

Precision Feeding: NIR On Line For Improving TMR Consistency

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Research in dairy science revealed importance of ruminal fermentation to optimize milk production in dairy cows. The intent is to obtain the best ruminal environment for microbial, combining specific proportions of nutrients in the diet. Totally mixed rations (TMR) technique respond to this need mixing all the feed together making it available 20-22 hours per day, but many problems are still unresolved. Differences between theoretical and prepared TMR and effectively consumed TMR by the cows were widely reported (Leonardi e Armentano, 2003)ⁱ. The differences are due to errors loading feeds (wrong weight, etc.) and change in water content that alter the amounts of dry matter of feed loaded into the wagon (Buckmaster 1998ⁱⁱ; Ishler 2001ⁱⁱⁱ). Animal producers are beginning to realize the importance of their feeding systems in terms of costs; thousands of dollars can be lost annually through: (1) Ingredients inventory shrinkage; (2) Inaccurate weighing of components in the ration; (3) Lack of knowledge of the actual Dry Matter and nutrients of the feed that are being fed.

Due to the current heavy crisis, it is a real basic requirement for all the farmers to optimize the diets, providing a more consistent TMR, controlling the accuracy of the mixer operator, measuring on line the actual Dry Matter Content of feedstuffs and monitoring the inventory of ingredients. This paper will focus on a new integrated system developed specifically to help farmers to feed animals on line with precision animal nutrition milestones. The dg precisionFEEDINGTM is a kit constituted by a Feeding management software package (DTMTM 2009), scale indicator (Top Scale Indicator) and a near-infrared reflectance (NIR) analyzer.

Rations Managed On Dry Matter Instead Of As Fed Basis

As a matter of fact in a real world there are some problems in delivering consistent TMR every day and probably the most important one is due to actual big changes in terms of constituents for the different ingredients and consequently for their nutritional characteristics. The most important factor to reduce variability is the dry matter of feedstuffs, especially for wet forages like corn-silage and grass silages. For example, in case of corn silage, the dry matter content measured on different samples collected the same day from the same front of a banker silo varies between 40,5 and 29,8 depending on their original positions. It's clear the difference in terms of nutrients even providing exactly the same as-fed weight of corn silage: for every 10 pounds as fed, you can provide 4 or less than 3 pounds of dry matter. As a consequence, even if all other ingredients are very stable, the TMR produced will be probably unbalanced. For this reason, if we are able to change from the as-fed to the dry matter weight, we can dramatically increase the TMR consistency.

The dg precisionFEEDINGTM is a kit promoted by dinamica generale as a tool specifically projected and developed to help farm's managers in implementing and managing their feeding processes in accordance with the Good Practices suggested by Precision Feeding technology.

- DTMTM 2009: Software for feeding management. It provides following functionalities:
 - full control on ingredients inventory in terms of quantities as well as values;

- manages ingredients and their nutrients;
- manages recipes with ingredients entered by as-fed or dry-matter weight;
- stores historical data of feeding sessions giving access to detailed and summarized statistical reports that measure: operator performances, feedstuffs consume, on-line analysis results.
- Top Scale Indicator: more than an indicator, it is a real control unit for the feeding process:
 - Controls the loading process requiring the ingredient and its target weight;
 - Requires the NIR analysis to the scanner unit for the actual component;
 - Performs a weight-adjustment operation re-calculating the target weight on the base of the actual dry matter value measured in real time.
 - Stores all data in terms of analysis results, actual weights loaded per ingredient and unloaded per pen, date, time and transfer them to the PC through a memory card or wireless (DTM 2009 DDP).
- IRMTM FL: it is a real NIR scanner, easily installable directly inside the bucket (thanks to mechanical supports accompanying the product) of the front loader (both, wheel and telescopic loader), able to:
 - scan material on the bucket measuring the actual values of:
 - Dry matter, Crude Protein, Starch, ADF, NDF, Ash;
 - Support vibrations and mechanical shocks thanks to its robust case and internal anti-vibration materials;
 - Working temperature: -20°C / + 40°C (-4°F to 104°F)
 - Accuracy: varies with robustness of calibrations, but general specifications for instrument: Moisture: within 2%; Starch, Crude protein, Ash, ADF, NDF: within 3%

Conclusions

Today, nutritionists know that there is nutrient variability of forages and ingredients that are being fed and so they formulate rations close to the edge to reduce risk of the cows crashing:

- feed a higher % concentrate
 - Enough forage to minimize the risk of acidosis
- use a little more fat
 - Provide energy and reduce acidosis risk
- feed more bypass protein

This all costs more money, even if it is less money than what you would lose from a crash! For this reason in order to reduce feeding costs it is necessary to increase the feeding consistency.

The dg precisionFEEDINGTM is a tool able to help animal producers to optimize their feeding processes in accordance with Good Practices suggested by the Precision Feeding technology. It is able to control wide changes in nutrients contents of feedstuffs and perform automatically actions in order to keep the final TMR as consistent as possible during the time, saving costs on feeding, improving the process efficiency and reducing the environmental impact produced by farms.

ⁱ Leonardi C. and Armentano L.E., (2003) – *Effect of quantity, quality, and length of alfalfa hay on selective consumption by dairy cows*. J. Dairy Sci. 86 (2): 557-564

ⁱⁱ Buckmaester D.R. (1998) – *TMR Mixer Management*. Dairy Feeding System: Managements, Components, and Nutrients, Camp Hill, Pennsylvania, Natural Resource, Agriculture and Engineering Service (Nraes)

ⁱⁱⁱ Ishler V. (2001) – *The case for taking weekly silage dry matters*. Hoards Dairyman (May, 10): 341