Dairymaster as well, the amount of stainless steel in the build. Other competitors would take two or three months to install the parlour, which would mean that I would have to be there more time. With Dairymaster being here for only one week it was ideal for us really. They soon got into things and by the end of the week we had all the rotary installed."

Dairymaster ensure the best build quality by building all their parlours in-house and building them for heavy-duty use. All parts are manufactured in the same location for optimum integration.

"We had a 24-unit double up parlour before. When we had 100 cows it was fine but now we've grown up to 650 cows. We went to the Dairymaster factory in Ireland where they make over 90% of the products themselves. In the end we took the decision to go for a 70 point Dairymaster. We saw that Dairymaster offered a very superior package with everything involved."

With the overwhelming benefits of a Dairymaster rotary parlour it is easy to see why it is such an attractive way of milking for not only this generation but also the next generation of young farmers, securing your future investment to producing milk efficiently. ■

dairymaster.com



Investing for the future with more data collection and less labour

DeLaval, Sweden

Johannes Aalberts is a dairy farmer who believes investing for the future with less manual work and more data collection is the way forward. The farm currently has 950 cows, but the family's goal is to increase the herd size to 1,400. The farm also has 20 employees. In other words, there is a lot to keep track of. When all cows are being milked on the rotary the farm management system DeLaval DelPro records all events and life becomes a little easier. The high producing herd has an average yield of close to 11,000kg ECM and a SCC below 150,000; this requires accuracy in data collection and consistent milking routines.

Rotary systems are the most efficient milking system on the market but to utilise them in the most efficient way depends on how the system components are put together. When planning was made for the new milk centre, the focus was on less time on non-value adding work and more time spent on tasks that bring value to the farm. As more cows are being milked by fewer operators, more and exact data is required to keep the quality and production on top.

Therefore, Johannes and his family made an investment in the future where they decided to go for a DeLaval milking system. A system where they can do more with less by gaining higher capacity to harvest more milk with higher quality. They can take decisions with better accuracy and reduce the use of scarce resources. This is possible with the milking system setup they decided to go for the parallel rotary PR3100HD, TSR (teat spray robot), DelPro herd manager and sorting gates.

Performance was one key criteria and therefore the PR3100HD was chosen based on visits to other farms with PR3100HD rotaries up and running nearby. Findings that Johannes made during these farm visits included the unique design, like an angled bail, the 1.5 wide cow entrance ensured high throughput and that the capacity of the platform was also kept on a high level.

One demand for the milking operation was that the milking process should be driven with only two persons in one milking session: one doing the cow-traffic, the other person prepping and attaching the clusters.



A proper stimulation of the cows is done by activating the milk-flow-driven stimulation DuoVac/DuoPuls.

One more of the findings, when looking to the future, was the TSR with its accurate spraying reduces teat dip consumption and keeps it on a steady level. It also reduced the amount of manual work for the milking session so work can be spent on more value adding tasks. More focus can be spent on consistent milking routines in the entrance area as the robot takes care of the spraying at the end of the milking session. Due to the fact that the teat disinfection is not linked to the milking-procedure the TSR is guaranteeing that no disinfection liquid will contaminate the bulk milk.

To be successful in herd management tasks a superior ID is required, as this is one of the essential puzzle pieces in the rotary milking system. It is possible due to the high ID rate for identification and milk recording etc to get the right information about the right cow. This is the foundation to take the right decision and take action to manage the herd.

"DelPro shows me immediately when a cow needs special attention," says Johannes. "The system quickly shows me the first signs of illness, so that I can sort the cow for treatment. The system works perfectly and discovers all sorts of irregularities, much earlier and much more reliably than a human being."

DeLaval DelPro is connected to multiple sort gates that can separate the cows into different groups after milking. Cows that need special attention after the milking session can be separated from the other cows so treatment work can start immediately, saving a lot of time not collecting cows in different groups.

"Another major advantage of DelPro is that the system keeps track of when a cow is in heat. This means that the cow is selected at exactly the right time for insemination," says Johannes. When DelPro and the herd management part of the system were combined with all other system components like the 50 bail rotary, DuoVac, AirWash and TSR, two people were able to milk more than 200 cows per hour in one shift. With this high efficient milking system the milking routine was performed in a good way. This is reflected in the high production of 11,000kg ECM and the excellent cow health on the farm with less than 150,000 SCC." ■

delaval.com



Canadian farm achieves automation efficiency like no other

GEA, Germany

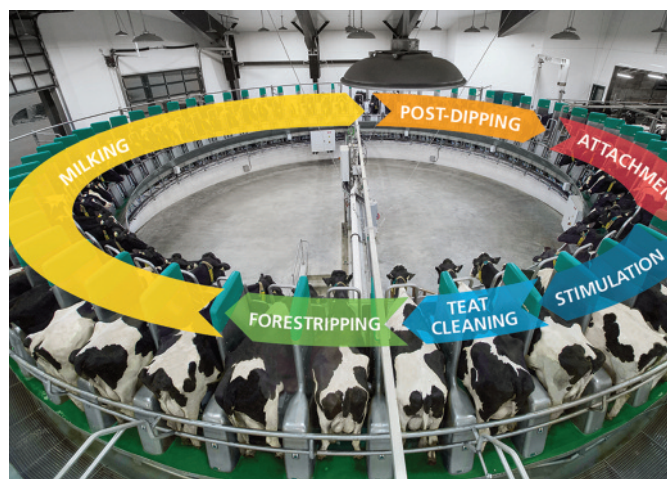
Gracemar Farms knows an opportunity when they see one. In fact, the Tenbrinke family jumped at an opportunity to install GEA's DairyProQ, the first fully automated external rotary parlour in North America. Taking advantage of this new technology paid off big with efficiency, production and milk quality.

The Tenbrinke's journey started with a desire to become more efficient. The farm was running at maximum capacity milking 750 cows in a conventional parlour in Chilliwack, British Columbia, Canada, and an additional 150 cows at a second location in Armstrong, British Columbia.

"We were limited with our traditional parlour because of how much time it took to milk. We were averaging just 150 cows per hour with each milking taking 5-6 hours," says John Kampman, who owns Gracemar Farms with his brothers-in-law, Richard and Michael Tenbrinke, and father-in-law, Wally Tenbrinke. When approached about the new milking system in early 2015, the family was immediately excited about the opportunity.

"We always said if we were to invest in a new milking system it would have

DairyProQ's monitoring technology provides one-touch access to cow and robot performance data.



From stimulation to post-dipping, each milking step is completed in one attachment without any human intervention.

to be a rotary since our management style revolves around milking three times a day," says Kampman. After touring installations in Germany, Kampman knew DairyProQ would be a great fit. "We were impressed right away with the speed of milking, attachment speed and consistency of milking."

Plans were drawn, and their DairyProQ robotic rotary was up and running in March of 2016. At 60 stalls, Gracemar is currently the largest DairyProQ installation in the world. Since installation, Gracemar has cut their milking time in half, milking 300 cows per hour, while increasing their herd size to 1,050 cows with only one operator in the parlour. "By improving our milking speed, we have been able to increase efficiency and cow throughput," says Kampman. "We have also been able to reduce labour costs by bringing the milking cows from our second farm to the main herd."

DairyProQ's all-in-one milking process helped increase milking speed at Gracemar. Every milking step is performed inside the teat cup – without any human intervention – for a fully automated milking process. Stimulation, cleaning, fore-stripping, milking and post-dipping is all done in one attachment. A time-of-flight camera ensures accurate attachment in a matter of seconds.

The milking process is also more consistent. Automation removes the potential for human error and ensures each cow is milked the same way every time. Additionally, every stall has a robotic module, which means that other stalls can continue milking, even if one stall is down.

For Gracemar, consistency has translated to improved milk quality. "We have seen fewer instances of mastitis and a lower somatic cell count. The sensing technology monitors milk conductivity, colour, temperature and volume in each quarter meaning we are putting better milk in the tank," says Kampman.

Monitoring technology also extends to parlour performance, giving the farm access to data on milking length, robot efficiency and more. Gracemar also implemented CowScout activity monitoring neck bands to get additional insights into breeding and herd health data.

"The data that DairyProQ provides has helped us improve our cow management. We can detect and solve issues quicker," says Kampman. "By automating the milking process, we have more time for things like dry cow and heifer management, hoof trimming and parlour maintenance – things that were difficult to complete before because so much time was spent physically milking cows."

Ultimately, GEA's DairyProQ has offered Gracemar Farms the opportunity for better management, improved efficiency and increased production and milk quality.

"We have been very impressed with the results since we've been milking with the DairyProQ. The efficiency of milking is even better than we expected and has allowed us to continue to grow and remain profitable," says Kampman. ■

gea.com

External rotary system provides an extra helping hand

BouMatic, USA

The Dykemans are no ordinary farm family. In addition to milking a herd over 1200 cows, they are a BouMatic dealership servicing other farm families.

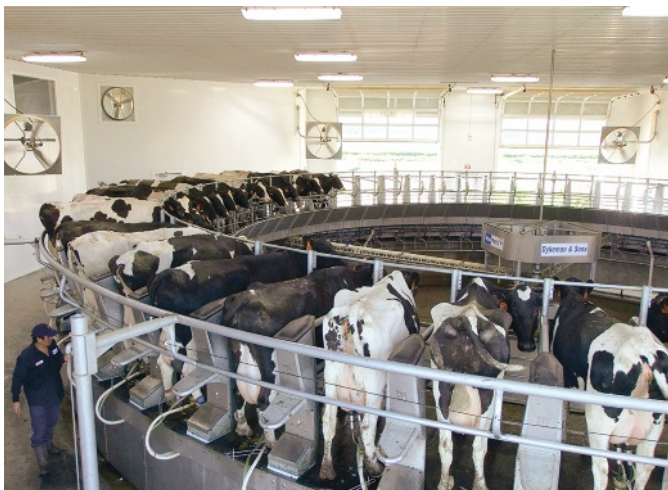
When Mort and Gloria Dykeman started milking in 1969, their herd of 100 cows milked in a Double-8 herringbone parlour. Ten years later the farm became a partnership with the addition of Ray and Roy Dykeman and became Dykemans & Sons Inc. The growth in their dairy led them to a needed upgrade and in 1992 they installed BouMatic's Perfection 3000 Milk Meters and ID and expanded to a Double 12 in the late 1990s. Their milking herd grew from 300 to 600 and more free stall barns were added.

