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Tech Topic

What the cows are telling us at the feed bunks

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During the past eight years, Diamond V Dairy Advisors have conducted well over 3,000 TMR Audits® and addressed ways to reduce variation of TMR (total mixed rations) prior to delivery to the cow. In the past year, the auditing teams have focused on feed bunk management and used time-lapse photography to help optimize this area of management.

We used time-lapse video cameras hung above feed bunks to observe feeding behavior and feed push-up activity for close-up dry cows, fresh cows, and groups of high-producing cows. The cameras took photos every 5 seconds, often recording for up to a week at a time. Then we used a spreadsheet to record behavior and activity observed in the videos, color-coding events to help us see patterns.

These continuous time-lapse video records emphasize the need for every management system to set goals to help guide the feeding team and those who advise the dairy. Meeting these feed bunk management goals helps ensure that every cow in the pen gets the same nutrition by:

- Reducing the variation in feed bunk adjustments
- Determining the most profitable level of push-out
- Awareness that target push-out levels may be different according to…
    - Varying stages of lactation
    - rBst cycle
    - Weather patterns and season of the year
    - Management skills and abilities

The skills and abilities of a dairy's management team, along with the environment, have a huge influence on milk production. A study by Bach and co-workers (2008) showed that non-dietary factors accounted for 56% of the variation in milk yield among 47 herds that were fed the same TMR. Feed availability was one of the key drivers in the differences among these dairies. Stalls per cow was cited as another major factor.

Here are some important questions for managing feed bunks for consistent dry matter intakes:

- Is the TMR delivered to the pen the same time every day?
- Is the pen count up to date for the feeder?
- If pen counts have been mixed up, has this been communicated to the feeder?
- Is the right amount of TMR delivered to the pen?
- Is the TMR evenly distributed along the bunk at all times?
- Does the TMR need push-up?
- Is the push up schedule being followed?
- Are refusals pushed out each day and weighed for each pen?
- What are your refusal level goals?
- How much do you adjust refusal levels?
- Do the push outs look like the original TMR?

Consistent feeding time

Time-lapse video enabled us to observe a large increase in the refusal level in a large commercial dairy when feeding was delayed 2 hours the previous day. The feeders had been late arriving because of extremely cold weather. Cows could not eat all of their allotted feed because they had 2 hours less to eat.

A study by Dr. Robbi Pritchard and others at South Dakota State University showed improved average daily gains in yearling beef heifers that were consistently fed the same time every day versus heifers that were not fed the same time each day (Pritchard, 2008). Feed intake and feed efficiency were numerically better, but not significantly so. Feeding times for the consistently fed animals were within 15 minutes of each other, whereas the feeding times for the other group were 1 to several hours different from day to day. When feeding times are not consistent, the amount of push outs and dry matter intake is going to vary.

TMR distribution along the bunk

One thing we pay close attention to is the delivery of the TMR along the feed bunk, which ought to be at a consistent level along the entire length of the bunk. Often the feeders don't feed all the way to the ends or they back up and deliver more feed in certain areas of the bunk. We caution feeders against backing due to safety issues. However, we also notice on certain dairies that cows will eat more in certain areas of the bunk. It is not known for sure why cows do this, but sometimes is due to heat stress, flies, older and more aggressive cows, and possibly differences in TMR consistency.

For example, if there is more grain in one end of the bunk due to poor mixing, more aggressive eating cows may prefer that area of the bunk, which may be a clue to an inconsistent TMR. We need to learn more about this.

Also, we often see waves in freshly delivered TMR. This effect is often observed in TMR from vertical mixers with delivery aprons operating too fast or when delivery auger speeds are too low. Adjustment of the hydraulic oil pressure switch on the tractor or truck can change the delivery apron speed to the desired level for a smooth delivery of the TMR. Vertical mixer auger speeds can be increased to help clean out the mixer box and also provide smoother TMR delivery along the bunk.

