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## **TMR–Quality Control Analysis**

### **Introduction**

The *TMR-Quality Control* test available at the Marshfield Soil and Forage Analysis Laboratory is one of the most powerful ration evaluation tools available today. University of Wisconsin-Madison dairy scientist and personal at the Marshfield Soil and Forage Analysis Laboratory developed the *TMR-Quality Control* analysis over a four-year period. On the surface, the *TMR-Quality Control* report appears to be just another routine analytical evaluation. The focus of the *TMR-Quality Control* analysis is the evaluation of ration energy content using precision summative equation technology. All key nutrients for the *TMR-Quality Control* analysis are measured using high precision laboratory procedures and energy estimates (TDN, NE<sub>L</sub> 3X) are made using coordinated bio-nutrient summative models. Because laboratory accuracy and precision are paramount to evaluate TMR energy content, the *TMR-Quality Control* analysis requires four days to conduct and costs moderately more than other routine feed tests.

### **Key Components**

- 1) The CP, NDF, Fat, NDF Digestibility (NDFD), Ash, Ca, and P content of TMRs are all measured in duplicate using state of the art wet chemistry procedures and/or are compared to internal standards to assure accuracy and precision of each nutrient.
- 2) *TMR-Quality Control* analyses have been coordinated drawing on four years of data to provide precise and relevant TMR energy predictions (TDN @ maintenance, NE<sub>L</sub> @ 3x) using bio-nutrient summative models (NRC, 2001).
- 3) The digestibility of NDF in the TMR is required to make an accurate and precise energy prediction. The NDF digestibility (NDFD, % of NDF) of TMRs in the *TMR-Quality Control* analysis are measured in duplicate in a closed, anaerobic in-vitro system (Van Soest/Mertens) and are compared to three internal standards to assure reliability and precision
- 4) Nutrient values obtained are hand checked by laboratory technicians with more than 20 combined years of experience.
- 5) The *TMR-Quality Control* report values are re-checked by laboratory staff before submission.

## Utility

The utility of the *TMR-Quality Control* analysis is to evaluate the nutrient composition of a TMR that was ACTUALLY FED to animals. The values from the *TMR-Quality Control* report can be compared to the ration formulation and inconsistencies can be easily identified.

The producer or ration consultant can be confident that the source of inconsistency between the formulated TMR and the fed TMR (*TMR-Quality Control*) are not due to laboratory analysis error because every precaution is taken in the laboratory. Therefore, if the formulated nutrient content of a TMR does not closely match the *TMR-Quality Control* report, one of three reasons exist: 1) The TMR was not mixed to ration formulation specifications. 2) The ration formulation process lacked information or contained false information (e.g., inaccurate forage energy test). 3) A bad sample was sent to the laboratory. The main utility of the *TMR-Quality Control* analysis is to evaluate if TMR diets actually contain the predicted energy contents as per diet formulation and were properly mixed and delivered to the animals.

## Limitations

The *TMR-Quality Control* analysis only measures the chemical or nutrient densities in a TMR diet. Animal performance may be influenced by dry matter intake, physical factors (particle length, grind size) and qualitative factors (mold, fermentation) in a TMR, which are not evaluated in a *TMR-Quality Control* analysis.

## Sampling Procedure

One of the keys to a successful *TMR-Quality Control* analysis is taking a good TMR sample. The following procedure should be used to take a good TMR sample:

- Mix TMR as per normal procedures.
- Distribute TMR in bunk to appropriate group.
- Immediately after distribution, fill a 5-gallon bucket with handfuls of TMR from the top, middle, and bottom of the TMR windrow from the entire length of the TMR windrow.
- Quickly tip the 5-gallon bucket upside down on a large clean surface and lift bucket up.
- With a thin piece of wood or sheet metal, cut the coned TMR sample in half.
- Discard one-half of the sample and submit the other one-half ( $\cong$  1 1/2 gallons) for *TMR-Quality Control* analysis.

## Example: TMR-Quality Control Reports

Listed below are selected examples of TMRs fed to high producing lactating dairy cows formulated to contain (approximately):

CP	18.0%	NFC	40.0%
NDF	29.0%	TDN	75.0%
Fat	5.0%	NE <sub>L</sub> , Mcal/lb	.78

Example	CP	NDF	NDFD	NFC	Fat	Ash	P	Ca	K	Mg	TDN	NEI
TMR	% of DM	% of DM	% of NDF	% of DM	Mcal/lb							
1	16.4	31.7	60.8	43.2	3.54	7.62	0.44	0.83	1.48	0.28	73.20	0.76
2	15.2	29.1	59.9	46.5	4.42	7.29	0.43	0.69	1.25	0.24	74.10	0.77
3	17.6	33.2	62.6	37.4	6.68	7.73	0.44	0.92	1.10	0.25	74.80	0.78
4	17.0	32.3	61.0	43.1	2.53	6.61	0.47	0.59	1.30	0.24	72.00	0.75
5	15.6	29.2	50.3	41.4	4.48	11.70	0.45	0.97	1.27	0.25	68.80	0.71
6	15.2	35.2	55.2	40.2	4.91	7.00	0.48	0.87	1.45	0.25	70.60	0.73
7	18.3	28.6	60.2	41.0	6.42	8.14	0.55	0.78	1.31	0.24	75.80	0.79
8	16.2	30.8	61.3	41.1	6.20	8.14	0.48	1.06	1.31	0.28	74.80	0.78
9	18.1	29.4	49.5	40.6	4.46	9.90	0.54	0.91	1.30	0.24	68.80	0.71
10	17.4	29.5	56.3	39.5	5.92	10.23	0.53	1.03	1.11	0.26	71.90	0.74