

### **Introduction:**

This case study presents a new way of identifying and measuring emissions of methane and volatile organic compounds (“VOCs”) from oilfield storage tanks. Storage tank “thief” hatches are located on the top of every storage tank at every well site in the world. These hatches provide access for tank level measurement and sampling, and as a safety device to prevent structural failure from vacuum (unloading) or over pressure (loading). These hatches are the largest source of methane emissions in the oilfield. The industry currently employs intermittent methods of detection that rely on human sight, special cameras, satellites, and acoustic sensors. The Advantis patented Hatch Scout solution is simple, inexpensive, and operates 24/7 monitoring tank hatches and alerting the operator if the hatch is venting methane and VOCs. Also, while leaking or venting volume is calculated and reported real time.

### **The Problem:**

The thief hatch is found on the top of all oil and water storage tanks and is necessary for access and safety reasons. The hatch safety function is to prevent structural failure of the tank during routine operation. The hatch must be opened when unloading to a transport truck to prevent vacuum pressure from imploding the tank. When the hatch is closed, the pressure relief function of the hatch prevents explosion of the tank by venting excess pressure through the hatch’s spring-loaded gasket. The thief hatch provides a critical safety function that unfortunately also represents a significant source of emissions. The Advantis Hatch Scout provides 24/7 monitoring for the operator to address the cause of the emissions.

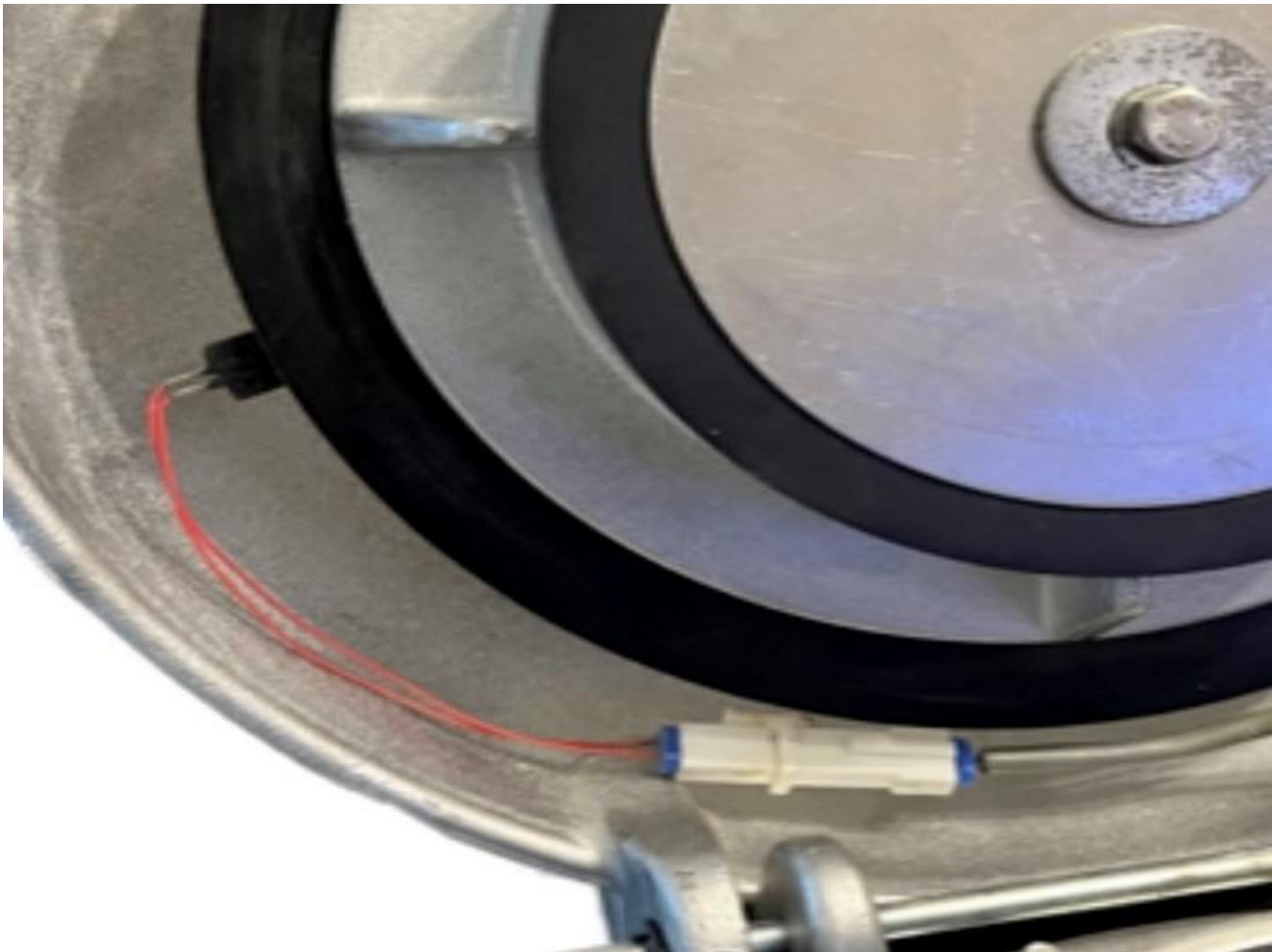
Oilfield methane emissions are considered by regulatory agencies as a substantial source of GHG (Greenhouse Gas) emissions. Methane is considered a particularly potent GHG. Tank hatches will obviously leak methane if the hatch is left open. Even when the hatch is closed, or closed and latched, the hatch will release methane if pressure builds by only a few ounces. Pressure may build when the tank level rises, the ambient temperature heats up, or if the production equipment (separator, vapor recovery system, etc.) malfunctions. Emissions from storage tanks pose an explosion and/or H2S poison hazard, a loss of revenue, and when/if the Methane Tax is imposed in February 2024, a significant additional tax may be imposed on the operator. The EPA’s November 2021 Announcement focused on finding and fixing methane leaks and importantly *“Ensure that all well sites are routinely monitored for leaks.”*

