

## **Issues with Electronic Identification in Milking Parlors**

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### **Introduction**

Many new large dairies are installing parlors with milk meters and electronic identification. When these systems function correctly, there can be value in the information available. The value extends beyond measurement of milk production for each milking for each cow to information allowing rapid assessment of parlor personnel, and the parlor equipment itself.

Unfortunately, on many dairies, the technology does not always function as well as desired. This discussion will identify some of the potential pitfalls and describe some methods for both diagnosis and treatment.

### **Background**

It has been over twenty years since electronic identification first became commercially available. Early uses included monitoring both feeding and milk production. These systems now range from very small devices that can be implanted in the ear or hock to larger devices worn around the neck or the ankle. The implanted devices are passive (no battery) and remain with the animal to slaughter, allowing for a future potential use for trace-back.

The larger devices are typically removed and reused when an animal leaves the facility. Many of these larger devices have additional capabilities such as activity or pedometry. The devices that measure activity by necessity contain batteries. When the batteries are also used to generate the signal to transmit information, they are called active transponders.

While the daily measurement of milk production is still important, many other uses have can help increase the value of these systems. Some manufacturers provide a variety additional data to assist in determining cow flow, milk letdown, conductivity, etc. The inclusion of automated sort gates with these parlors have the potential to save labor, so long as the proper information is assigned to each cow and the cow is recognized and sorted as she exits the parlor.

### **Location of Antenna**

There are two general designs for placing the antennas: An individual antenna at every stall and an antenna located at the entrance of each side of the parlor (referred to as a "portal" system). There are advantages and disadvantages of each system. Both systems work nearly perfectly when the following are present:

- Every cow has a functioning transponder
- Every antenna works correctly
- Cows walk in the parlor in order, without partially entering and then backing out
- Cows place their transponders within the zone that the antenna can detect them.

Perhaps the most common problem situation arises when an individual cow's transponder is not read. This can occur for a number of reasons:

- She never had a transponder
- She has lost her transponder
- The transponder is not working or otherwise malfunctioning

- The electronic number was never entered into the PC
- The electronic number was entered incorrectly into the PC

Individual stall antennas tend to minimize the impact of this situation. One stall will not have an identified cow, but will still have a milk yield and other data. All the other stalls will be unaffected by the missing cow. At the end of the milking, there will be no milking data for the unidentified cow.

With a portal antenna system, one missing cow affects the entire side. The system "sees" one more milk weight being reported than the count of cow IDs. In other words, there is an unknown cow. Additionally, at that point the system cannot automatically tell which milk weight goes with which cow. There are currently four approaches to this scenario:

- Have the milking staff be responsible for entering the correct cow identification and fixing the automatic ID system . This works well in smaller parlors, where the milking staff recognizes every cow and is not under very much time pressure. It is infeasible in larger parlors to expect workers to constantly stop their routine and fix ID issues. The IDs either don't get fixed or quality prep of cows suffers.
- Assume the last cow entered was the unread cow. On average, this mis-assigns data to about half the cows and cannot be recommended.
- Discard all data from that "turn", because bad data is far worse than missing data. Some systems report a zero, other merely report an average weight for the cows that were identified, with this average based on the cow's previous milkings. If averages are sent, it is much more difficult to promptly detect problems. Too often it masks a problem long enough to let a system fall into total chaos.
- Use an algorithm to determine which weight most likely belongs to the missing cow. This has been very successful if only a few tags are not working, but is not a perfect solution to all situations and is unsuccessful if tag maintenance is poor.

## Sources of errors

There are a number of reasons that identification errors occur in these automated systems. Problems can be due to the manufacturer, the software, the employees, the cows, and even to the design of the parlor. Understanding the sources of errors can help diagnose and correct them more quickly and minimize their frequency.

### Tag problems

All tags eventually fail. Some are broken on arrival, some fail intermittently, some appear to last nearly forever. The average lifespan varies by manufacturer, environment, and perhaps battery life (if batteries are present) . In certain cases, a tag will emit multiple signals and will appear to be two different animals. There have also been cases where two tags have the same electronic ID.

### Antennas - portal, individual stall

Antennas have a range, also called a sensitivity. As a general rule, larger antennas can detect smaller signals. There are three situations where unwanted signals have been detected:

Off-farm (e.g., nearby Loran towers)

On-farm (e.g., variable speed pumps)

Nearby cows (e.g., the antenna reads cow at next stall/cows in exit lane)

The opposite problem also can occur. In order to decrease the detection of unwanted signals, sometimes the sensitivity is decreased so much that tags need to be very close to the antennas or risk not being read. When there are antennas at every stall, the sensitivity of each antenna needs to be carefully adjusted, so that the correct cow is consistently read while the neighboring cow is rarely read.

### Cow problems

Sometimes the problems originate with the cows themselves. They do not get identified: they turn their heads away from the antenna, they pass the antennas too fast, or their tags are twisted. Some cows stick their heads back into the portal antenna after they have been milked and get read a second time. Some cows linger near the parlor and get re-identified by the antenna at the individual stalls after they have already completed milking.