In 2006, the Dykemans decided to rent an additional farm located in Worcester, New York. They were then able to milk another 400 cows and further grow their herd. Ray and Brenda's son, Kyle, graduated from Cornell University at that time and came back to farm with the family. They became a partner in a 500-cow herd with 17 other members called Envision Dairy LLC in 2008.

By 2011, the third free stall was built and the herd had grown to 900 cows, maximising their milking facility at the home farm. This is also when they became a BouMatic dealership.

Feeling a lack from dealerships around them for their own dairy's needs, they felt they had a lot of knowledge to offer to the area. The Dykemans also have a love and respect for BouMatic milking equipment that made the choice an excellent fit. They are currently servicing over 12 dairy farms with one service technician.

In 2016, Dykemans completed their latest expansion with the building of a 60-stall Xcalibur 360EX external rotary. And recently, the SR-1 BouMatic Spray Robot was put into action keeping them on the cutting-edge of BouMatic innovation.



External rotary

Designed for continuous, around-the-clock milking, the BouMatic Xcalibur 360EX is rugged and precision engineered to deliver unrivalled throughput and maximum efficiency for a dairy operation.

Reducing the risk of downtime and finding ways to help an operator save costs with energy efficiency are all factors of the design. Super strong radial arms link the platform to the centre. The platform rotates on a massive circular double I-beam rail system with nylon rollers for the ultimate in smooth operation that is safe and easy on cows. The extremely durable nylon rollers require no lubrication and reduces maintenance costs. The rotary electric drive system saves operating costs with an energy efficient design.

The system also provides comfort to both the cow and operator. The sloped concrete platform deck enhances cleaning and promotes sure footing for the cows and a quiet environment for milking. Low profile cabinets eliminate an intimidating maze of pipes and a well-designed entrance and exit add to the cow's comfort.

Each stall has an integrated system console to house automation components and pulsators and provides easy access to CIP jetter cups. Automation is within easy reach of the operators to prevent fatigue. Fold-down jetter doors are positioned for easy access and quick set-up.

Smooth operation, clean, contemporary lines and easy cow loading and unloading are hallmarks of BouMatic's rotary milking system. Through increased cow comfort, operator efficiencies, improved equipment performance, and long lasting construction, the Xcalibur 360EX provides dairy operators with the ability to harvest the highest quality milk gently, quickly and completely.

SR-1 Spray Robot

The purpose of the SR-1 is to care for and prevent infection of the cow's udder meticulously immediately after milking. The spray robot integrates into the rotary milking system, but functions entirely independently. Because of this it can be applied to every type of external rotary milker.

By applying high pressure to the spraying agent a very fine mist is created. The unique spraying mechanism reduces consumption of the spraying agent compared with conventional sprays.

BouMatic is now focusing on the further development of accessories and components for the spray robot as well as further innovations for the milking parlour.

BouMatic is dedicated to ensuring that dairy farm producers throughout the world have the ability to produce the highest quality milk most efficiently, profitably and responsibly. ■

boumatic.com

Flexible and functional solutions for sheep and goats

Milkplan SA, Greece

Over a thousand farms in Greece use Milkplan systems daily for milking their sheep and goats, and hundreds more worldwide. The company's success in sheep and goat milking systems derives from their flexible and ergonomic design as well as their equipment for quick and easy milking. Their last big project, Albustan farm, is not only one of the biggest in UAE but also one of the largest in the world. It was designed to ensure maximum performance and energy saving favouring the farm's high profit-making potential as well as its future sustainability.

Feeding

In order to ensure the right feed intake, feeding should take place in a comfortable environment and the amount of feed should be distributed equally and uniformly. For the first 2,000 sheep and goats of the Albustan farm, Milkplan installed 4x80m feeding belts, so that employees will not have to dispense feed along the barn. Besides the simplification of the feeding process, the MP feeding belt offers secure locking per site, thus facilitating the marking and vaccination processes. Another great advantage is the fact that employees do not have to walk along the feeding area in their shoes which tends to be too risky in terms of microbes and disease contamination. Following animal well-being recommendations and their experience in the field, Milkplan laid special importance on the neck width as well as the height of the belt so that the whole system meets exactly the needs of the herd.

Animal welfare

Special arrangement of the rest area protects animals from stress, infections or injuries and contributes to the barn hygiene. For this, Milkplan's technicians paid special attention to the barn's design so as to ensure the animals' smooth movement, comfort and welfare. Ergonomic and convenient drinking troughs were placed at easily accessible points to facilitate the herd's daily life.



Milking

For the needs of the milking parlour, the team chose the MP Armektron F4A so that the highest percentage of productivity will be reached in the least time. It is designed for 24/7 operation while assuring milk quality from teat to tanker. Adaptable to any space requirement thanks to its flexible and ergonomic design, MP Armektron F4A offers comfortable movement for the animals as well as minimum labour. Its equipment guarantees maximum flow and less stress to the animal, facilitating quick and smooth milking.

Herd management

To increase herd productivity, enable breed specialisation and improve individual animal production, MP Armektron F4A was installed with an electronic herd management system so that automatic data collection is possible. The accurate and reliable database generates analytic reports needed for decision making and efficient herd management and genetic improvement.

Cleaning

Appropriate cleaning of the milking parlour is necessary for its efficient operation as well as its long durability. That is why the choice of a suitable washing system is highly important. MP Armektron Pulse & Wash 2to1, the innovative automatic washing system by Milkplan, meets all CIP requirements and features applications for automatic hot and cold water supply, time/quality/temperature setting and control, washing cycles and drainage control as well as unlimited program options for any farm. Programmed through a user-friendly digital screen, it offers effective washing combined with minimum water and detergent consumption as well as reduced operating costs. Besides, MP Armektron Pulse & Wash 2to1, provides full electronic pulsation control ensuring pulse signal precision, udder health maintenance and excellent system stability, while at the same time guarantees minimum vacuum consumption.

Milk cooling

A highly important factor for the maintenance of the milk's quality is the process of cooling so as to avoid both the development of bacteria and the increase of milk acidity (pH). At Albustan farm, right after milking, the milk is transferred in MP Powertanks to reach the appropriate temperature and maintain its characteristics unchanged. The appropriate milk cooling tank is the only reliable way to protect the capital of the milk producing farm. MP Powertanks' special design and their evaporators' diamond weld pattern ensure direct dissipation of the milk's heat as well as energy saving and zero coolant leakage.

Sustainability

Having in mind that profitability is the key customer benefit; the aim is to get more milk per hour and of a better quality. However, exemplary farm management presupposes the actions of making farms more attractive for employees, giving farmers more time to drive their business and allowing them to focus more on animal welfare aspects.

About Milkplan

Milkplan operates in the field of farming technologies and equipment designing, manufacturing and selling. The company holds a leading position in the Greek market and it ranks among the biggest companies of the livestock field at an international level. Guided by quality, innovation and consistency, Milkplan exports to more than 75 countries worldwide having over 85% international sales. With 30,000m² company-owned manufacturing facilities, state-of-the-art equipment and technology, advanced industrial know-how and fully certified manufacturing, Milkplan offers flexible and functional turnkey solutions for the construction and effective operation of modern livestock units ensuring high end-user efficiency. ■

milkplan.com

Not only a milking parlour; a fully integrated system

Milkline, Italy

In the Town of Taiki – Hokkaido Island, Japan – three farmers determined to reach a turning point for their business, decided to merge their three small dairy farms into one single company with about 1,000 cows in lactation. The new born dairy farm was named Ocean Link.

This joint venture was supported by the Japan Agricultural Cooperatives Churui, a Cooperative Society that deals with supporting, developing and managing the constitution of big size farms formed by the union of small to medium size dairy farms.

The key aims of Ocean Link were to maximise milking efficiency and milk quality, ensuring optimal comfort for both animals and operators. Specifically, due to the high number of animals to be managed and controlled, an effective and consistent monitoring of the udder and teat health was required. Moreover, as the future perspective was to increase herd size, a solution that allowed a corresponding increase in output and faster cow throughput was necessary.

After spending time evaluating the wide range of systems on the market, the farmers choose Milkline as it offered not only a milking parlour, but a fully integrated system with the most advanced technology. The Milkline's official Japanese dealer Cornes AG planned and managed all the phases of the project providing a complete, highly customised service.

The integrated system that met all the requirements consisted of the Milkline Proactive Rotary Parlour with 60 milking points equipped with the Milpro P4C – the unique milking system on the market that allows quarter-based monitoring and management of the milking process. The management



of the productive process was completed with the monitoring system based on activity and rumination detection and one selection gate to automatically sort animals that need special attention. All these devices were connected to the DataFlow II herd management software, allowing integration and control over the entire productive process.

The Milkline Proactive Rotary Parlour is a parallel external rotary milking parlour, developed to obtain maximum performance. The cows step onto the platform individually and directly in the proper milking stall ensuring a continuous and regular cow traffic flow, thus reducing competitive behaviour among the animals. In this way cows feel quiet, safe and comfortable.

The Milkline Rotary platform provides excellent working conditions for the milkers and makes the milking process easy and smooth as the operator can perform all milking procedures with minimum movements required, assuring a consistent routine. Three monitors were cleverly installed in the milking parlour so the milkers could see in real time events/faults/treatments for each animal, ensuring them a constant overview of the milking process. Moreover, thanks to the touch-screen data terminal they could record important information directly from the milking parlour.

The Milpro P4C is the quarter-based milking system with individual quarter pulsation based on milk flow and stop of the milking per single quarter, substantially reducing over-milking. During milking, Milpro P4C also evaluates the milk electrical conductivity per quarter, makes a diagnosis, and signals possible quarter infection in real time 'Mastitis alert', hugely enhancing the detection of subclinical mastitis.

The identification system is based on HR-LD tags that perform real-time monitoring of the health and the reproductive status of each cow by analysing the animal's activity and rumination rate. Thanks to the merging of these important indicators, the system is able to automatically detect the heat and to provide indications about nutrition and health status of the animal 24 hours a day.

