# New Technologies and Trends in Precision Dairy Monitoring

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Precision dairy monitoring has provided dairy farmers with many new and interesting management opportunities. Recent publications and presentations by researchers and industry representatives represent some new directions in precision dairy monitoring.

**New Technologies**
*Image Analysis*
An interesting concept in precision dairy monitoring technologies is the use of image analysis on dairy farms. The benefit of on-farm image analysis would be a reduction in technology costs. For instance, instead of affixing tags to every cow, camera images identifying animals through conformational traits and markings would track cow activity, lying and standing behavior, lameness, body condition score, respiration rate, feeding behavior, and many others. These technologies are still young and limitations exist regarding their current implementation, but this is definitely an area of interest for many technology manufacturers.

*Virtual Fences*
Many dairy farmers worldwide still extensively use grazing systems. This creates some interesting issues and opportunities for dairy farmers. With rotational grazing, pasture fence management can be labor intensive. Additionally, identifying animals needing attention and locating them on expansive pastures can be challenging. Virtual fences may be the answer to these problems. Virtual fences use GPS or animal triangulation (relay stations to identify animal position and location) to locate animals. Virtual fences are established at the farmer's discretion. A set threshold is established, and cows are discouraged from crossing by warnings and a gentle electric shock.  As cows approach these virtual fences, auditory warnings are issued via a collar or tag fixed around their neck. If cows surpass the set threshold, a gentle shock is issued to encourage cows to return to the specified pasture area. Challenges still exist in regards to tag size, power requirements, and effective distance between cows and readers for virtual fence technologies. Future versions of these technologies should correct these problems and increase their attractiveness.

*Cow Time Budgeting, Movement, and Location*
Animal position and location is not limited to pasture. Animal position and location systems are available and gaining in popularity, especially in Europe. These systems allow farmers to track cow movements within a barn. These systems triangulate a cow's position, and follow it as cows move throughout the barn. This enables a user of this technology to track an individual cow's movement, and monitor where the majority of a cow's time is spent. This can serve as an addition tool in diagnosing estrus or health alerts when used in combination with traditional metrics (e.g. activity, lying behavior, feeding time, rumination time, etc.).

**Alerts and Precision Dairy Monitoring Technologies**
A recent issue in precision dairy monitoring is alerts, specifically health alerts. Detecting cows struggling in early lactation is a goal for technology companies and dairy producers alike.   Many have heard the saying, "there are three rations on a dairy farm: the ration that's formulated, the ration that's mixed, and the ration that's consumed by the cow." A similar saying can be used in regards to alerts and

precision dairy farming, "There are three types of actions following an alert from a precision dairy monitoring technology:  the action that should be performed, the action that's recommended based on technology information, and the action that's actually taken by the farmer."

Frequently, identifying specific diseases (e.g. ketosis, milk fever, metritis, etc.) is not possible and technologies take a "shotgun" approach to disease detection by looking for deviations from normal cow and herd behavior. Unfortunately, this is not always effective and tends to create alerts that producers do not always trust, are not sure how to handle, and frequently take no action upon. Recent estimates from researchers at the University of Kentucky indicate that producers disregard nearly 65% of health alerts generated by technologies. This can be for several reasons.  Frequently technologies are not able to correctly identify a disorder, or generate false alerts. This causes producers to begin to distrust alerts when they occur. A second explanation is that disorders are subclinical and the technologies are correctly identifying these events. In cases without clinical symptoms, these alerts are often regarded as false. In the future, companies should work closely with farmers to refine alerts. Refining these alerts and providing meaningful suggestions and support following alerts may allow dairy farmers to make timely and meaningful decisions.

## Conclusion

With exciting and new technologies on the horizon, many opportunities exist for monitoring on a dairy farm. Technology advances are exciting and allow new levels of management to be attained, but care should be taken to ensure dairy farmers are being provided meaningful information with which they may take meaningful actions. More research and development is needed with new and existing technologies to ensure this is accomplished.