Current methods for monitoring oilfield locations are intermittent: visual inspection by field personnel; a flyby with a drone, airplane, or satellite; special camera focused in the right direction on a clear calm day. Many operators have adopted a process called LDAR (Leak Detection and Repair). Once all the repairable leaks are repaired, the tank hatch will be the only remaining “non-repairable” source of leaks. All of the current methods are not only intermittent but are also very expensive and may be cost prohibitive for smaller operators or marginal well sites.

The industry needs a simple, low-cost, turnkey solution that will monitor and report hatch emissions 24/7 and calculate the amount of methane emissions.

**The Solution:**

The Advantis Hatch Scout is a patented turnkey solution that fits existing hatches installed on tanks. The Hatch Scout attaches a sensor to the hatch gasket and can detect minute changes of force on the gasket. Once calibrated, the force on the gasket indicates whether the hatch is open, closed, closed and latched, or closed and latched and “burping” gas. If the hatch is burping gas, Advantis can correlate the force change on the gasket to the volume of gas leaking past the gasket. The force sensor gauge is wired into a shoebox-sized control box (an SM-3) that contains a logic board, cell/satellite modem, and a battery recharged by a solar panel on the box lid. The SM-3 is UL certified intrinsically safe for explosive environments, is installed on the top of the tank structure, and can monitor up to 6 tanks. The SM-3 transmits data from each hatch monitor 24/7 to the operator’s handheld devices or desktops. The operator and their field personnel will have real time alerts if any tank hatch is open or blowing excess gas into the atmosphere.