To ensure the highest level of automation in managing the herd, the Milkline Selection Gate was installed, which automatically sorts animals according to specific criteria directly from the milking parlour or through the herd management system.

The herd management software DataFlow II automatically collects data from every single animal and from the connected devices – milking point controllers, monitoring system and sorting gates. All data recorded are processed in real time, generating valuable and insightful information to support an effective decision-making process.

Specific alarms and warnings, for example cows in heat or mastitis alerts, can be notified on the farmer's smartphone and displayed in the milking parlour, improving herd management. The DataFlow II user-friendly interface ensures extremely simple consultation allowing early detection of problems for prompt actions.

The idea of a fully integrated system with a unique and reliable referent was a big success and Milkline was highly recommended to Northern Sky, another new big dairy farm born from the joining of five small farms. Also in this case the joint venture was supported by the Japan Agricultural Cooperatives Churui. ■

milkline.com

More dairy cows equals more units on Irish family farm



cow entering the rotary deck. This allows the operator to continue working but also be fully informed about the oncoming cows.

Pearson Milking Technology, Ireland

The O'Keeffe family are milking 350 cows on a grass based system in Callan, Co Kilkenny in the south east of Ireland. They had previously been milking 80 cows and also had beef stock on the farm. In recent years they have increased cow numbers and reduced their beef enterprise.

They are a spring calving herd and are milking their 350 cows twice a day, with an aim to get to 400 cows in 2017. They had been milking in an 8 a side parlour which was taking five hours in the morning and four and a half in the evening. Mr O'Keeffe has great drive and enthusiasm for the future of his dairy unit but could not continue with this present labour intensive solution and it would not allow for growth to 500 or 600 cows in the future. His aim was to install a parlour that could milk 325 cows per hour.

A decision was made to install a new 50pt Pearson Rotary Milking Parlour to future proof the farm; with a performance of 325 cows per hour with minimum labour. The individual rotary bail meant cows would not be bullying each other for meal during milking and the Pearson low sloped bail design allowed a smooth cow friendly entrance and exit onto and off the deck.

Durability

The industrial design of the Pearson double beam undercarriage and nylon roller system would mean service on the rotary deck would be minimal over its lifespan. The use of stainless steel for milk and pulsation pipes kept yearly service costs down and the Pearson narrow bail design allowed more units to be fitted into the shed when compared to other makes on the market.

User friendly technology

There are no keyboards on the front of the rotary bails to get damaged by cows or water, instead there is a simple LED display strip that changes colour depending on the information received when the cow gets identified onto that bail unit. Green is good milk, Red is reject milk and Blue means an attention alarm. There is also a large durable push button for starting the milking unit.

Animal number/milk yield and attention alarms are displayed on the Global Parlour Monitor positioned beside the operator. This is a touch screen panel allowing an overview of all the animals on the rotary deck and gives total control to the operator to make decisions on the attentions alarmed, like separating cows or registering illnesses or just bringing that cow around a second time to let the operator view her again. The Pearson Voice alarm system was installed, this system puts out a voice message beside the operator letting them know of any attentions with the



Herd management

To reduce another job from the operator during milking the Pearson Auto feed system was installed. Two feed types were required and are activated by an ear tag identification system. Once identified coming onto the parlour the cow gets the relevant mix from each meal feeder dispensed to her. With the Ceres management software controlling the feed units the O'Keeffe family can choose to feed per group/feed to yield/feed to lactation days or steam up and steam down cows depending if they have just calved or drying them off.

To enable expansion on this farm a 12 metre by 60 metre collecting yard was constructed allowing cow numbers to increase to 600 cows if local land became available. To bring the cows up this large collecting yard a Pearson Voyager Crowd Gate was installed. The crowd gate monitors the cow flow through the rotary and automatically moves forward at the relevant times to keep cow flow to a maximum. Cow handling on the exit of the rotary was also very important so a three way sorting system was installed. These items gave the milking operator total control of cow flow in and out of the parlour during milking.

Animal hygiene

As cow numbers increased on the farm, so did the danger of some of the bought in animals perhaps infecting the rest of the herd with unseen diseases. To reduce this occurring the O'Keeffe farm installed a Pearson Cluster Flushing system onto the rotary. Once the cluster is removed from the cow it is automatically rinsed out and disinfected leaving a clean cluster for the next cow to be milked. Also installed was an automatic teat sprayer near the exit of the deck. This ensures the cow's teats are treated with teat spray before leaving the deck preventing infection into the open teats on the way back to the paddocks.

pearson-international.com

Robots prove the perfect solution for west Wales dairy farm

Fullwood, UK

Linley and Marian Griffiths farm 200 acres in west Carmarthenshire, Wales, running 120 dairy cows plus followers on an entirely grass-based system. The Griffiths rely 100% on family labour, with Marian's 80-year old father, Gerwyn, still actively involved in rearing the farm's young stock. Their son, William, 20, has also joined the farm business, and has provided some of the impetus behind a major upgrade to the farm's milking infrastructure.

"We were historically milking through an eight-abreast parlour originally installed in 1967," Linley describes.

The old parlour was updated in 1998 to include ACRs (automatic cluster removers), computerised feeding and milk meters, and the Griffiths family made subsequent improvements four years ago by introducing activity monitoring pedometers to improve the herd's fertility.

Despite the improvements, even with both Linley and Marian in the parlour, each milking was taking a minimum of two hours to complete. The couple were therefore keen to install a new system which would not only speed up the milking routine, but which would also future-proof the farm for William's career.

The Griffiths had previously ruled out a herringbone parlour simply because there wasn't enough space within their existing buildings.

"I was also looking to reduce the effects that the twice-daily milking routine was having on my hands," Linley adds. "I suffer from Raynaud's disease which causes severe pain in my hands and fingers when they get cold and wet. I've been interested in automated milking systems since the first robots were introduced to the UK in the early 1990s and saw them as a way of ticking all our requirements." Two Fullwood M'erlin robots have therefore been

The cows at Blaencorse took to the robots exceptionally quickly and have responded to more frequent milkings by giving improved milk yields.



Cows have 24-hour access to grazing during the summer but are still averaging 2.5-2.7 milkings per day.

installed within the area previously occupied by the abreast parlour's collecting yard.

Both robots feature a twin-exit design that allows cows to be directed back to the cubicle house and feed barrier, or diverted into a small holding area for veterinary attention.

"That feature was one of the main reasons for choosing the Fullwood machines," Linley continues, "plus the fact they are so quiet when operating thanks to an all-electrical milking arm. Other systems use pneumatic air to move the cluster which can be noisier and more intrusive, especially for timid cows."

Training the cows to use the robots turned out to be far simpler than Linley and Marian anticipated. "We had prepared ourselves for months of physically pushing the cows into the robots," Marian describes. "But by the third day the vast majority were using the robots voluntarily. It was simply a case of using the touch screen panel on each robot to guide the cups onto the teats for the first time. After that, the robots were able to refer to each cow's previously stored teat co-ordinates to quickly and easily attach the cluster."

Marian and Linley's daily routine starts at the same time as it always has, but now finishes earlier thanks to the extra time not spent in the parlour. We now have more time available to walk through the cows, check for signs of bulling and keep on top of routine jobs such as foot-trimming. It is a more relaxed, more productive environment for us and the cows."

Being situated in south west Wales means grass grows in abundance at Blaencorse Farm. As such the herd grazes from the end of March through until mid-October, with 24-hour access to fresh grass during the summer.

"We've installed a segregation gate in the cubicle shed to prevent cows going outside if they are due to be milked," Linley describes. "During the robots' first winter, when the cows were housed, we were averaging 3.3 milkings per cow per day, with the high yielders reaching five or more milkings. Even with 24-hour access to grass the herd is still averaging between 2.5 and 2.7 milkings per day. The increased frequency has had a direct impact on productivity, with milk yields rising during the first six months from 9,000 to 9,300 litres per cow."

These yield improvements have been achieved without any additional feed inputs: "Previously we were feeding 4kg of blended feed per head. This year we are down to just 2kg. We are feeding the same amount of parlour cake, but because the robots are able to identify each cow individually, we're able to target feed according to yield. As a result, our peak yields have improved, with our record daily production for an individual cow peaking at 67 litres, with several other animals easily achieving in excess of 50 litres per day."

The M'erlin robots have proven to be the perfect solution for the Griffiths. "We have installed a new milking setup with minimal disruption to the herd and seen a good increase in milk yields. Our working day is more productive and the farm is now set up for a long future in milk production." ■

fullwood.com

Ensuring an optimum environment for animals and people

Waikato, New Zealand

The new dairy on the YiLi Group Hua Yuan farm in China reflects the Group's high standards for creating the optimum environment for animals and people.

The Inner Mongolia Yili Industrial Group (YiLi) is China's largest dairy producer and the 10th largest dairy company in the world. The Group owns a large number of dairy farms in China varying from small family units up to large intensive 24 hour operations.

The Hua Yuan farm is located in the Heilongjiang Province, 250km north west of Harbin city. Heilongjiang has always been a dairy province but is enjoying a resurgence as larger, more intensive farms are developed.

According to the Waikato Milking Systems' Country Manager for China, David Morris, planning for the Daqing farm began around two years before the farm became operational.

This is nothing unusual. The YiLi Group has very high standards across all its operations and particularly in relation to the housing and care of animals and the creation of an ideal working environment for its people.

One example of this commitment can be seen in the Group's requirement that the approaches to, and on, the milking platform have to be covered in rubber to provide a cushioned surface for the cows to stand on. This is a response to the fact that hooves tend to be softer with animals which live indoors.

David Morris said that he and the company's Chinese dealer, Beijing KingPeng Global Husbandry Technology Co Ltd, worked with YiLi throughout the two year planning and construction phases of the farm.

"The climate in Daqing is relatively mild during summer and very cold in



winter so the walls and roof of the cow barns and the milking parlour are insulated.

The cows live indoors all year round and are fed a total mixed ration diet of grain, grass and silage mostly grown in the Heilongjiang Province.