A common problem is a combination of a design failure, and cow behavior. In portal ID systems, there is typically a funnel entrance area prior to the antenna. If a cow can enter the antenna, get read, and then later back out, a portal id system will fail. The "chute" leading up to the antenna needs to be of sufficient length and narrowness so that it is very rare for a cow to be read and then back out of the chute. The underlying premise of portal antenna is that the cows are milked in the order that they are identified.

In a rotary parlor with a portal antenna system, any cow that takes an extra trip around may not get re-identified by the antenna. These cows may need special handling.

### People

Having two tags with the same electronic ID occurs when the factory creates two identical tags and both end up at the same dairy. Unfortunately, this usually is detected after the tags are already placed on the cow. In order to minimize this, some manufacturers are now creating a unique number for each tag. By necessity, this means the tag numbers are much longer numbers. Not surprisingly, the error rate from manual entry increases dramatically with longer numbers to enter - and incorrectly entered numbers will not function.

A much more common problem is animals that enter the parlor without a physical tags. It may have fallen off or or a cow freshened, and was milked before her tag was assigned and installed. It is important to make sure all animals have tags on them before they ever get to the parlor the first time. Most dairies are now tagging cows as they enter the close-up pen. For those dairies with bulls, it is usually helpful to have the bulls properly tagged.

### Computer

Even when working tags are placed on the cows and the numbers are properly entered into the management computer, the data still need to be sent from the computer to the parlor controller. Sometimes this is another computer, and sometimes it is an external device. If the connection is unavailable, or not scheduled, there might be a delay between the data being entered and the parlor knowing about that cow.

### **Testing and diagnosing a system**

A new system should be thoroughly tested after installation is complete. It is also useful to establish maintenance evaluation procedures. Tags do fail, cows and tags may be not entered correctly, stalls can malfunction, new equipment can interfere with the antennas, and the system stops performing as desired.

Daily reports - after every milking - should alert the dairy to the existence of problems. Most dairies notice they have a problem when they stop getting daily milk weights on certain cows, or from certain stalls, or from a specific side.

Properly functioning sort gates facilitate complete testing. Merely send a cut for every milking cow in the herd, then physically redirect the cows after the cut gate. Those cows that get cut have everything right: they have good tags, the tags were entered properly, the sort antenna is functioning, and the information made it from the original keyboard to the parlor controller to the sort gate. Those cows not cut either have bad or duplicate tags, they were mis-entered, or they have no tags at all. Some dairies do this exercise on a weekly basis to easily identify those cows that need tag maintenance.

We have also using a structured system to understand exactly how these system function, not only when everything is working perfectly, but also how the systems perform when a problem occurs. Every system will malfunction at some point in time. Early detection is useful with this technology.

A sample evaluation protocol is included as an appendix to this paper.

Finally, some systems have the ability to log all tag activity for a milking shift. The file contains the exact time each tag was read, the actual tag read, the stall occupied, the milk produced, the time-of-day the unit was attached, the time-of-day the unit was detached, and other information. These raw data files can be searched and sorted if necessary, and it a tedious process, but surely is better than reading thousand page printouts.

### **Does accurate ID really matter?**

There are systems that have been sold with electronic meters, without electronic identification. Some dairies have the milkers enter each cow number in as she is milked. There are even some dairies that utilize the information without any cow identification. Obviously, if accurate individual milk weights were the only goal, this would make little sense. But with all the additional information available, it is worth a discussion of what data are still valid, even if no individual cow identification is available.

Analysis that needs accurate cow ID:

- Milk weights on individual cows for estrus/disease detection, feeding, culling, and other individual cow decisions.
- Time-of-day each cow is milked to identify cows milked in the wrong pen
- Conductivity, activity/pedometry measurements to detect mastitis, estrous, and disease.
- Parlor filling time usually requires accurate portal identification. (Last minus first cow).

Data that may not need cow ID, if stall is accurately identified:

- Order of unit attachment is available merely from times for each stall.
- Timing of unit attachment is also available from times for each stall.
- Duration to detect problems with automatic take-offs at an individual stall.
- Calculation of certain parameters, such as cows-per-hour, turns-per-hour, and milk per hour.
- Stall weight calibration merely requires weights for each stall.

- Flow rates (cow letdown and udder preparation), even when available for each cow, are still useful when overall averages are used for each shift.

In addition, if pen milk totals are available, we can even calculate:

- Average flow rate, as only total milk and duration are needed
- Milk per stall, only milk weights and total stalls occupied are necessary.
- Milk per hour can be calculated with total milk and total time.

## Conclusions

Similar identification systems are available for cars bypassing the lines at the freeway toll booths, and automatically changing automotive fuel to the proper credit card. Non-agricultural uses have the potential to help improve the technology, and decrease the costs.