

FEEDING AND MANAGEMENT FOR ROBOTIC PARLOR FARMS (Individual Box Automated Milking System or IBAMS)

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Introduction

In order to fully understand the scope of “Individual Box Automated Milking Systems” or IBAMS, we must first define the different styles, which are based on the order in which the cow moves to feed and the milking process and the control of this order. The different styles are defined as Guided, Modified Guided and Free Flow. Further sub definitions are defined later. As you begin to evaluate the different styles, it is important to understand the working processes and inherent pitfalls of each. Without this knowledge and an understanding of the manufacturer’s software, trying to find any method to measure or develop benchmarks is futile. The development of IBAMS is still in its infancy. Sales strategies and misunderstandings of the free flow concept have led to a lot of misinformation. It is important to recognize that many of today’s designs were developed based on guided flow systems- Many of these studies were done on farms with less than 180 head milking 2x. These were early adapters and though we have learned a lot from these studies, future adaptation to large dairies will pose new challenges for our industry. Manufactures will be further challenged to modify their thought processes and machines so as to develop a level of efficiency that equals and or exceeds our current and future conventional milking systems.

We marvel at the beauty of the bovine species in its ability to adapt to almost anything man dreams up for it. Since the early 1990’s, individual box style automated milking systems have been used on our farms sometimes, but not always, with success. The guided flow was among the first style of IBAMS most likely because we had always designed our feeding and milking systems that way. But we must recognize that cows love autonomy, are very curious and calculating problem solvers. If you want proof of this, leave a gate partially locked and we all know what happens next.

Finally, a last comment. Time is infinite but if you are going to be successful with IBAMS, you have to treat time as a limited resource. Configure your system and select equipment that makes the most efficient use of machine cow time.

Styles OF IBAMS

Currently there are three basic configurations of the “Guided” systems; they are Milk First, Modified and Feed First. With the “Milk first” design, the cow moves from a stall to a pre-selection gate where she is identified. At that point, the computer determines if she is eligible or has permission to be guided into the commitment pen prior to entering the robot. If the cow is not eligible, permission is not granted and the cow is immediately guided to the feeding area. Animals that are late to be milked have priority at the robot. Factors that may determine which route the cow will be guided to are the current stocking density in the commitment pen and the milking status of the individual cow. These conditions are user defined. If enough time has elapsed from the last successful milking and stocking density is below the threshold limit, the cow will be allowed into the commitment pen where she can gain access to the IBAMS. Once in the commitment pen the cow will have to go through the IBAMS in order to get to next area.

In the “Modified” system, the cow moves from the stall and has the ability to go to the feeding area or through the pre-selection gate. At the gate, all the same actions take place as in Milk First. This style is most commonly found in a retrofit or a six-row barn that couldn’t be converted into a true-guided system. Here, one side faces the feeding area.

“Feed First” was offered in the past but today few recommend this system. It is still seen in Northern Europe with low energy PMRs and feed stations but not much in the US or Canada.

In “Free Flow” systems, the cow moves from the stall and has free access to the robot or feeding area with no pre-selection gates. Leaving her free to move as she wishes. This style is gaining in popularity among all of the manufacturers.

Benchmarking and Software

Each manufacturer has its own software system that controls the IBAMS and has some in house herd management software attached to it that may include a husbandry management tool such as activity monitoring, heat detection, rumination, eating time, conductivity, SCC and other possible health alerts. Some systems are currently compatible with and capable of exporting select information to Dairy Comp 305 or PC Dart. However, this is a one-way transfer from IBAMS to the external herd management software and current IBAMS software does not allow the import of information from DC305 or PC Dart.

Terms

It is exciting that these machines collect hundreds of individual animal data points on a daily basis and records this information for current and future analysis. Across different software platforms the terms, in most cases, are not interchangeable due to the difference in data collection. One must take care in understanding these terms and how they are defined in order to understand how to manage the system.

“Box Time” is calculated three different ways depending on platforms. Most start out the same with the time the animal is identified in the IBAMS. From there, they begin to differ greatly. Box time starts at cow ID. Some end the calculation at the time of last teat cup take off, others at the time the exit gate opens, and still others stop their calculation when the exit gate has closed and the animal has completely exited the IBAMS.

“Refusals” are defined as the condition in which an animal has entered the IBAMS and was not milked or fed anything at that time. An animal is refused if she has not met a user defined minimum amount of time since the last complete or successful milking or minimum amount of “expected milk” in her udder. She may also be refused if there is a user defined maximum number of milking cycles in a given 24-hour period. Closely related on some platforms is “Passes”, however you should not compare the two. They are not the same. Passes can occur if the threshold limit at the commitment pen has been reached. Timid animals can learn to stay in the commitment pen because once the threshold limit is reached it can offer protection because no other cows can enter. This can skew the “Passes” metric.