An 80 bail Waikato Milking Systems Orbit concrete rotary was selected to milk the farm's 2,200 cow herd equipped with SmartECR (automatic cup removers), bail gates and AfiMilk Herd management.

The Orbit rotary platform provides operators with a clean, fast milking environment. Cow flow on and off the platform is excellent and the milking equipment is easily accessible – all factors which were important to YiLi.

Waikato Milking Systems has an office and warehouse in China and a team of full time installers headed by Installation Director, Jim Duan, who worked with KingPeng on the construction of the dairy.

Their dairies and systems are in demand in China so their New Zealand trained Chinese team is very thorough and highly specialised to provide a high consistent standard to each and every dairy.

Jim Duan and his team, supported by a technician from New Zealand, provided support and expertise leading up to the commissioning of the dairy in July 2016.

Training of cows for a large operation like this can be challenging because the animals are of varying ages with varying backgrounds. Many are heifers so some time is always allocated to training them to walk on and off the rotary platform. However, the YiLi team reported that the cows settled to the new environment within a couple of days and flow on and off the platform very easily.

The Daqing herd is Friesian of mostly New Zealand origin and is milked three times a day all year round.

Around five people operate the rotary, each with a specific role in the 'spray and wipe' process which is common in China to enhance hygiene. One person sprays the udder when the cow comes onto the platform, the next wipes the teats before two people cup the cows. At the end of milking the cups are removed automatically (by the SmartECRs) and the final member of the team dips the teats before the cows leave the platform.

David Morris said YiLi is very impressed with the new dairy.

"From day one the platform and milking system performed smoothly and consistently with no problems. The staff have found the operation of the milking system to be logical and easy and find the milking environment to be quiet, light and airy.

"I was impressed with Yili Group from the first time I met with them at the Inner Mongolia Hohhot Headquarters. Their attention to design detail from cow flow to the equipment function was clearly a top priority in their brief for the project and I am delighted we achieved that."



waikatomilking.com

All-round system for all aspects of dairy farming management

Afimilk, Israel

When two well-known Israeli dairy farms on Kibbutz Gazit and Kibbutz Mishmar Ha'emek decided to merge under the Nofim Farm co-operative, the stakes were high. The project involved consolidating the two farms (with 400 cows each) into a new, cutting-edge dairy facility located at Kibbutz Gazit – a complex undertaking that required the careful planning and execution of every single aspect at the new farm.

The dairy farm at Gazit already had proven experience with Afimilk farm management solutions, and after additional market research and careful consideration, the Nofim Farm co-operative decided to go with a fully integrated, state-of-the-art Afimilk system at the new facility. Based on the requirements, an end-to-end solution was installed that combined an Afimilk R600 60-point rotary dairy system with the AfiFarm 5.2 herd management solution, AfiMilk MPC Milk Meter, AfiLab Milk Analyser and AfiMilk MCS (Real-Time Milk Classification Service).

Calm and safe milking environment for the herd

Ideal for large-scale 24/7/365 dairy farms, the robust, yet automated and easy-to-manage, Afimilk R600 rotary dairy system creates a calm and safe milking environment for the Nofim Farm's large herd. With a record rate of up to 500 milking cows per hour, it maximises parlour throughputs while achieving optimal milkout for cows and improving overall milking quality.

The wide-open entrance design allows for quick, efficient loading of the cows onto the milking platform, and the intuitive exit design makes it easy for the animals to leave. Moreover, the herd manager can control the rotary speed based on the needs of his herd; and adjust it using the data accumulated by the AfiFarm management interface, which includes cow ID and recognition, milk yield, milk quality, constituents, and automatic sorting.

Everything needed for safe and efficient milking

But that's not all. By integrating Afimilk's best-of-breed solutions, Nofim Farm benefited from a comprehensive dairy farm management solution that



incorporates everything the farm needs to safely and efficiently milk its cows.

With the In-Line Milk Lab – which pairs the industry-leading AfiMilk MPC Milk Meter with the AfiLab Milk Analyser – the farm benefits from integrated milking point analysis and control. This enables the timeline identification of changes in milk production and solids for the earlier detection of health problems; the early detection of nutritional deficits and poor feed quality; the prevention of milk contamination by ensuring proper wash procedures; and an improvement to the entire milking environment for better overall herd health and management.

The AfiMilk MCS further enhances the solution by analysing each pulse of milk in real-time at the milking stall according to its coagulation properties. Based on the results, the milk is separated into milk for making cheese and milk for fermented or other fluid milk products, and channelled to designated bulk tanks on the farm. This significantly increases cheese production yields and streamlines operations and logistics on the farm.

End-to-end dairy farm management solution

All of the Afimilk technology is managed by the AfiFarm 5.2 software – the ultimate herd management tool. The fully integrated AfiFarm dairy farm management software collects information about each cow and gives dairy farm managers access to an accurate and comprehensive real-time view of their herd's health and fertility, milk quality and productivity, calving status, and more.

The real-time data is stored, analysed and displayed in reports on a user-friendly dashboard that, together with decision-supporting tools, enables dairy managers to make the best possible decisions with regard to milk production, components, animal behaviour, health conditions, parlour equipment, nutrition, and more. In addition, the farm managers can stay connected and updated at all times with notifications to their mobile phones via SMS or the Farm Notification app.

With the end-to-end Afimilk dairy farm management solution, Nofim Farm benefits from a labour-efficient milking parlour, a consistent daily cow routine and work routine, a high level of efficiency and throughput – and an all-round, world-leading solution that takes every aspect of dairy management into account.

[afimilk.com](https://www.afimilk.com)



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www.positiveaction.co.uk



UK surveys reveal the importance of home produced forage

At least nine out of 10 UK farmers see forage and better use of grass silage as playing central roles in the future of their businesses. But in several vital areas of grass and silage production, farmers are falling short.

Those were the clear messages from experts at a recent UK industry briefing to help farmers get more from forage and silage, and following two separate farmer surveys.

According to Ben Wixey, national agricultural sales manager for forage experts Germinal GB, 98% of the 560 UK livestock farmers taking part in the 2016 Forage Use Survey ranked forage as the most important, or one of the most important, factors in their long-term farm business sustainability. Two-thirds of respondents said they were actively striving to do a better job with forage management.

Despite these very clear statements of intent, the rate of UK reseeded grassland is, on average, well below that required to maintain swards in anything close to maximum productivity.

“Only one in five of the livestock farmers taking part in the survey stated they were reseeding more than 10% of their grassland each year,” added Ben, “and almost half were reseeding less than 5% each year. This clearly points to significant lost potential, but more importantly a great opportunity for the industry to do better.”

These results were echoed in a separate UK survey of over 100 dairy farmers, which found that, despite high levels of concern

about future volatility in milk price and feed costs, and 90% of farmers rating greater use of grass silage as extremely or very important in helping to reduce bought-in feed costs, there were worrying shortcomings in silage-making techniques.

“Clearly, producing good grass and good silage makes a lot of sense for improving farm business sustainability,” said Derek Nelson, product manager for animal nutrition and silage experts Volac. “But if farmers are to genuinely increase milk production from home-grown forage and reduce bought-in feed use, it will be essential to address these shortcomings.”

“More than 80% of dairy farmers in the survey were looking to reduce bought-in feed costs. However, UK silage quality does not seem to be improving,” he added.

Cut to Clamp initiative

In response, Volac is launching a new ‘Cut to Clamp’ initiative in the UK this spring, aimed at helping farmers produce consistently better silage by focusing on best practice in six key areas: cutting, wilting, treating, harvesting, clamping and feeding. Several of these were problem areas in the survey.

The survey found nearly one in five farmers was cutting first cut grass either at heading or afterwards. “Although this increases yield, it compromises quality, and therefore potential milk production,” Derek said.



“Similarly, nearly 80% of dairy farmers in the survey were wilting for 24 hours or longer. But the objective should be to wilt as quickly as possible to 28-32% dry matter, which may take less than 24 hours. The longer you wilt, the more vital sugars are lost.”

More worryingly, the survey highlighted some poor understanding of fermentation to preserve grass silage – with only 40% of farmers recognising that a good fermentation converts some of the crop’s sugars into acid, and nearly a quarter not recognising that it was important to exclude air.

“To maximise the quantity and quality of silage cuts, it will be important to follow best practice techniques,” Derek added.

“When it comes to preserving the nutritional value of silage, look for a silage additive that is proven.”

“Studies have confirmed that treating forage with the MTD/1 strain of *Lactobacillus plantarum* in

Ecosyl has delivered more DM conserved, better preservation of feed quality, and improved milk yield per cow.

“Best practice silage-making includes techniques such as cutting at the correct time, good clamp management with effective sealing, and maximising the numbers of beneficial bacteria available for fermentation. These issues, plus others, are some of the key areas that Cut to Clamp aims to address.”

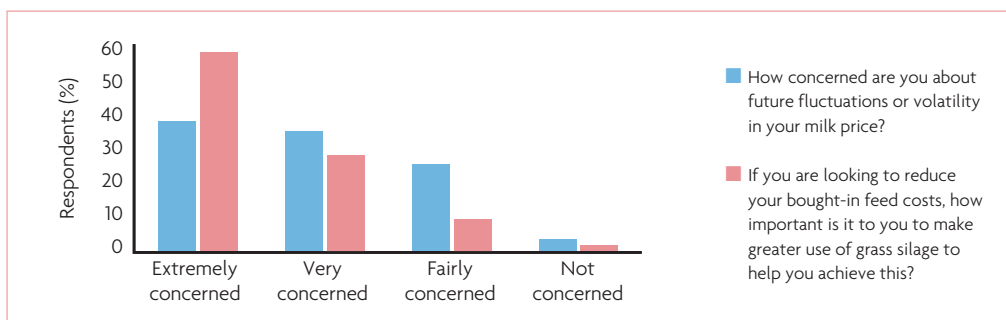
Start with the right material

Supporting Derek’s overriding quest for better forage quality, Ben Wixey stressed the importance of starting with the right raw material, something that can only be achieved if swards are in the best possible state. He pointed out that under most circumstances, reseeding offers a rapid return on investment.

“Reseeding more regularly will ensure more of the grass being harvested will be the original sown species, as opposed to weed species, so there will be a tangible increase in the value of the crop.”