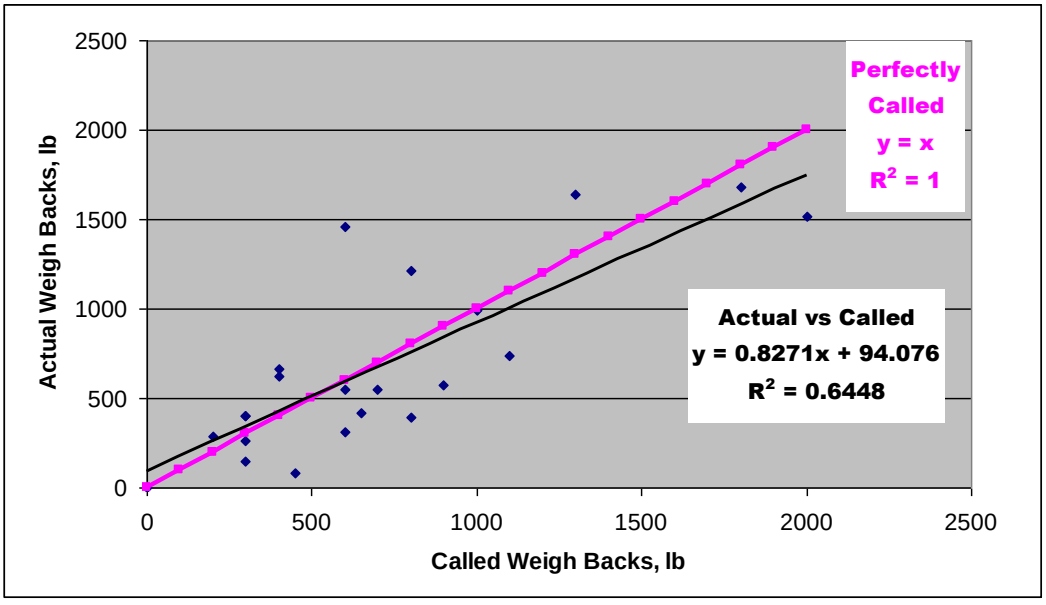
Weighed versus estimated push outs

We see a wide range of management practices for determining push-out levels and ultimately dry matter intake levels. Some dairies do not push out feed, but rather drop fresh feed on top of the old feed, whereas other dairies weigh push-outs for each pen and adjust the amount of feed drop on the next load.

Most dairies are somewhere between these two extremes. Typically, the main feeder goes through the barns in morning, "calls" all the bunks, and estimates the amount of push-out. The feeding crew then pushes out the bunks right ahead of feeding. If the push-out amount is down, the feeder increases the size of the TMR load for that pen. Vice versa if the push-out is too much. How accurate is the feeder in calling these bunks?

We can get an idea from our study of a couple of dairies that were doing a good job of feeding cows on time with very consistent TMRs. Figure 1 below shows the relationship between called weights and actual weights of push-outs on a dairy.

Figure 1. Called versus actual TMR push-out weights.



This particular dairy had pen sizes of 175 cows and the feeder's precision was around +/- 94 pounds and he was 82% accurate. Because the bunk was so long, it was hard to detect the difference between 0 pounds and 188 pounds. Also, the feeder's accuracy declined with the increase in time between when he called the bunks and the actual time feed was pushed out prior to fresh feed delivery.

Our observations would indicate that a fair amount of error in push-out levels and therefore dry matter intake can occur with this method of feed bunk management.

The current state of the art for managing push-outs is to push out feed less than 15 minutes before fresh feed is delivered. The push-out is weighed about mid-morning when the feeder has caught up. Then the weights are entered into a feed software program in the tractor cab and the load weight for the next feeding is adjusted up or down or set to remain the same. The dairy must use a feed software program to make this process easy to implement. As a result, dry matter intakes are more accurate, which helps with other measures of dairy performance such as income over feed cost (IOFC) and feed efficiency.

Consistent bunk adjustments

Stone (2008) showed more consistent dry matter intakes in groups of cows over time when a dairy made minor adjustments in feeding (+/- 0.5 lb dry matter/cow/day, Figure 2) compared to a herd that adjusted feeding levels according to the amount of refusal or push-out (Figure 3).

Figure 2. Dry matter intake with 0.75% refusal goal and feed adjustments of 0.5 lb dry matter/cow/day.

