High-tech international milk

The Teagasc Milking Machine Maintenance and Research Programme

John Upton Teagasc Animal and Grassland Research and innovation Programme, Moorepark.

Milking researchers and consultants gathered to undertake an experiment at UW-Madison in April 2015. Left to right standing: Ian Ohnstad, The Dairy Group UK; Muireann Conneely, post-doc University of Wisconsin Madison; Graeme Mein, milking machine consultant Australia; Morten Dam Rasmussen, Aarhus University, Denmark; John Upton, Teagasc Ireland. Kneeling left to right: John Penry PhD student University of Wisconsin Madison; Doug Reinemann University of Wisconsin Madison.

Optimum milking management requires the cow, milker and milking machine to be operating in harmony. A key element of the Teagasc programme in the coming year will be a management survey on 20 farms which will assess the interactions of these factors on Irish dairy farms.

Teat dimensions will be recorded prior to milking unit attachment. Mouthpiece chamber vacuum and teat end vacuum will be measured during milking, non-invasively using the Bio-Control VaDia. The VaDia is a battery-operated data logger, which is small and light enough to be taped to a teatcup during milking (figure 1). Post-milking teat condition will be assessed by a number of visual observations.

This kit can be used by a trained advisor or researcher and is used mainly as a research tool at the moment. But it may become more widely available in the future. For example, many advisors in Norway use the device as an on-farm diagnostic test. It is a milking time test device, as opposed to a dry test device or milking simulator device. Therefore, if the standard set of dry tests fail to detect a problem (eg a problem during milking of a cow), then this is a useful tool.

How it works

VaDia logs the vacuum data at four points during milking. The data can be downloaded and analysed to identify any vacuum irregularities, to identify where the milking equipment and milking routine are underperforming.

The over-milking period for a teat is identifiable by the point where the mouthpiece chamber (MPC) vacuum increases sharply toward the end of milking (figure 2). Analysis of on-farm data shows that herds without cluster removers are prone to over-milking towards the end of lactation. During the over-milking period, short milk tube vacuum can approach system vacuum causing congestion (or swelling) of the teat tissue and hence delayed closure of the teat canal after milking.

Classification of cow teat condition can be used to assess the effects of milking management, milking equipment or environmental factors on teat tissue and the risk of new intramammary infections. Short-term changes in teat condition in response to a single milking can be used to diagnose faults in milking machines or milking management.

These short-term changes include firmness of the teat-end after milking and swelling at or near the base of the teat. These changes can be assessed after milking. Factors commonly associated with teat-barrel swelling include over-milking and teat-cup crawling. Factors commonly associated with swelling near the teat-end include over-milking, high vacuum, pulsation failure or insufficient rest phase of pulsation.

Longer-term changes in teat-end condition can be monitored by assessing the degree of hyperkeratosis (or roughness of the teat-ends) in the herd. Apart from seasonal weather conditions, major factors affecting teat-end hyperkeratosis include teat-end shape, production level, stage of lactation and interactions between milking management and machine factors (ie slow milking and over-milking).

Teat-end hyperkeratosis can be made worse by disinfectants that cause chemical irritation to teat skin or may be alleviated by the use of a disinfectant with a high concentration of emollient.

Combining milking time tests with teat condition assessment provides useful information for assessing milk-

research links

Figure 1:
VaDia device fitted to the rear left (RL) teatcup of the cluster. Recording points for short milk tube (SMT) vacuum and mouthpiece chamber (MPC) vacuum can be clearly seen.