“Even assuming quite modest increases in dry matter and D-value, the extra performance achievable from the higher quality forage will often pay for the reseed in the first year,” he said. Cut to Clamp will be rolled out over coming months via a dedicated website, videos and tools to help farmers benchmark their silage-making, and via a number of silage audits carried out by Volac on-farm experts. ■

Fig. 1. Results from a Volac survey of 100 dairy farmers.



Provide your cows with a treat that improves their health

A cow has a natural instinct to groom herself. It is also a social behaviour allowing them to bond with others in the herd.

boumatic.com

Offering a brush into the environment enables the cow to focus her energy on something intended for rubbing. Without a brush, she could inadvertently injure herself by rubbing on something sharp. Also, by grooming, the cow's skin is cleaner and there is a reduction in the num-



ber of parasites and organisms on the cow's coat.

Cow brushes increase blood circulation overall, which positively affects circulation to the udder. Promoting blood circulation can result in an increase in milk production and has been shown to reduce cases of clinical mastitis. By walking more and lying in their stalls for a shorter period of time, cows may be lowering their exposure to bacteria present on the stall's surface.

The BouMatic Cow Brush is comprised of single brushes with a stainless steel core housed in a closed and solidly protected cabinet.

Heavy duty bearings located at both sides of the rotation shaft add to its robustness. The high quality nylon brush provides a comfortable scratch to the cow with the right length and firmness of bristles to stimulate blood circulation. The brush has added features of an automatic reverse and automatic on/off control to aid in a longer life for the bristles and energy savings.

Not just a mattress, but an enveloping comfort

The Aquastar Ultimate, recently developed by Bioret Agri, combines all the benefits of a latex mattress as well as the traditional single chamber waterbed with the Aquaboard, a new and innovative water filled brisket board.

bioret-agri.com

More than a mattress, the Aquastar Ultimate is an enveloping comfort that conforms to all morphologies and 'accompanies' the movement of the animal. The water contained in the top cover cushions all pressure points and optimises blood circulation. Test results demonstrate that when a cow lies down on the Aquastar Ultimate, the water pouch works like a heat exchanger so that her heat is transmitted to the entire water pouch minimising retained heat under the cow's body with a cooling effect.

By reducing heat stress, the Aquastar Ultimate will maintain greater cow comfort and avoid excessive internal energy consumption that reduces milk production.

Part of the Aquastar Ultimate, the Aquaboard, a unique water filled brisket board assures the reduction of trauma during lying down or standing up compared with other existing solutions as the water gently 'positions' the animal.

The adjustable height adapts to any combination of cows, genetics, cubicles and mattresses. You can control the water pressure inside the tube and therefore adjust the height and firmness of an Aqua Board to attain perfect comfort for your cows. With the Aquastar Ultimate, cows lie straighter and more comfortably in cubicles.



Exhaust fans and cooling pads for the best cow comfort

In order to ensure the necessary thermal comfort of dairy cows during the hot season, farmers can opt for building and plant solutions that improve the environmental conditions of the barn and speed up heat loss from the cows.

pericoli.com

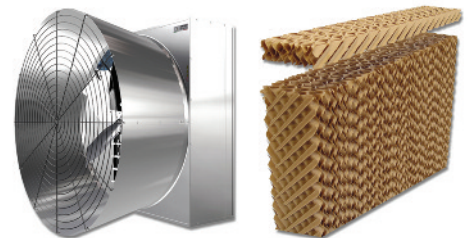
The Pericoli Group has successfully developed and designed a completely innovative project that combines the benefits induced by mechanical ventilation and evaporative cooling, a solution that is widely used in poultry farming.

This system, commonly known as 'cross ventilation', can create a uniform transversal airflow in the barn: this combines the benefits of the adiabatic cooling produced by the cooling pads and the 'windchill effect' generated by the exhaust fans (EOC53) with

high levels of energy efficiency in order to minimise the costs.

This system is innovative because it combines the idea of an open barn characterised by an active air movement by circulation fans with a cooling system managed by exhaust fans – which work in negative pressure – and the cooling pads that humidify and reduce temperatures, thus ensuring the animals have a feeling of freshness and heat loss.

Furthermore, it has been verified that this cooling and cross ventilation system guarantees considerable savings on energy costs thanks to the efficiency of the exhaust fans.



Better calf rearing in real outdoor calf barns

An optimal barn climate can prevent respiratory problems in calves almost completely. The following factors are important:

- Plenty of fresh air.
- Absence of draughts.
- Low ammonia.
- Large space for all calves.

holm-laue.com

These factors are often not well implemented in conventional calf barns and even sophisticated ventilation concepts have a great risk of pneumonia.

The solution is very obvious: genuine outdoor climate stalls offer all the advantages mentioned above. Calf hutches play an important role here. Calves grow in fresh air and the hutch provides protection against draughts. However, uncovered hutches may draw moisture into the litter and often only the inside of the hutch is bedded. The calf is forced to lie inside the hutch instead of outside in the fresh air.

A cost-effective solution is a simple roof for the hutches. It keeps the litter dry and offers extra shade in summer. The calves will spend more time outside the hutch.

This can also be implemented in group housing. Spacious Igloos offer space for up to 14 calves and the Igloo Veranda provides protection against rain and sun, as well as shelter for the operator. In addition, each calf has plenty of room with a minimum of 2.5m² each. Due to the wheels, the Veranda is mobile and can be moved for mucking out.

It is an optimal house for young calves and very inexpensive to build.



The first lighting system built for cows – and farmers

DeLaval cow LED systems deliver light with extreme precision. The light is distributed evenly and exactly where it has the most effect.

delaval.co.uk

Studies have shown that milk production increases when cows are exposed to 16 hours of light each day. But by studying which aspect and level of the light spectrum causes the effect – a reduction in hormone levels – DeLaval was able to identify that the same effect could be achieved using a lot less energy, simply by removing the light that cows can not see. The results are clear. Cows’



yield still increases due to longer light exposure, but the energy needed to achieve this can be reduced by up to 75%.

For the remaining eight hours, cows need to rest. The night light setting provides low-level, low-energy light that allows night routines such as letting cows find their way to the VMS or feed table, to go on without disturbing resting cows.

In the words of Mr Kloek, a farmer from the Netherlands, who has been using the LED lamps now since March 2016:

“I have not seen a winter dip in milk production. My cows stayed at a high level during the autumn, where I used to see a drop when the days get shorter.”



Maximum comfort and optimal hygiene for the well-being of cows

Cow comfort and well-being is drawing increasingly more attention. To achieve the best cow comfort, GEA provides a whole range of cow mattress and bedding systems.

gea.com

The advantages of the GEA bedding systems are evident both from a cow comfort and economical point of view. A well-rested cow ruminates more efficiently and is able to produce more milk. Essential in a GEA bedding system is the amount of grip it provides. This means that the cow will feel much

more confident lying down and standing up. In addition, the design is rugged and therefore able to withstand many years of intense use.

The GEA bedding systems (Durasoft, Polysoft, Gummysoft, Akwasoft, Gummystuds) are the result of over 20 years of experience in cow mattress systems.

For the future, the introduction of the tried and tested GEA Contour Mattress System is planned for Europe.

This airbed mattress system is designed to promote the natural lying behaviour preferred by cows.

Improving dairy herd mobility and security

Animat Inc is a world-leading manufacturer of rubber flooring for dairy, equine, beef and cattle installations, thanks to a complete line of products that can be adapted to fit every single space.

animat.ca

The Interlock, Animat’s flagship product for over 30 years, is made of first quality recycled SBR rubber and is DLG approved. Its unique pebble top design reduces risks of fall and slippage, improves herd mobility and security, while the unique 2D or 3D puzzle design can be adapted to virtually any floor configuration and cleaning systems.

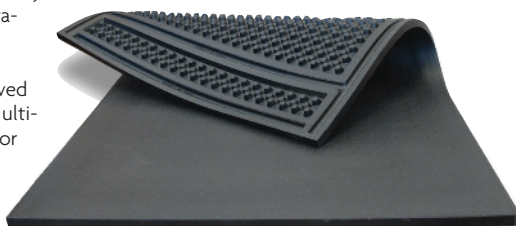
The DLG Approved Animatress I, the ultimate in comfort for cow stalls, consists of an open cell PU foam concealed in a 3mm top cover with backing. It contributes to herd welfare and promotes resting time.

Another DLG approved product, the Animatress III, is also made

from first quality recycled SBR rubber. The combination of the unique pebble top design and underside cushioned design helps in reducing falls and slippage. Cost effective, durable and comfortable, the Animatress III is proven for any type of stall, is easy-to-install and is available in Interlock.

The MaxGrip mat is specifically designed for use in areas where traction is crucial for herd movement. It reduces overall stress and provides optimum traction in strategic locations.

Finally, the Transition mat, Animat’s newcomer, is precisely



designed for calves <250kg. It provides the level of comfort and security for calves to grow strong and confident and to perform up to their genetic potential.

Converting metal into high quality innovative products

Ebbers Metalworks BV in The Netherlands converts metal into high quality, innovative products by means of technological processes and modern machinery.

ebbersmetalworks.nl

For dairy cows the company can provide professional stainless steel Dutch quality yard scrapers.

Their Proline yard scrapers are

available in two working widths of 40 or 55cm. The scrapers are equipped with smooth and durable rubber strips, reinforced with canvas, which can be exchanged easily.



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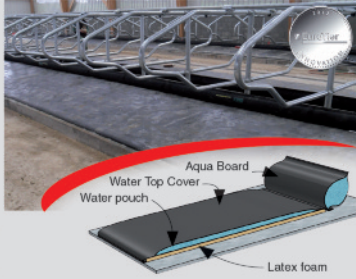
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Link to the White Paper - Dairy Cooling: The Benefits and Strategies



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 - Farm management for better productivity.



How to conduct flavour preference trials in dairy cows

Feed flavours are additives that are being increasingly used in animal nutrition as a tool to enhance both the smell and taste of feed, in order to improve feed intake. It is generally observed that a higher feed intake in animals leads to improved performance and consequently a higher return on investment.

by Joëlle Faugeron, Product Manager and Clément Soulet, Business Development Manager, Pancosma, Switzerland.
www.pancosma.com

This potential of flavours to enhance feed palatability and thus intake has generated a tremendous amount of interest in such additives. Livestock animals, and more particularly ruminants, have demonstrated sensitivity to variations in the smell and taste of the feed they are given, which directly influences their feeding behaviour.

