Micro-Machines on Dairies Do They Have a Place?

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COMPUTER TECHNOLOGIES AND DAIRIES

The only thing that is constant in the world of meat and milk production today is change. Computer systems and other technologies have allowed the dairy industry to be more efficient food producers. Many types of sensors, automated machinery, and intelligent technology applications are available that allow increasingly detailed management of the dairy. Sensors are used to monitor temperature and humidity and integrated with environmental systems that help move the dairy cow to a more thermal neutral environment. Radio frequency identification (**RFID**) is now routinely used to improve animal tracking and identification. Individual animals can be identified without restraint and animal records can be automatically transferred to computers for record keeping. Dairy producers use this information as to efficiently monitor cow movement from group to-group, reduce the chances of improper drug application, and assist in veterinary checks. These systems are also used for real time heat detection and health monitoring.

Computer ration formulation is used on all dairies today to optimize milk production and economic performance of the ration. These models describe rumen function and predict feed intake and milk production. Properly used, these programs allow quick and accurate decisions to be made as to whether a feedstuff should be a replacement in the ration or simply an added ingredient. In many cases, feed management software is also used side-by-side with the formulation program. Computerized dairy ration modeling is a powerful management tool for any dairy large or small. Micro-machines may be the next evolutionary step in using computer technology to make the dairy more efficient.

THE BASICS OF MICRO-MACHINES

Automatic mixer machines for rations were first developed and patented by Pomerleau from Massachusetts in 1956. The title was "Mixer for Solids and Liquids" and the patent described how to accurately mix small amounts of liquid with a small amount of dry material and blend that mix into a manufactured feed. This was accomplished by spraying liquid, measured in *parts per minute,* through nozzles for mixing with solids. The first micro-ingredient machines that were installed in a feedlot were developed by Hawes in 1969; one is still in operation in the Texas Panhandle. Since the Hawes machine, more than 20 patents have been issued for modification or adding unique characteristics to deliver micro-ingredients to beef and dairy rations. The micro-machines can be used in a wide variety of applications for beef and dairy operations. The new emphasis on feed safety and more stringent regulatory rules have led to increased usage of micro-machines in dairies and feedlots.

The micro-ingredient systems employed are generally of two categories, *weight-lost* and *weight-gain* system. The system

contains separate bins holding the individual micro-ingredients. The weight-gain system discharges each bin individually into a common scale. The load cell records the weight and adds it to the batch and determines when to turn the bin motor off for that micro-ingredient. Bins in the weight-loss system have individual scales and can run simultaneously, which allows for shorter batch times. Both units have a software program that determines the on-going inventory of additives and aids in generating records accurately.

Both weight-gain and weight-loss systems remove the *human factor* for ensuring accuracy in feed formulation. In a weight-loss system, for example, when the micro-ingredient stops flowing; the system will detect it immediately and sound an alarm or turn the system off. In a weight-gain system, if the bin containing the micro-ingredient stops flowing to the weight scale, the system will notify the operator. In both systems, lack of micro-ingredient flow is best prevented by regularly topping off the bins. Both systems will be more accurate than even the best human worker when hand-delivering the micro-ingredients. In addition to the ration safety implication, the monetary cost of the human error, either over or under the mark, can be eliminated.

Micro-systems strengthen ingredient traceability by recording how much of each ingredient is discharged into the mixer, which allows for more accurate inventory control. In addition, both weight-gain and weight-loss systems increase worker safety by limiting exposure to the ingredients. Dust collectors can also be installed with both micro-systems to further improve worker safety. The automated micro-ingredient systems are easy to maintain and operate. Companies that supply micro-machines to feedlots and dairies provide training and service or offer service contracts.

The micro-machine can store, measure, and dispense feed additives in both dry and liquid forms. Micro-machines can measure and handle feed additives in very small amounts, from milligrams to grams per head per day. The feed additives that are commonly added in feedlots and dairies are:

1. Amino acids or their analogs
2. Trace minerals
3. Vitamins
4. Yeast
5. Bacterial cultures
6. Enzymes
7. Ionophores and other FDA approved additives

Micro-machines are highly flexible and can prepare micro-blends for precision feeding for all classes of dairy production. Because micro-ingredients are required at differing amounts per animal daily for the different production systems, micro-machines can be used for a wide variety of dairy production groups:

1. Early, mid- and late-lactation cows
2. First and second calf heifers
3. Far-off dry cows
4. Close-up cows
5. Cull cows
6. Replacement heifers at all stages
7. Other rations recommended by the nutritionist

MICRO-MACHINE OPERATION DETAILS

The micro-ingredient machine is software controlled to weigh specific amounts of micro-ingredients for each production ration. The particular production ration is entered into the system and

identified by name and or number. The required micro-ingredients are entered in amounts per head per day. The micro-ingredient addition rates are easily changed with the software program based on the nutritionist's recommendations. The software builds the required amount of each micro-ingredient, depending on the batch size called for by the operator. The micro-ingredients are conveyed through lines by water pressure into the mixer and then flushed with water to prepare for the next batch.

The typical micro-machine has 8 bins for micro ingredient storage, flex bins for high-volume feed additives, and scales for liquid additions. All this is integrated with software to deliver micro-ingredients to the mix truck/wagon. Typically, the bins need to be topped off with the micro-ingredients daily. The feeding operator assembles the macro-ingredients into the mixer in a conventional manner, followed by the addition of the micro-ingredients with a push of a button or wireless control. Typically, the software generates daily ingredient reports and detailed reports of rations made with amounts of actual ingredients used versus projected usage.

CONCLUSION

The micro-machine offers safety advantages and delivers accurate amounts of feed additives daily to dairy and beef cattle.

Micro-machines advantages:

1. Turn key operation
2. Accurate weighing of micro-ingredients
3. Flexibly delivers recommendations of nutritionist to different groups of cattle
4. Quality control
5. Uniform delivery
6. Inventory control

The micro-ingredients are the most expensive ingredients added to the ration. With accurate addtion of the micro-ingredients, for different performance needs, the cost of micro-ingredients can be significantly reduced. Dairies and feedlots without a micro-system require the micro-ingredients to be added to each batch as a supplement or premix. The wind and other sources of shrink can be costly using this type of mixing system. The typical return on investment of micro-ingredient systems is one to three years based on the number of cows.

Micro-machines use on dairies do they have a place?

The answer is **YES**, both from an economical and an accuracy of dispensing the micro-ingredients standpoint.