



Measuring Up

GrowSafe technology offers potential to monitor feed efficiency, animal behavior and illness.

by *Alaina Burt*

A new system to monitor feed intake is gaining a toehold in the beef industry. University researchers and large commercial feeding operations are putting the system to work, hoping to gain insights into feed efficiency, eating behavior and animal health. The system is called GrowSafe, and it is a product of GrowSafe Systems Ltd., based in Alberta, Canada.

GrowSafe got its start in the ostrich industry as a means to monitor animal health using radio frequency identification (RFID) devices. The result was an RFID data collection system similar to a Pinpointer device, which monitors animal participation at a feeding area. An RFID transponder (tag) interacts with an RFID reader, allowing for traceability of an individual animal. Readers are positioned in places such as feeding and watering areas. When an ostrich enters the feed area, the system automatically reads the electronic tag. Likewise, when an animal leaves the feed area, the signal stops.

The company's first design didn't impress the ostriches, says Alison Sunstrum, GrowSafe vice president. The ostriches simply wouldn't eat. The company regrouped and reconfigured its design to allow the ostriches to eat in familiar surroundings with other ostriches.

"We realized that to successfully monitor animals, we needed to develop a method to identify animals in their typical production environments without restricting social interaction," Sunstrum says.

The company's next step was to develop a way to read multiple low-frequency transponders in a close setting. This was resolved by the implementation of a mat that was placed in front of feeders. The mat collects individual data simultaneously without animal confinement to a chute or gate to read the tag.

The data collected from animals

entering and exiting a feed area could accurately depict a day in the individual animal's life — without human interaction or interference. Through GrowSafe's technology, data was obtained that illustrated ostriches as very social animals, visiting a feeding area as often as 500 times a day. Through mapping the data, researchers began to notice that an ostrich's behavior changed sharply in relation to disease, upon which visits dropped to 50 times a day.

"Typically our systems can identify an animal becoming ill about four days in advance of visual assessment and about 24 hours in advance of body temperature changes," Sunstrum says. "We learned that animal behavior was a far earlier indication of morbidity than weight loss."

In quarantine stations where ostrich survivability was only 12%, the system was able to improve the survival rate to 92%.

From ostriches to cattle

In 1993, Alberta Agriculture, Food and Rural Development (AAFRD) approached GrowSafe to install monitoring equipment at a water location to see if cattle would behave similarly to ostriches, Sunstrum says. The results confirmed the similarities between the species. Sunstrum says this marked the start of developing an advanced RFID system for cattle.

The variations across the industry in animal and bunk size made adaptation to the cattle industry difficult. Any technology placed in a bunk, installed overhead or entrenched was either eaten, torn down or dug up, Sunstrum explains.

It wasn't until 2000 that the company was able to overcome the challenges by switching from an interconnected computer system to wireless communication for data collection. GrowSafe installed prototype systems at Cactus Feeders and ContiBeef.

"[They] helped us to test, debunk or develop a lot of our theories," Sunstrum says.

Now the system can transmit information for 30 miles and continuously collect data from 60,000 GrowSafe devices in chutes, pens, alleys and trucks. The data is then accumulated in a central computer.

Application to the industry

GrowSafe's system has the capability to measure individual animal consumption, feeding behavior and animal weight. Animal scientists have also found this system could measure differences between efficient and inefficient animals through the feeding process, which the company believes will begin to automate feedyard activities.

Through monitoring an individual animal's feed consumption, the company has developed software that can identify sick animals based on behavioral changes. The software can identify certain illnesses based on specific behavioral changes, Sunstrum says. By recognizing illnesses, GrowSafe then developed an automated in-pen medication system to treat sick animals.

By monitoring an animal's growth throughout the feeding stage, the data collection system can automate marketing decisions by identifying animals that are ready for market and in which type of market the animals would do best.

Universities and research facilities are implementing the technology for production-based studies ranging from feed efficiency to diet formulation.

Bull development

In West Virginia, Jim Bostic, executive secretary of the state cattlemen's association, planted the seeds for a study focusing on feed efficiency at West Virginia University (WVU) using GrowSafe to study bulls on test.

"I approached them with the concept that, overall, the cattle industry needed to take a serious look at feed efficiency,

because our competitors were really winning that game and we hadn't seriously looked at it as an industry," Bostic recalls.