Higher feed intake in dairy cows has been shown to improve energy balance during the early lactation period, and higher milk yield in the mid-lactation phase. Dairy farmers usually choose flavours that they believe are preferred by cows.

Objective assessment

A preference test or choice experiment is a method to objectively assess animal preferences for different types of flavours.

By definition, a preference test is an experiment in which animals are exposed to several conditions, each differing in one or more variables. This type of test is often used to compare different feeds and the effect of each type of feed on consumption and preference. The selection of a specific type of feed by the animal is obviously driven by preference, but one has to bear in mind that this is limited to the options of available feed. This means that in a test where several different flavoured feeds are offered, higher consumption of a specific flavoured feed does not imply that the animal likes that particular flavour, but that it is preferred among the available flavours.

To get useful results, a preference trial has



An example of poor feed tray positioning in a preference trial.

to be carefully set up. First of all, the parameters to be measured should be relevant. In most cases, feed intake is a key parameter that is assessed in trials to determine flavour preference.

Depending on the conditions (indoor or outdoor trial), it might also be useful to measure the period of time the animal spends consuming the feed.

For other types of products (sweeteners, bioactives, etc), it may be important to measure secondary response variables such as metabolism, milk yield, and milk composition. Different techniques can be used to assess feed intake and animal behaviour in indoor trials, including direct observation, video or photographic recording. In any case, one must ensure that the animal is not disturbed by the measurement.

The design of the area where the different types of feed are given to the animal is also important. It is possible that the lack of space around some of the feed trays can distort results. An example of poor feed tray positioning can be seen in the picture above, in which feed in the side trays (trays 1 and 4) was consumed much less than the feed in the middle trays.

To alleviate any position bias in the results, a proper rotation of the feeds between the different tray positions should be planned. This would also avoid the natural preference of animals for any one position. The size of the bins should also be

adapted to the size of the animal's muzzle. Undersized bowls would thus make it difficult or even impossible for cows to eat.

Hunger is a disruptive factor in tests as hungry animals tend to eat whatever is given to them, without demonstrating a genuine preference. Therefore it is advised to run the trials once the animals have been already fed. An acclimation period that will allow animals to adjust to the conditions of the experiment is also recommended.

Assessing palatability

For palatability assessments, an adaptation period to the feed of more than one day is necessary. In case of preference tests comparing different flavours with a neutral control, the feed should not be the one the animals are used to eating.

Previous exposure to feed is known to have an influence on preference and intake. The number of animal replicates is often between six and eight per treatment for indoor experiments. In addition, the number of treatments generally varies from 2-10 for indoor trials. In addition to numerous sensory evaluation tests performed by in-house panelists, Pancosma always validates its palatable creations with appropriate animal trials. Animal palatability trials are always complex to perform. It is therefore crucial to pay rigorous attention to obtain accurate and reliable results. ■

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Number: 20
Rotavirus

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Introduction

Rotaviruses cause diarrhoea in many animals, including man. They are classified by a complicated system into serogroups (groups), serotypes and subgroups. Even though these viruses share certain antigens and cross infections do occur, in general resistance is specific and cross protection against heterologous strains is poor.

The situation in calves

The common cause of infection in calves is by group A serotypes and, less commonly, by group B. Based on serological surveys, rotavirus is common globally. Older calves act as a reservoir of infection and rotavirus carriers. They intermittently shed the virus.

Rotavirus coexists with other pathogens in young calves afflicted by diarrhoea, such as ETEC and *Cryptosporidium parvum*. Mixed infections of rotavirus and bovine viral diarrhoea (BVD) virus is more severe than that caused by each virus on its own.

Neonatal calves are at greatest risk from rotavirus infection and most infections occur in the first week of life. Morbidity is usually high (50-100%) and mortality variable. Clinical disease and mortality is influenced by several things including level of immunity, magnitude of dose, viral serotype, concurrent intestinal infections and degree of crowding. Uncomplicated infections are often self-limiting but in the field infections range from inapparent to mild or moderate to fatal. Generally the younger the calf, the higher the likelihood of severe disease with mortalities. This is due to the loss of water, electrolytes and nutrients as a consequence of the diarrhoea.

Pathology

Rotavirus infections are confined to the small intestine where they destroy the cells on the enteric villi. The infection is characterised by maldigestion and malabsorption.

The level of local passive immunity conferred from colostrum intake determines the risk and relative severity of the infection.

Clinical signs

Rotavirus infection can not be differentiated from ETEC and other enteric pathogens on clinical signs alone. It has previously been noted that the manifestation of this disease can be influenced by a variety of factors. In rotavirus infection the faeces are usually watery and yellowish in colour.

Rotavirus infection in the youngest calves is accompanied by depression, dehydration and shock. These signs are rarely seen in calves over two weeks of age.

Palm oil and body weight loss

Addition of rumen protected fat to the diet of cows may limit negative energy balance and/or shorten its duration, leading to increased milk production with a reduced risk of metabolic disorders in dairy cows. The objective of this Serbian study (*Chem. and Biol. Techs. in Agric.* 2(6)) was to test the effect of rumen-inert fat supplement of palm oil on milk production, milk composition, rumen characteristics and metabolic variables of early lactating dairy cows.

The results indicated that palm oil supplementation in weeks 4-12 postpartum spared postpartum body weight loss, increased milk yield and milk fat content and had positive effects on rumen characteristics.

Heat stress in Belgium

This paper (*Mededeling ILVO No. 185*) reported on studies during 2011-13 in Belgium that looked at the effects of summer temperatures on the thermal comfort of Holstein dairy cows, as well as their energy metabolism and milk production.

In addition, the use of shade to prevent heat stress was investigated by assessing its effect on microclimate, cow behaviour (voluntarily going to shaded areas) and heat stress reduction levels.

Increasing temperature increased cow discomfort and slightly reduced milk production (by approximately one litre a day), while offering a shaded area improved cow comfort.

Accelerometer accuracy

This American trial (*J. of Dairy Sci.* 99 9109-9113) looked at the use of an accelerometer to measure step activity and lying behaviour in dairy calves.

The correlations of step activity, lying bouts and lying time between video recordings and the results from the AfiTag II were 0.99. The correlations between AfiTag II and an accelerometer (HOB0 Pendant G data logger) were 0.99 for lying time and 0.93 for lying bouts.

The high correlation between video recordings and AfiTag II suggest that this device can be used to measure step activity, lying time and lying bouts in unweaned dairy calves housed in groups.

Bovine leukaemia

This Canadian lifetime study (*Prev. Vet. Med.* 133 1-9) was undertaken to determine the life time effects of enzootic bovine leucosis on longevity and milk production in Canadian dairy cows and used retrospective data from 1998 to 2003.

It was shown that leucosis test positive cows produced substantially less milk than their test negative counterparts.

Uterine involution

The objective of this Polish study (*Annals of An. Sci.* 16 759-768) was a comparative study of uterine horn diameter, blood calcium and magnesium concentrations and uterine washings in cows with or without endometritis on uterine involution.

The results confirmed that the process of uterine involution is slower in cows with endometritis and that the endometrium of the inflamed uterus does not utilise sufficient

amounts of calcium and magnesium. This means that the concentrations of these minerals in uterine fluids are higher than in cows without endometritis.

Feeding fresh forage and TMR

This Uruguayan trial (*J. of Dairy Sci.* 99 8779-8789) looked at the consequences of increasing access to high quality, temperate fresh forage for cows fed a total mixed ration (TMR) in relation to energy intake, rumen fermentation, microbial protein flow, passage rate, nutrient digestion and utilisation, and metabolic and endocrine profiles.

It was concluded that more than four hours of daily access to high quality, fresh forage in the diet of dairy cows fed a TMR reduced energy intake and balance but had no effect on nutrient digestion or utilisation.

Tropical calves

This Brazilian work (*Trop. An. Health and Prod.* 48 1387-1394) was undertaken to assess the energy and protein requirement in Holstein calves up to 87 days of age.

It was shown that the actual requirements of newborn calves were higher than those cited in the literature and that the requirements of newborn calves were higher than recommended.

Subacute ruminal acidosis

These Chinese trials (*J. of Dairy Sci.* 99 8790-8801) were undertaken to assess the relationship between thiamine and grain induced subacute ruminal acidosis (SARA) on thiamine status in blood and rumen fluid.

It was concluded that thiamine status was affected by SARA and ruminal infusion of thiamine could help by improving the proportions of ruminal volatile fatty acids and reducing lactate contents in ruminal fluid and blood.



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Rapid exit parlour



BouMatic's new innovative rapid exit parallel parlour – the SmartWay 90 – combines the performance and technology of two different BouMatic exit systems: the rotating exit reel (Xpressway parlour) and the vertical lift exit (Xcalibur 90LX parlour). Its major advantage is a remarkably improved cow throughput because unloading times are obviously reduced.

It is the stress-free entry and exit concept that improves the cow throughput. At the end of milking, the operator simply pushes a button to lift the total front rail to its top position, allowing the cows to exit quickly with an open view.

The cows have a large and open exiting space since all sequence gates are mounted directly onto the lifting front rail and, apart from the main support posts, no obstructing ground-mounted posts are in their way. Besides, hesitating cows are gently pushed out when the front rail with sequence gates comes back down and rotates gently into position to load the next cows.

Another great advantage of the SmartWay 90 is the enlarged 29-inch spacing between sequence gates. The cows are placed individually in a perfectly straight position and even the current large breeds move comfortably in this new parlour. On top of that, each stall position is enhanced with shoulder bumpers for the cows' well-being. Finally, after milking, the sequence gates come back into position silently due to their weight, without the traditional spring mechanism. This also reduces annoying noise during the milking process.

The SmartWay 90's upper cabinet has an optimised and smaller design, giving the operator a good overall view and an ultimate udder access. He has more head space and stands in an ergonomically perfect, straight position, close to the cow. The TouchPoint parlour displays are also within easy reach.