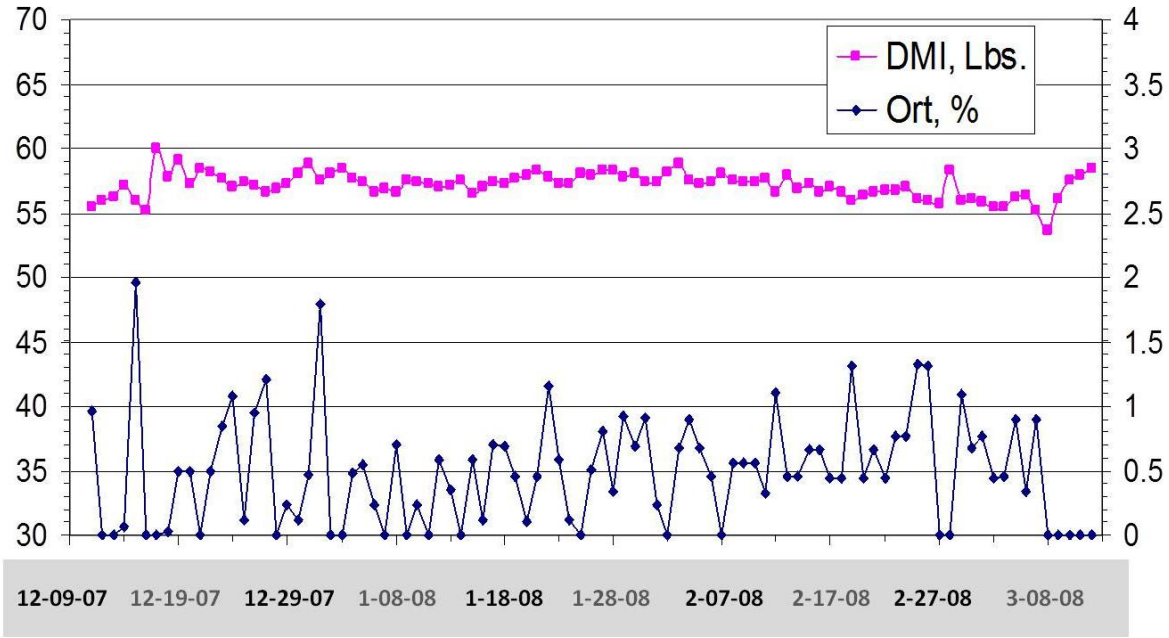
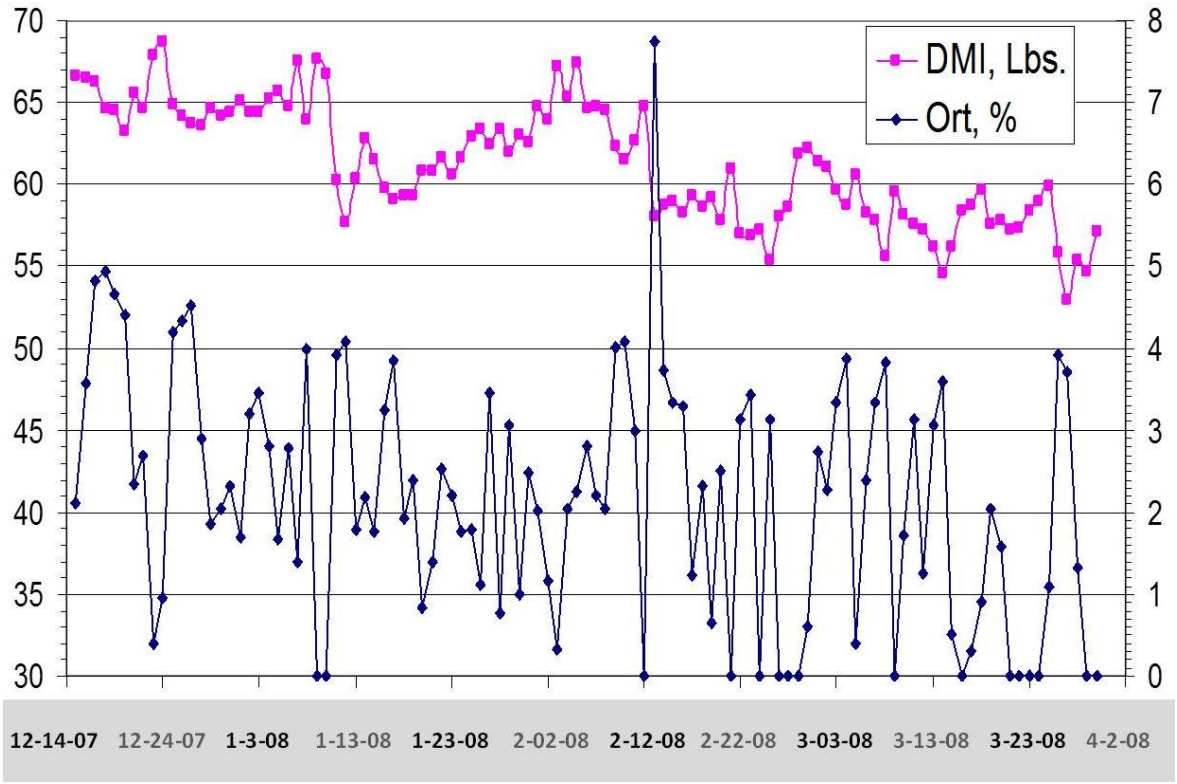