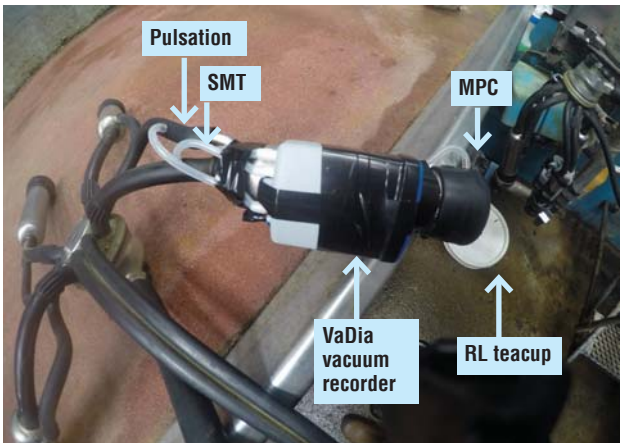
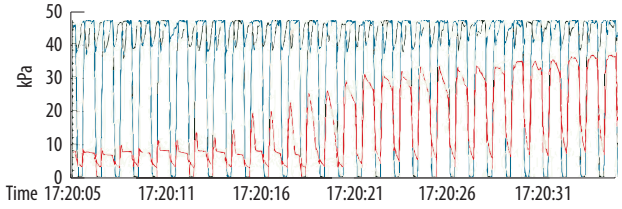


Figure 1

Transition from main milking period to over-milking period. Short milk tube (SMT) vacuum in blue and mouthpiece chamber (MPC) vacuum in red. Pulsation chamber vacuum is shown in green. The liner is open when the pulsation chamber vacuum is high.



ing machine, milker and cow interactive effects. Teat swelling or damage, which becomes evident during these observations, can often be explained by vacuum data obtained through application of the VaDia device.

Links with Wisconsin, USA

The same challenges to milk the cow as quickly and completely as possible while maintaining udder health and milk quality are faced by farmers in the USA and in Ireland.

Many US farmers milk their cows three times per day to maximise production. This fact, together with large herd sizes (typically greater than 500 cows), makes milking a 24-hour operation on many farms. Hence, hiring trained staff to operate the milking parlour is a major issue for the US dairy farmer.

Farmers in the US are very much focused on the number of cows milked per hour. Hence, they train their staff to operate as efficiently and methodically as possible, using standard operating procedures and working routines. Documented operating procedures for cow preparation and milking routines ensure easy handover from one milker to another (in the case of a US farm) or from farmer to relief milker (in the case of an Irish farm) in times of staff changes or labour shortage.

The milking machine research programme at Teagasc Moorepark is strongly linked with the milking research lab at the University of Wisconsin-Madison in the USA where the programme is managed by Prof Douglas Rienemann.

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TIP

Review your electricity costs using www.bonkers.ie

There are large variations in the price of a unit of electricity (eg from 18.3 to 13.8 cent per kWh of day rate electricity). An average size farm can save over €700 per year by changing electricity suppliers.

Note: Night rate electricity is a good fit for all dairy farms. There is no charge from ESB networks to install a night rate meter. The meter standing charges increase from approx. €0.46 per day to €0.60 per day after moving to night rate electricity. This means that a minimum of 1.5 units of electricity would need to be used each night to offset the extra charges.

Researchers from Teagasc, the UK, Denmark and Australia met at the UW-Madison in early April 2015 for 10 days of discussions and experimentation on the interaction between the milking machine liner and the teat of the cow.

One important goal for the group was to clarify and simplify advice on how to optimise three of the key physical influences of any milking unit on cows' milking characteristics (e.g. average and peak milk flow rates) and teat condition. Those three key influences are milking vacuum, pulsator settings and liner compression.

Results of a series of recent studies at UW-Madison indicate that the relative effect of each of these factors on raising or lowering average milk flow rate is approximately 20% for milking vacuum, 20% for liner compression and 10% for pulsator settings.

This collaboration between Teagasc and UW-Madison has developed a method of assessing teat end and teat barrel congestion through analysis of milk flow rate from a teat using a quarter milking device.

The milking machine research programme at Moorepark will use these techniques to quantify the congestive effects on the teat induced during milking with various combinations of vacuum level, pulsation settings and liner compression levels.

The aim is to provide refined guidelines for milking machine settings and liner suitability for different herds with the goal of minimising teat-tissue congestion during milking. Minimising teat-tissue congestion will reduce the risk of bacteria passing through the teat canal after milking, thereby reducing new mastitis infection risk.