The ruggedly built, air operated and secured SmartWay 90 parlour comes in galvanised steel, ensuring long-lasting durability.

boumatic.com

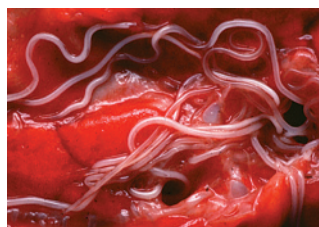
Act now against lungworm



Feedback from cattle farmers during the 2016 grazing season suggests lungworm (husk) disease outbreaks are becoming more prevalent and unpredictable.

An independent survey in the UK last year found that 40% of 202 dairy farmers interviewed had heard cattle coughing at grass.

A third of milk producers (35%) said that they had had lungworm confirmed in their stock at some point over the last three years.



More concerning was the age group spread for the lungworm incidence. As might be expected, half the disease outbreaks were reported in dairy young stock during their first grazing season, but 40% occurred in second season grazers and even 38% in adult cattle.

This suggests animals are simply not developing lifetime immunity to this debilitating disease anymore.

Nearly two thirds of lungworm cases (60%) were reported in the autumn and just over half (54%) in the summer (some farms reported cases in the summer and autumn).

According to MSD Animal Health veterinary adviser Paul Williams, planning husk control strategies for young stock prior to their first grazing season makes sound financial

sense. But relying on wormers alone does not really allow the animal to develop its own natural immunity.

Bovilis Huskvac is a live vaccine, made from irradiated larvae, which are incapable of causing disease. Vaccination should be completed at least two weeks before dairy calves are turned out to grass. For suckled calves it should finish two weeks before the calves begin to eat significant amounts of grass. Wormers should not be given until two weeks after the final dose of vaccine.

"The vaccine produces a very good immune response against disease but it does not prevent all worms from natural infections completing their life cycle. This allows for the continued development of natural immunity, which often fails to occur where there is an over-reliance on wormers," added Paul.

msd-animal-health.com

A new player on the Asian market



Wisium is a new player on the Asian premix market and the company had its formal launch at the recent VIV Asia exhibition in Bangkok.

Through a local and global approach in production management, Wisium offers feed producers a strong and dedicated partnership focusing on creating value: performance, quality, productivity and profitability.

Wisium is the international brand of Neovia, a major global player for over 60 years.

wisium.com



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Unlock feed potential



With poor feed efficiency commonly adding 1.5-2.5ppl to total feed and forage costs on many dairy units, KW nutritionist Dr Matt Witt is urging milk producers to put every aspect of farm operation under the microscope in a drive to increase efficiency this year.

"Improving how efficiently feed is used to support milk output and fertility can have a huge impact on margins," he told International Dairy Topics. "Even a 5% improvement over the average feed and forage cost of 12-16ppl could save 0.6-0.8ppl, worth £1,200-1,600/month (€1,400-1,900) for a typical 200 cow herd averaging 33 litres/day. But it is important to realise that it is not just the ration or feed management that matters."

According to Dr Witt, any factor that affects the cow's stress levels,

comfort, health or access to feed and water can reduce feed efficiency. All need to be examined closely if maximum value is to be extracted from both home-grown and bought-in feeds.

"Some aspects of building design or farm layout do require long-term planning. But many issues are more easily tackled, whether it is inadequate lighting and ventilation, contaminated feed and water troughs, or poor forage production and management.

"Correct ration design and feed are important – for milking and dry cows – but it is often other factors that prevent cows reaching their full potential. If these issues are ignored, no amount of effort put into improving feeding will get performance beyond a certain point," Matt added.

kwalternativedeeds.co.uk

Romer Labs acquires Transia



Romer Labs is establishing itself in the German market following the acquisition and successful integration of Transia GmbH.

The new entity, Romer Labs Deutschland, will offer an extensive range of innovative testing solutions and services in addition to the established product portfolio of the former Transia GmbH.

Romer Labs offers a broad range of innovative tests and services covering mycotoxins, food pathogens, food allergens, gluten, GMO, veterinary drug residues, and other food contaminants.

Furthermore, it operates four accredited service laboratories in Austria, the UK, Singapore and the USA.

romerlabs.com

Bovine tuberculosis detection kit



Thermo Fisher Scientific have launched VetMAX M. tuberculosis Complex PCR Kit, the only commercially available PCR test that detects all seven strains of the M. tuberculosis complex in a single solution.

"The kit is a reliable and fast tool to confirm the presence of mycobacteria belonging to the

tuberculosis complex," Martin Guillet, global head and general manager of AgriBusiness at Thermo Fisher Scientific, told International Dairy Topics.

"We now offer the most comprehensive product portfolio for bovine tuberculosis, including all Office International des Epizooties (OIE)-prescribed bovine tuberculosis diagnostic tools, enabling veterinarians to select an effective combination of tests that best fit their local program."

The robust PCR test is designed to only detect all seven strains belonging to the Mycobacterium tuberculosis complex (i.e. M. tuberculosis, M. bovis, M. africanum, M. microti, M. canetti, M. caprae, and M. pinnipedii). It is the sole commercial M. tuberculosis complex PCR with an integrated ready-to-use master mix.

The test uses the Applied Biosystems VetMAX Xeno Internal Positive Control that is detected in the same well as the sample for a duplex PCR approach.

Results using this PCR approach can be returned much faster when compared to bacterial culture testing methods. While the results of a M. bovis culture can take up to six weeks, results using PCR – from sample preparation to testing – take just three hours. The information is then delivered to the farmer or veterinarian in two to three days.

thermofisher.com



Fattening the milk check



by **Fernando Diaz (DVM, PhD)**
Independent Dairy Consultant

Milk fat is synthesised from fatty acids that come from the peripheral circulation (60%) or are synthesised de novo in the mammary gland (40%). Fatty acids with 4-14 carbons and part of those with 16 carbons derive from de novo synthesis in the mammary gland with the main source of carbons being acetate and in less proportion beta-hydroxy-butyrate.

The rest of the fatty acids of 16 carbons and all of those with 18 carbons and longer chains derive from circulating fatty acids, arising from the absorption of dietary lipids or fat mobilisation from body reserves.

One reasonable approach to enhance profitability in dairy farms is the strategic production of milk components without negatively affecting cow performance, health or reproduction.

Fig. 1. shows the price paid for butterfat in the Midwestern United States during the last 12 months according to the Federal Milk Marketing Order published by the Agricultural Marketing Service of the US Department of Agriculture.

Average milk fat price in that period was \$5.26 per kg, with the maximum premium paid in July (\$5.86/kg) and the minimum in October (\$4.62/kg). Putting that into perspective, increasing a tenth on the butterfat concentration of a

45kg-herd would improve daily income between €20.8 and €26.4 per cow at any given time during those 12 months. For example, raising milk fat from 3.7 to 4.0% would improve yearly income by \$228,000-289,000 in a 1,000 cow-herd producing 45kg of milk.

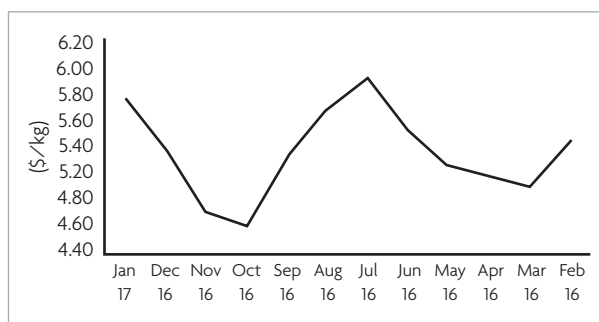
Fat is the milk component most easily modified by the diet with possible changes of up to three percentage units. Nutrition and feeding management represent the environmental factor with the greatest impact on milk fat and it is a tool that can be used to alter its fatty acid composition.

Several ingredients and additives available on the market have shown scientifically their efficacy for boosting milk fat production:

- Feed ingredients with high content on sugars and soluble fibre such as molasses, liquid whey, beet pulps, almond hulls, bakery meal, etc.
- Feed additives such as potassium carbonate, sodium bicarbonate, methionine hydroxy analogue, etc.
- By-pass fat with high concentration of palmitic acid.

In conclusion, milk fat prices affect considerably profitability, and production of milk fat offers a potential to enhance income in dairies.

Fig 1. Milk fat price in the American Midwest (AMS-USDA).



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Pasteurisation verification

 Milk pasteurisation efficacy is typically monitored by checking for the presence of alkaline phosphatase (ALP), thus ensuring the product is safe for consumption.

Helping to ensure that this test is both quick and easy to perform is achieved by the new Hygiena ZymoSnap ALP pasteurisation verification device. Typical products that can be tested include milk, cream, flavoured milk and other milk-based products.

ZymoSnap measures ALP enzyme activity in milk products, delivering results in just five minutes to provide a low-cost alternative to conventional test methods.

Reliance on monitoring pasteurisation time temperature alone does not fully guarantee a safe product because it cannot detect cross contamination events.

Alkaline phosphatase is a natural enzyme present in raw milk that is inactivated under HTST processes and is used as a marker of pasteurisation. The internationally recognised standard residual levels of ALP in pasteurised milk is <350mU and this is written into regulations in many countries.

Hygiena ZymoSnap ALP test pro-

vides a simple rapid convenient solution that requires the EnSURE luminometer and a small dry block incubator giving results in five minutes using a two step procedure.

EnSURE luminometer is a multi-test platform that supports several other tests for hygiene monitoring that has multiple applications with the dairy manufacturing operations, thus providing a cost effective system for any dairy.

If desired, customers can use Hygiena's SureTrend data analysis software to track test results, automatically generate reports and maintain records for audit compliance. SureTrend is available free of charge with every Hygiena luminometer.

hygiena.com



Butyrate capacity doubled

 Palital, manufacturer of additives for animal feed, has doubled its production capacity of butyrates to meet increasing demand for its products.

The butyrate, sold under the brand name Intest-Plus, is one of the main products from the Palital range and produced by them at their facility in Velddriel, The Netherlands.

The demand for butyrate as a feed additive is increasing worldwide due to the growing opposition to the use of antibiotics in the production of animals for meat and milk.