Figure 3. Dry matter intake with 3.5% refusal level and feeding level adjusted by amount of the refusal.



Management of the herd with consistent dry matter intakes included daily moisture measurement of silages that were blended prior to sampling and feeding. The inconsistent herd used routine moisture testing but did not blend the forages prior to sampling and feeding.

Do push-outs look and smell like the original TMR?

Dairy cattle are very good at sorting against long pieces of forage. The TMR is considered "sorted" if the levels in the Penn State Particle Separator decrease by 10 units in the bottom pan and increase by 10 units on the top screen. Cutting corn silage longer, feeding haylage, or adding liquids to the TMR can help reduce sorting.

Push-out target levels

For every pound of dry matter consumed, the cow can produce approximately 2 pounds of milk. Assuming the cost per pound of dry matter is $0.12/lb and milk is $16/cwt, then the IOFC per extra pound of dry matter consumed is $0.20. So, the goal is to not run cows out of feed, but to manage push-out levels in order to maximize overall efficiency of feed utilization, which requires a good feed bunk management. The amount of push-out varies according to:

- Management level of the dairy
- Stage of lactation
- Pen stocking density
- rBst use

Close-up dry, fresh, and high group pens can have a lot of cow movement in and out of the pen causing variation in pen head counts. These pens typically have higher push-out levels compared to low-production pens or pregnant pens where cow numbers are more stable.

What we are learning from time-lapse cameras

Research by Armstrong and co-workers (2008) showed increased milk production when feed was pushed up every half hour (4 push-ups) compared to pushing up every hour (2 push-ups) for 2 hours post-feeding (Table 1).

Table 1. Influence of push-up frequency immediately after feeding on performance.

Item	1x/h	2x/h
DMI, lb/d	41.4	40.1
Milk, lb/d	61.3[b]	65.3[a]
Milk/DMI, lb/lb	1.48[b]	1.63[a]
Lying in stall, % of cows	45.3	43.8

Note: Different superscripts indicate significant difference ($P < 0.01$).
Source: Adapted from Armstrong et al., 2008.

This level of management is not common practice on most commercial dairies in U.S. Also, we see very few push-ups from midnight to 6:00 a.m. on many dairies.

Using our time-lapse cameras and recording events in a spreadsheet, here's what we observed:

- Cows are eating at the bunks at all hours of day and at night and these cows are most likely to be the submissive, less aggressive cows
- Cows are eating in the dark
- Often cows cannot reach feed for up to 4 to 7 hours
- The amount of push-out – also called refusal, weigh-back, or orts -- is a very poor indicator of feed accessibility during a 24-hour period
- Cows are stretching to reach the feed ridge
- Feed push-up times are inconsistent, because often the pusher is the maternity worker
- Cows returning from the parlor lie down quickly if they cannot access feed or are in higher stocking density pens
- Cows may be locked away from feed upon return from the parlor; and
- There is high eating activity along the bunk after cows return from the parlor and feed is pushed up

We have seen improved dry matter intakes and milk production on dairies that started pushing up during the night and on a regularly scheduled pattern

throughout a 24-hour period. Also, more dairies have started to drop fresh feed between milking times, creating an extra significant meal. They have observed very good lock ups with this practice and have found it easier to feed pens when they don't follow the milking schedule. Some dairies in the Northern U.S. have begun feeding twice – once in the morning and once in the afternoon – to keep feed fresh and to improve feed efficiency. This is common practice in the Southern U.S. where there is more heat stress.

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