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# Thief Hatch Monitoring for Storage Tank Emissions

*Nearly half of all emissions in major oil basins come from storage tanks. Equipment companies and producers have been working together to install better and tighter sealing thief hatches – hatches used on tanks for manual access to product- for decades, but even the best thief hatch will not seal if it is not closed. This may sound painfully obvious, but unsealed thief hatches are a major issue in the field, enough so that governments are starting to take regulatory action against offenders.*

By Jeff Jones, Product Manager – GO™ Switch, Emerson



Equipment monitoring has become ubiquitous in many aspects of process control. Industry 4.0 is beginning to revolutionize efficiency in all aspects of production, transportation and distribution, but it has been slower to catch on in remote storage at upstream tank batteries. This may be due to any number of reasons, such as a perceived high cost of implementation, tank location or lack of knowledge about equipment monitoring options that are available. Now, thanks to Industry 4.0, these remote batteries are becoming more and more connected, with level sensors automatically notifying suppliers to send more product. But gaps in monitoring and connectivity still remain.

## Monitoring Thief Hatches in Tank Batteries

Most tank batteries exist in remote locations where days may pass between site visits and where a physical inspection of the tank top may not have traditionally occurred on a regular basis, but when the sites are visited

the thief hatches are frequently accessed. “In order for a producer to complete custody transfer, they have to thief the tank to check levels and media properties,” explained Andrew Orchard of Applied Controls. “This is done through the thief hatch which doubles as the access hatch, and the first level of pressure protection for venting and vacuuming on the tank.” Many different teams are accessing sites which can be spread out over many miles. In the confusion of day to day activities, hatches are sometimes left open, or more

frequently are closed without being fully latched. Without any type of monitoring, it could be days or weeks before an open or unsealed hatch is detected and closed.

From his base of operations in Englewood, CO Andrew Orchard saw the need for monitoring before it was required, “As a sealing element, thief hatches inherently leak. Under new regulations...emission limits per well pad have been lowered by over 65% and custody transfer now must be completed without opening the thief hatch. As thief hatches are still necessary for maintenance, it is essential to monitor and confirm that the hatch is closed so it does not contribute to overall emissions limits.” Orchard not only had to present his customers with products that met certain physical requirements, but he needed to provide solutions that made it easier for his customers to meet operational complexities.

A newly built, closed and properly sealed thief hatch can limit emissions to the minimum levels required to meet these regulations, but a hatch left open or not fully

sealed allows emissions to continuously vent out into the atmosphere. While the customer might have been mostly worried about loss of product in the past, concerns began to arise about the toll these leaks were taking on the environment. Direct action was taken in states such as Colorado and California, which have recently passed regulations to require constant checking and documenting that each thief hatch in a facility is closed and latched. There have been incidents already where major sites are fined up to USD\$25,000 for every day an operator cannot account for a hatch being closed and properly sealed.

Knowing that a hatch is closed is vitally important, but the information requirements are becoming more complex. Operators don't just need status updates, they need precise data for crucial emissions calculations and reports. Orchard explained, "Knowing how long the hatch is open and ensuring it is closed upon the completion of custody transfer is critical to measuring total site emissions and remaining under the allowable limits."

### Managing New Regulations

New regulations are not just putting stress on these sites during physical inspections, producers are also required to self-audit and report emissions calculations back to agencies themselves. Operators are now required to confirm and document on a weekly basis that every thief hatch is fully closed and sealed. And every day that they are unable to account for a missed open hatch, they are liable and may be fined. In the past, producers might have changed procedures to put contingencies in place and gather manual data, but today's demand for process efficiency called for an automated process.



Monitoring solutions had been thrown together in the field before, but there was a consistent problem with them- false signaling. Just as a closed but unlatched thief hatch can be missed by an operator, previous monitoring systems sometimes made no distinction between a latched and unlatched switch, resulting in a 'false trip'. Orchard explained the problem this presented, "False trips can result in recording increased emissions as the thief hatch may show open when it may not be and can result in operators spending extra time checking thief hatches."

### Shift Design Variations

Orchard and his team at Applied Controls needed a solution that could be developed quickly, install on existing thief hatches, and fit multiple models/designs. Looking at the complexity of his customer's request and beyond to other sites managed by other customers, they knew that a proper design couldn't just be pieced together. Tens or hundreds of thousands of thief hatches exist in tank batteries today, and it was going to take a lot of work to make a solution fit all of them.

### Design Variations

The varieties of thief hatch designs in the field today are virtually endless. The producer was working with multiple different thief hatch models that ranged from brand new to decades old. They mostly used variations of the Enardo 660 series, which perform well beyond required regulations regarding leak rates, but that variety meant complexity. The varieties included an older model, the 660 and the new 665 model. Within both models there are three styles, standard,





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“Long” and “High Flow”. Mounting patterns, latch positions and angles differ across every one of these products.

### Finding a Solution

The Applied Controls team partnered with TopWorx, a sensor manufacturer based in Louisville, KY, to come up with a solution to solve his customer’s monitoring problems. Steven Plummer, the lead Engineer at Top-Worx’s custom mounting division, said, “This was a challenging solution to develop. Sensing that the lid was closed wasn’t enough, we had to confirm that the hatch was properly latched, without giving a false positive. We ended up with a design that was easily installed in the field on both new and existing thief hatches, and not just something that looked good on paper.”

TopWorx and Applied Controls delivered kits that allowed customers to retrofit their thief hatches in the field using only simple tools. A modular mounting kit held a 73 Series precision sensing GO™ Switch, designed specifically to only signal when a lid was fully latched, regardless of whether it was a new or old model. The sensor could then be wired to a Rosemount 702 Wireless Transmitter, which simplified and lowered the cost of install, but most importantly could automatically keep record of each time the thief hatches were open and closed with automated timestamping.

Orchard was pleased with the simplicity of the design, saying, “[The design] allows producers to monitor the status of thief hatches without false trips.” A client in California agreed, “The GO Switch thief hatch system is the only solution on the market I am aware of that will reliably and economically indicate whether a thief hatch is open or completely latched shut.” Implementation of



such a reliable monitoring system has been widely overlooked for decades, but operators are beginning to see the benefits of connecting everything in their facilities. Cutting down on the time that operators use to check and document the position of these hatches increases the producer’s efficiency and brings their entire operation forward into Industry 4.0, and it might be overdue. If these tank batteries are smart enough to automatically order their own replacement product, they should also be able to tell if the door is left open.



### ABOUT THE AUTHOR

Jeff Jones is an experienced Product Leader with a diverse history developing new products for customers across multiple industries. Today he serves as the Sensing Products Leader for Emerson Automation Solutions - TopWorx in Louisville, KY. Mr. Jones works closely with end users, integrators, and engineers from across the globe to identify, design, and deliver new solutions.