It is not only governments that are increasingly wanting to limit the use of antibiotics, the consumer also wants a 'clean', reliable and safe piece of meat on the plate: meat that is antibiotic free.

Palital is a flexible partner that offers a unique and patented production technology. The company closely cooperates with customers and its partners worldwide, supplying both standard products or custom made formulations.

palital.com

Low lactose whole milk powder



NZMP, the global ingredients brand of Fonterra, has launched Low Lactose Instant Whole Milk Powder. This new ingredient has less than 2% lactose and allows consumer milk powder manufacturers to capitalise on the increasing consumer demand for low lactose foods.

Consumer awareness and the popularity of low lactose products has been steadily increasing – with 13% year-on-year growth in on-pack claims in the Middle East and Africa and 54% in South East Asia.

Demand for low lactose products has increased, and there is an enormous opportunity for profitable growth with low lactose dairy powders.

Standard Instant Whole Milk Powder contains 40% lactose, while NZMP's product contains less than 2% (a 95% decrease in lactose) which means most people will be able to tolerate the lactose in this ingredient without the symptoms associated with lactose intolerance.

Lactose is the sugar found naturally in milk and other dairy products. It is broken down by the enzyme lactase in the gastrointestinal tract and absorbed, but some people lose the ability to digest lactose.

Nearly three out of four people in Asia are deficient in the enzyme lactase and up to 40% of people in the Middle East and Africa are similarly deficient.

nzmp.com

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 BouMatic Robotics is driving further innovation to the robotic dairy industry with the development of its Double Grabber technology. The new mechanical head allows the robot arm to fetch two cups at once, resulting in efficient arm movement and box performance. By reducing the arm movement, the Double Grabber increases the cow throughput. This feature will now be standard equipment on all single-box and double-box robots.

boumaticrobotics.com

A new eye on artificial insemination



AlphaVision is an insemination-breeding gun fitted with a miniaturised camera that facilitates the work of AI technicians, livestock breeders and veterinarians performing inseminations.

Its ease of use combined with the association of action and vision allows novices to rapidly learn the insemination process.

For more advanced AI breeders or professional AI technicians, AlphaVision is also a diagnostics tool that will allow visualising infections such as metritis, cervix malformations, bleeding or cysts following post-partum issues.

During the cow's pre-insemination period, use AlphaVision to check the involution of the cervix in order to minimise straw waste, check for the presence of cervical mucus and verify its quality, should the oestrus stage not be clearly determined.

Thanks to AlphaVision, during the insemination, the direct contact between the gun and the vulva or vaginal wall is avoided, thus preventing potential bacteria from entering the uterus.

Inseminating difficult cows is made much easier through optimised technician comfort and the increased well-being of the cow.

AlphaVision can save photos during the insemination. This enables veterinarians to conduct remote diagnoses.

Alphavision comes with a cell phone and an application which allows you to manage your AI history, to view the cervix of the cow in real-time and take photos.

imv-technologies.com

IDT Biologika acquires Ridgeway



Ridgeway Biologicals Ltd, the UK specialist company for autogenous vaccines, is to be integrated into IDT Biologika's global animal health vaccine network.

Pursuing its globalisation strategy IDT Biologika has expanded its network of companies offering autogenous vaccines for animals, following the acquisition of the Canadian Gallant Custom Laboratories.

"As a leading supplier, Ridgeway Biologicals is an optimal fit to our global activities in autogenous vaccines," Andreas Kastenbauer, Managing Director at IDT Biologika, told International Dairy Topics.

"Ridgeway will be an integral part of our vaccine services offering bespoke solutions to veterinarians all over the world."

Following this acquisition, they have strengthened their presence around the globe and united all quality animal health development, production, approval and distribution activities for the Americas under one umbrella.

idt-biologika.de

Understanding the basics of Antimicrobial Resistance

8 – Reservoirs of resistance

Antibiotics are derived from substances that were developed thousands or maybe millions of years ago to protect bacteria from adversities. The bacteria that were affected by these antimicrobial substances often developed resistance against them.

Some of these substances were later used to develop antibiotics and the resistance that was created thousands of years ago was just as effective against the new antibiotic of similar structure. It was then a matter of chance when the new antibiotic came across a bacterium containing such a resistance gene. It was really bad luck if it was present in the particular pathogenic bacterium that the new antibiotic was to be used against.

However, since the original resistance was created a long time ago and considering the very short generation time for bacteria, such resistance could become quite widespread in different bacterial populations. The first time the scientists discovered a particular resistance gene was when they were investigating a modern day resistance problem and it was named accordingly. If we examine bacteria that could never have come across antibiotics, such as those found deep in arctic soils or in corpses that have been buried for hundreds of years, these genes can be found confirming their origin was from before the time the antibiotic was created.

Thus, many bacteria could contain a resistance gene that is waiting for the opportunity to move into a modern day pathogen.

There are various populations of such bacteria. Obviously, there are human and animal bacteria, then there are those in home or hospital or farm and veterinary practice environments. There are the populations of bacteria found in the soil and water

supplies as well as those found in sewage and other effluents. Each of these groups of bacteria represents a reservoir of resistance that modern day pathogens can tap into!

If we look at particular examples we can see how a resistance gene started in an animal population and then moved into a human population only at a later date to move back into the same or a different animal population. As time progresses this complex picture will be slowly elucidated.

In the meantime, what can we do to lessen the likelihood of more antibiotic resistance emerging? One obvious and worthy strategy is to minimise the contact between the bacterial population in our animals and these other bacterial populations. This may be possible in modern housed intensive farming but it is a virtual impossibility in outdoor or free range production.

Once again, we have the situation of what the consumer wants (free range production) potentially giving him another issue (antimicrobial resistance) that he does not want!



Middle East milestone



Kemin Industries recently launched its organic trace mineral product line in the Middle East during a symposium in Jordan.

With this new registration of KemTRACE Chromium in the Middle East, Kemin has accomplished an important milestone in organic trace mineral nutrition. With more than 20 years of research and development, chromium propionate is a proven source and is fed to millions of animals around the world.

Flagship trace minerals in the portfolio are KemTRACE Chromium and KemTRACE Zinc.

"KemTRACE Chromium and KemTRACE Zinc are essential nutrients used to support increased trace mineral nutrition and improve profitability for the livestock industry in the Middle East region," Malek Abdelqader, Commercial Director Middle East region, told International Dairy Topics.

"Trace minerals are essential components of livestock feed for normal functioning and production. By offering this nutrient in the Middle East, it allows producers the opportunity to increase profitability and grow healthy animals to meet the rapidly increasing consumer demand for protein in the region."

KemTRACE Chromium is used in dairy diets in more than 30 countries. Today, KemTRACE Chromium is the only FDA approved source of chromium available in the USA for dairy diets. Over the last several months, the Kemin regulatory team has been dedicated to registering the diverse KemTRACE minerals across the Middle East region.

kemin.com

Innovative 7-layer silage sheet



Bock UK, already known for their unique sloping walled silage clamps, are continuing their innovation in the dairy sector with the launch of the new Super7 silage sheet.

The sheet is for use on all types of silage stored in clamps across the UK and replaces the previous best practice – a cling film under layer and top-sheet – replaced with a single film, the incredibly strong Super7.

Trials have already been very successful with the sheets achieving a market leading oxygen permeability of less than $2\text{cm}^3/\text{m}^2/24$ hours (conventional silage sheets have a permeability of $250\text{cm}^3/\text{m}^2/24$ hours).

"This makes the sheets as near to a perfect oxygen barrier as we have seen in the UK to date," William Wilson, Business Development Manager for Bock UK, told International Dairy Topics.

"Examples of it being used in Germany confirmed that Super7 helps eliminate waste and will vastly improve silage quality – and in the current climate attention to this detail is so important for progressive dairy farmers."

ceva.com



CVZ shipped more than 60 million doses of its vaccine for preventing bluetongue disease for serotypes 1, 4 and 8 during 2016. This figure represents three times more than the previous year. The vaccines were supplied to governments, as well as third party companies, via distribution agreements, for marketing throughout Europe. The company is forecasting similar sales figures for 2017.

czveterinaria.com

The 7 in the title refers to the seven different layers with each layer of different thickness of micro fine plastic that are bonded to form the single sheet which is incredibly strong, smooth and flexible and allows the sheet to draw onto the silage surface.

Bock UK have kept the white top surface, in keeping with the rest of their product range, as it reflects rather than absorbs the sunlight and reduces the potential for heating of silage.

bock-uk.com

Ceva acquire cattle vaccines



Ceva Santé Animale have completed the acquisition of a diversified portfolio of products, including cattle vaccines and multi-species non-steroidal anti-inflammatories from Boehringer Ingelheim following its acquisition of Merial Animal Health.

All the products will be immediately available through local Ceva companies or its distributors, with no interruption of supply.

Ceva has been consistently one of the fastest growing top 10 veterinary businesses in the last decade, investing heavily in the development of vaccines, as part of its global preventative health strategy.

Figon

28-31st March
Zaragoza, Spain
www.feriazaragoza.es

Canadian Dairy Xpo

5-6th April
Stratford, Ontario, Canada
www.dairyxpo.ca

International Dairy Expo/China '17

21-23rd April
Harbin, China
www.dairyexpo.com

Livestock Philippines

24-26th May
Manila, Philippines
www.livestockphilippines.com

Agrena

28-30th June
Cairo, Egypt
www.agrena.net

Lanka Livestock

20-22nd July
Colombo, Sri Lanka
www.lankalivestock.com

Dairy Tech India

28-30th August
Bangalore, India
www.dairytechindia.in

WAAVP

4-8th September
Kuala Lumpur, Malaysia
www.waavp2017kl.org

SPACE

12-15th September
Rennes, France
www.space.fr

Agritech Taiwan

28-30th September
Taipei, Taiwan
www.livestocktaiwan.com

World Dairy Expo

3-7th October
Madison, WI, USA
www.worlddairyexpo.com

European Buiatrics Forum

4-6th October
Bilbao, Spain
ebf@all-is-event.com

Ildex Indonesia

18-20th October
Jakarta, Indonesia
www.ildex-indonesia.com

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www.abvista.com

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