The GrowSafe system has now been installed at WVU Reymann Memorial Farm near Wardensville for more than a year and is being utilized by researchers and the West Virginia Bull Evaluation Program.

Wayne Wagner, Extension specialist and professor at WVU, works directly with the bull test. He says implementing the GrowSafe system has changed how feed is delivered to animals on test, but he doesn't necessarily feel that the labor inputs have been a drawback.

"It works very well at measuring feed intake," Wagner says. "We haven't experienced a lot of trouble with two individuals, for example, trying to eat out of the feedbunk at the same time, so we think it's pretty darn accurate."

Bulls are on test from October to March at the West Virginia Bull Evaluation Program. The first set of bulls started on the system in October 2003. Because of uncertainty in how the information would be reported, the feed conversions weren't published in the sale book this spring. They were made available on a supplement sheet.

Consignors value feed conversion information differently, Wagner says. "Some will see the value and some will not. Some will reap the benefits, and some will not." Those who retain ownership in calves might value the data more.

Wagner reports that their first experience with the feed conversion data was a wake-up call for some producers.

The bull development center offers smaller-scale producers access to the technology by consigning three contemporaries, whereas it would be difficult to implement the technology on smaller scales because of the start-up costs.

"I guess that's one of the reasons why I think this system is so important," Wagner says. "It gives our small producers a chance to be on the cutting edge."

Cow-calf production

When bulls aren't being tested with the GrowSafe system in West Virginia, nutritionist Gene Felton at WVU is running a different kind of feed efficiency test.

"I've got a real interest in looking at maternal conversion or maternal efficiency — basically, how efficient mom is at converting feed into pounds of calf that's produced," Felton states.

The study is designed with a practical

cowman in mind as the Angus-based herd is being fed a 95% forage ration. Felton is attempting to correlate some hard numbers with the optimum condition for an efficient lactating cow, as well as study if there's a difference between nursing bull or heifer calves. As the test progresses, Felton sees the bull calves from this test group continuing in the feed efficiency study by being consigned in the West Virginia Bull Evaluation Program. Continually testing for feed efficiency will answer some genetic questions about feed efficiency, he says.

GrowSafe is measuring the amount of feed intake for the cow-calf pairs on test. Felton notes that the system saves time in collecting data but does take more management.

Felton has had difficulty with the remote location of the Wardensville test. Being three

and a half hours away from the study means equipment needs to communicate well. Felton has found that the electronic equipment is sometimes susceptible to electronic interference such as lightning storms.

With that in mind, Felton says, the company has been extremely helpful and responsive. It's been a learning experience for both groups.

Growth and disposition

GrowSafe is also being used to study feeding behaviors, as well as what they reflect about disposition. Gary Hansen, assistant professor and beef specialist at the North Florida Research and Education Center (NFREC) in Marianna, is in the process of implementing a GrowSafe system that will

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Texas test uses technology to measure net feed efficiency

Two recent technology advances provide new opportunities to improve the genetic merit of beef cattle for feed efficiency, says Gordon Carstens, associate professor at Texas A&M University. The first, he says, is the use of GrowSafe technology to accurately and more cost-effectively measure feed intake in cattle. The second is a new way to express feed efficiency through net feed intake (NFI), which Carstens says is also referred to as residual feed intake (RFI).

"Feed efficiency has typically been measured using feed-to-gain ratio (F:G)," Carstens says, "which is a gross measure of efficiency in that this trait does not attempt to account for feed needed to support maintenance and growth requirements."

A number of studies have demonstrated that F:G ratio is moderately heritable in cattle, and that F:G ratio is negatively related to growth rate — cattle that grow faster have lower F:G ratio, he explains. Therefore, applying selection pressure against growth traits will indirectly result in lower F:G ratio in growing cattle.

Because it is easier and less expensive to measure growth traits, there has been little incentive for beef producers to measure feed intake in seedstock animals to identify more efficient cattle based on F:G ratio, Carstens says. Moreover, if producers were to apply selection pressure against F:G ratio to improve efficiency, cow size would increase, resulting in higher feed costs to support the breeding herd as growth traits are positively related to mature body size. As a result, applying selection pressure against F:G ratio in growing seedstock animals would have minimal effect on total system efficiency of integrated beef operations.