“PMR, Partially Mixed Rations” are given in the manger or feed bunk. A portion of the ration is also given through the IBAMS, which is usually in the form of a pellet or meal or an individual ingredient and in some systems liquid feeds which seem to be gaining in popularity.

“Free Time” is defined as the amount of time left in a 24-hour period which the IBAMS has left to accept access by an animal. This is calculated every 24 hours and begins by subtracting the time for mandatory internal washing and sanitizing. This also varies by manufacturer and can be anywhere from 15 minutes to 23 minutes. Then the time each animal spends in the IBAMS is subtracted with the result being Free Time.

“Milk Flow” is the rate at which the milk is flowing from the teat and through the system and is directly related, but not limited to, all factors such as stimulation, maintenance, vacuum settings, take off times, and teat and animal health. Currently milk flow rates at industry monitoring points such as 0-15, 15-30, 30-45 seconds and 2-minute milk are not being stored as a metric. However, external tools can be used to better collect information currently not recorded.

Some terms are closely related or similar.

“Fetch Cow”, “Late” and or “Red Cow” is an animal that needs a little encouragement to return to the IBAMS after a user determined time interval. The most likely causes of high fetch cow numbers are poor training protocols, overstocking, a PMR balance set to a level higher than needed for the production level, poor pellet or an unappetizing meal form being offered in IBAMS, lameness, heat activity and sickness.

“Rest Feed”, “Concentrate Not Consumed” or “Not Eaten” These are feed that is allocated to the animal but was not consumed in that 24-hour period. This can be a result of a few different factors and is likely associated with the number of visits in that given 24-hour period or improper settings in the feeding charts. It is important to note that all of the IBAMS only record what is metered out and calibration should be done often. Currently the systems do not weigh what is left in bowl.

“Incompletes” or “Failures” are defined as a milking cycle started but not completed as designed in the system. Factors that affect this are inflation kick offs, poor let down, and the system’s inability to find and or connect to the teat. Maintenance, both machine and animal, and animal uneasiness or poor treat placement also contribute to incompletes or failures. Laser and camera systems are getting better at handling teat placement issues.

“Rumination” is a useful tool for recording actual cud movements while “Eating Time” is recording the time the head is located in a feeding position.

“Expected” - Most of the platforms will work from expected averages. For example, the cow visits the robot and is successfully milked on Monday 4 times, on Tuesday 3 times and on Wednesday 5 times. Her “expected” milking on Thursday is now 4 times. If there is no rest feed in the balance ration, then her feed allotment will be divided into 4 feedings in the next 24-hour period. This method is also used by many IBAMS to calculate expected milk in the udder, expected milking speed and expected box time.

Barn Design

Regardless of manufacture or style, barn design takes priority. An IBAMS is only a tool used to extract milk from the udder with minimal daily intervention by us. The best machine will still fail if the barn is not designed to accommodate the animal and the IBAMS style. Even the best forage quality or the most aggressive training protocol will not make up for an inefficient or restrictive layout.

Training

Training is mandatory and if not executed properly can lead to a less than efficient outcome. There are several thoughts on this in the market place, but keep in mind that a training program is likely to be successful if it is managed to meet the behavior patterns of the animal first and then the goals of the management. Every animal needs to be trained to the IBAMS. The animal is lead into the IBAMS were a camera or laser reads or “maps” teat placement and begins to store data on that individual animal udder and teat placement. Training the animal and the IBAMS has now begun. I have found if you lead or fetch and successfully milk her greater than 4 times a day within the first week of her lactation, she is more likely to not show up on a fetch list later in lactation. This type of protocol has shown that in early lactation they visit 4-6 times, mid lactation they tend to visit 3-4 times and late lactation 2-3 times within a 24-hour period. Pay close attention to all animals that fall off this pattern. They are telling you that something in their world has changed and a cow side visit is necessary. Many factors play a role here. They may include but are not limited to, feet issues, injury, health or estrus event. If you have introduced new animals to the group, this can disrupt activity and individual animals may need to be fetched a few times to get them back into a desired visitation pattern. It is also important to understand when something such as a power outage, breakdown, feed mix up or unexpected change happens, that you pay close attention to the behavior. When animals go away from a consistent visit behavior, managing them back on track is key factor to success.