"Net feed intake is a feed efficiency trait that will facilitate selection of more efficient cattle without the concurrent increases in growth and mature size that would occur if selection pressure were applied against F:G ratio," he says. NFI measures the variation in feed intake beyond that needed to support maintenance and growth requirements. It is calculated as the difference between an animal's actual feed intake and the feed an animal is expected to consume based on its body weight and average daily gain (ADG). Cattle that eat less than expected have negative NFI, which equates to improved net feed efficiency.

"Research has shown that NFI was moderately heritable and genetically independent of body weight and ADG in growing calves," Carstens says. "Thus, NFI is a trait that will provide producers the opportunity to apply selection pressure for improved feed efficiency without impacting cow mature size."

Carstens gives the example of two 700-pound (lb.) bulls with an ADG of 3 lb. Since they had similar weights and gains, both bulls would be expected to consume approximately 20 lb. a day. In actuality, one bull may have consumed 18 lb. while the other ate 22 lb. The bull that ate less than expected would have an NFI of -2 lb. per day, while the other bull would have an NFI of +2 lb. per day. The negative bull would be more efficient.

Within a bull test or a contemporary group the average NFI will be zero, which means half of the bulls will have a negative NFI.

The Beef Development Center of Texas (BDCT), spearheaded by Carstens, is one of the first commercial net feed efficiency tests to date. It is conducting its first test using the GrowSafe system. The second test will be initiated this month. It is the BDCT's goal to test four groups of cattle each year in groups of 130-150 head.

have the capacity to test 480 head of calves going on test at 650-700 pounds (lb.) in 24 pens.

“We will be looking at residual feed intake (RFI) and how that correlates to carcass, growth traits and disposition and what type of effect disposition has on carcass,” says Hansen, who found his interest in feed efficiency while managing a ranch in Texas and observing how some animals are more efficient than others. He believes this system

will be beneficial for measuring efficiency for Florida producers because most of the cattle are the result of exotic crosses.

A feed node can feed eight to 10 animals and have a computer track all of the information while eliminating human error through the GrowSafe system. Previous feed efficiency technology was labor-intensive, recalls Hansen, noting that behavior and consumption varied greatly for animals housed alone.

With the GrowSafe system, Hansen says, “[We] can measure everything an animal puts into its body during that feeding time.” He also realizes the system can pinpoint an

animal’s feeding behavior at any time, as well as measure other behaviors.

“[GrowSafe] can measure how much the animal is consuming, how aggressively the animal hit the bunk, how much the animal took out and the bite size,” Hansen says.

Conception to consumption

Besides studying feeding habits and behaviors at the end of the line, some people are using GrowSafe to trace performance from conception to consumption.

Larry Berger, professor of animal sciences at the University of Illinois (U of I) Urbana-Champaign, is part of a team installing the

world's largest-capacity GrowSafe system. The system can handle 1,200 head, and cattle used in the trials will be from the U of I's Angus and Simmental purebred herds.

"The main advantage is to measure individual feed intake in a group setting, where you don't put individual animals in a pen," he says.

Large numbers are necessary for accurate comparisons of sire groups, Berger says. By utilizing the GrowSafe system, data can be collected on how much an individual cow consumes and how much the calf consumes postweaning, which can be combined with ultrasound and harvest information on the

calf in relation to marbling and fat deposition.

GrowSafe will measure how animals ultimately perform on a carcass basis and on an overall profitability basis, Berger says in regard to the technology, which will give producers a better understanding of feed economics.

Group effort

Realizing the cost of implementing a GrowSafe system is financially challenging, Rod Hill, of the University of Idaho animal and veterinary science department, is working to obtain grants to make the system portable and to conduct testing at several

producer sites to measure RFI. A typical test would last about 70 days, Hill says, which would require animals to be on feed 21 days prior to testing. This type of setup would enable producers to test heifers, bulls or steers while providing Hill with the data needed to identify genetic markers for RFI.

The possibilities the GrowSafe system has in the beef industry are numerous. This tool is unlocking some previously closed doors in feed efficiency studies and will benefit producers' bottom lines by allowing them to select cattle that consume less and to observe illness before serious gains are lost.