Feeding

After Barn design, the single most influencer is feeding. The biology of the cow is the same no matter which design is used. She needs a level of nutrition that supports her current metabolic state. The difference will be how and where you provide the nutrition. Having a full understanding of IBAMS and working with individuals that have experience with IBAMS will help to insure success. Several of the manufactures offer certified feeding and management training courses and industry partnering to assist in making a positive experience for all parties involved. These courses are continually offered and in some cases the certification process is only good for 2 years. Because of rapid change and new learning, this insures that serious individuals will retake certification and be current on new methods and techniques.

It is extremely important to understand how the different platforms deliver feed at the IBAMS and how to set up feeding charts properly. Poor feeding charts can have negative effect on traffic in all IBAMS styles. Experience is a key factor to the success

with IBAMS and working with individuals who have experience should not be overlooked.

Pellet quality or meal taste is another priority consideration at the IBAMS. For many, pellets are the feed form of choice. There are places where feeding meal is meeting the producer's goals, however more are using pellets.

If the feed offered is not something the animal craves, then getting traffic to the IBAMS will be challenging. Even the most aggressive training programs will not compensate for the poor crave at the feed bowl and lowering PMR energy balance will not make up for it. Daily monitoring should be strictly observed and every effort should be made to insure the feed delivered to the bowl is in a consistent form that they crave every time. Factors that affect this are the ingredient formulation; delivery systems both at the feed manufacturer and at the IBAMS. Flavorings and liquid feeds can assist if implemented properly. Caution though, there is a learning curve here too.

The next is PMR energy level. Industry wide the recommendation is to balance the PMR to 10-15 LBS of production below the group average then make up the balance of the nutrition in what is being offered at the IBAMS. This is a great starting point and is just that, a starting point. One should closely observe the group's behavior to determine what direction the PMR balance should move. Too low a balance and refusal can be too high. Meaning too much activity at the IBAMS. Too high a balance and refusals will be low and fetch lists will be long. Care should be taken to make sure consistency is being observed. If constant change in refusals and visits is occurring, then a constant variation will be observed in intakes at the IBAMS. When visits drop, feed intake at the IBAMS will immediately drop, because the feed portion is divided up into "expected" visits. As an example, a cow is allocated 15 lbs. of pellets at the IBAMS in a 24-hour period. For the last 3 days, she has been averaging 3 milkings a day. For each visit she will be given 5 LBS of feed. Today she comes only 2 times. The total for today is 10 LBS instead of her allocated 15 LBS. In most cases, the 5 less pounds (Rest Feed) not fed today will be made up and added equally to her next expected visits in the next 24-hour period. Keeping with the 3 milking visits, the IBAMS may now give her approx. 6.6 lbs. of feed. Increased variation is now observed with a range of feeding in two days from 10 to 16 LBS of grain at the IBAMS. Keep in mind that none of the IBAMS weigh the feed, only meter out a given, adjustable amount. When density changes in the feed offered, different amounts will be given, however the software will not adjust for it until a new calibration takes place.

Other things to consider. Taking starch out of the diet is not always the answer. Levels can get too low causing a down-hill spiral. On the other hand, feeding too much at the IBAMS can also affect visits. If she receives a balance portion at the IBAMS large

enough to exceed her energy requirement or actually cause upset, then she will be less motivated to visit. My observations have been more on less motivated than belly upset.

Like in non-robotic systems care should be taken to minimize sorting at the PMR. Paying attention to particle size, moisture content, mixing and regular and consistence push-ups are still very sound management practices.

Management

Managing the flow of cow traffic through an IBAMS is similar in all set ups. Total ration is set on providing enough energy at the PMR yet leaving enough out to drive hunger and drive visits to the IBAMS. In my opinion, coming to the IBAMS to relieve udder pressure is a myth. She comes to the IBAMS for one reason; it fills a need, a need to consume that tasty snack! One has to pay close attention to what the software is reporting about each cow and group and then managing that information in order to contribute to each groups success. A sound training program and proper energy balance is key.

The software that controls the IBAMS has many user-defined settings that can assist in maximizing the cow flow. Understanding the settings and what the monitors are reporting are just as important. It is extremely important to spend the time to get educated.

Conclusions

Putting a team together of experienced individuals from the beginning has proven to be a very important part of the success of feeding and managing IBAMS.

Time is the resource you need to use wisely when working with IBAMS. Everything that is done needs to improve the box time.

It's important to spend time observing the animal behavior patterns in an IBAMS to fully understand how to feed and manage. Training is a key factor to success.

Benchmarking between manufactures can be challenging if one has not taken sufficient time to understand their differences.

We continue to identify new benefits that IBAMS offer in today's market. Major advancements in robotics, software, layout and design have already taken place and will continue in the future. IBAMS are here to stay.