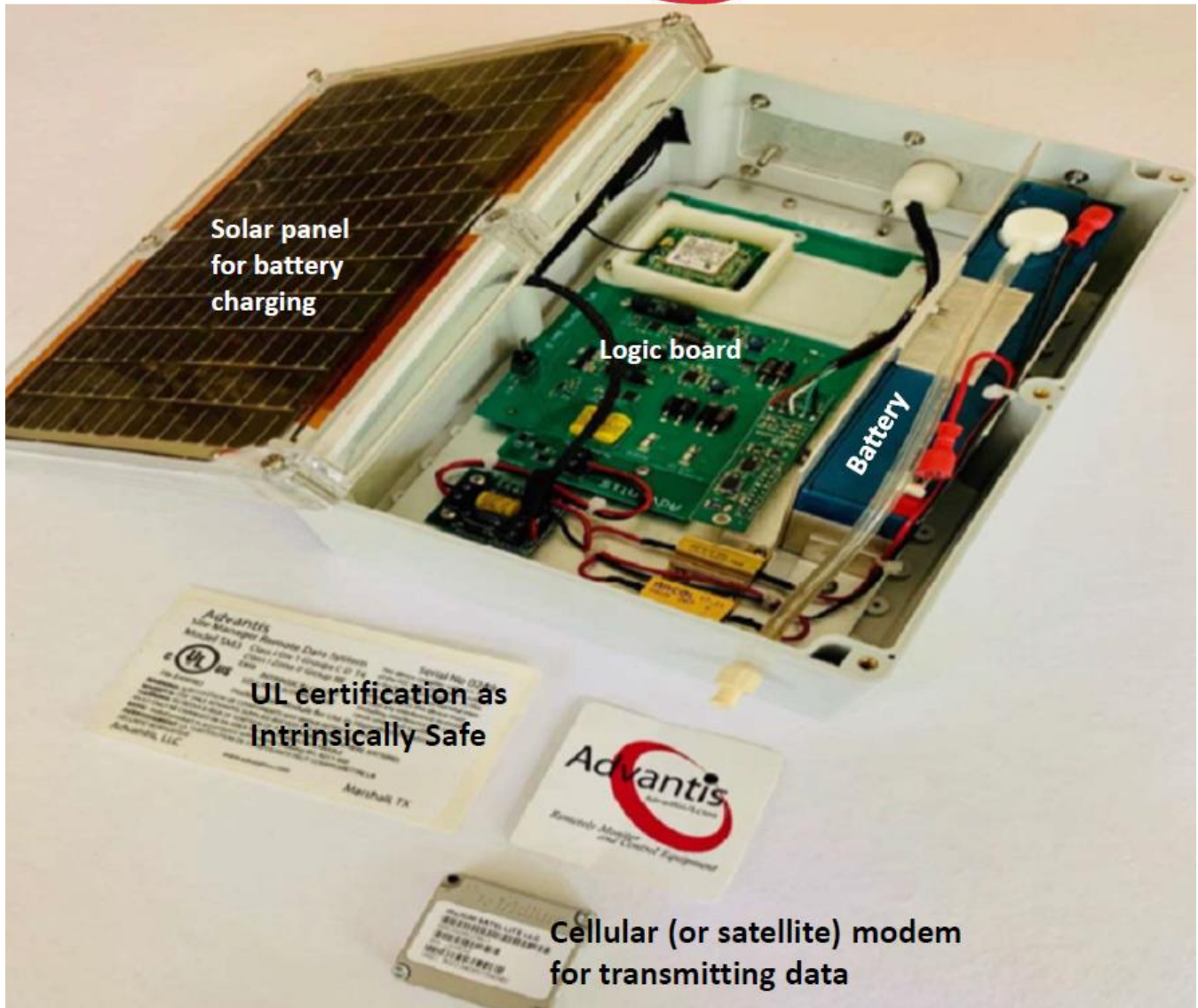
*Force Sensor installed on a typical thief hatch*



*Advantis intrinsically safe Site Manager*

The SM-3 can also monitor tank level sensors, chemical pumps, compressor status, and any other routinely monitored well site equipment. The next evolution of the SM-3 will be a wireless version once the UL intrinsically safe certification is achieved. Advantis LLC has been in the remote monitoring and control business since 2005 with products in municipal, oil/gas, and general industry.





### **Benefits:**

Low cost to purchase and install. Installation may be done by operator personnel.  
Immediate notification for hatch status change and estimate of volume leaked.

### **Field Trial Results:**

An operator in West Texas installed Hatch Scout on four water and six oil storage tanks. The oil is transferred to a terminal by pipeline and not transported by truck. Water is pumped by pipeline to a saltwater disposal well in the field. Gas is compressed at the wellsite and sent to a central gathering point for sale. All ten tanks were piped into a VRU (Vapor Recovery Unit).



Test well site in West Texas

### Hatch Status

| Name         | % Venting Past 7 Days |
|--------------|-----------------------|
| H1 Water 2/2 | 90%                   |
| H2 Water 2/1 | 91%                   |
| H3 Water 1/2 | 90%                   |
| H4 Water 1/1 | 90%                   |
| H1 Oil 2/1   | 90%                   |
| H2 Oil 1/1   | 89%                   |
| H3 Oil 2/2   | 90%                   |
| H4 Oil 1/2   | 90%                   |
| H5 Oil 2/3   | 90%                   |
| H6 Oil 1/3   | 90%                   |

### 7 Day Hatch State Log

#### H1 Water 2/2

| Date/Time              | State   | Duration               |
|------------------------|---------|------------------------|
| 9/13/2023, 12:56:41 PM | Latched | 1 hr, 30 mins          |
| 9/13/2023, 11:26:46 AM | Venting | 2 mins                 |
| 9/13/2023, 11:24:52 AM | Latched | < 1 min                |
| 9/13/2023, 11:24:52 AM | Venting | 2 mins                 |
| 9/13/2023, 11:23:16 AM | Latched | 9 mins                 |
| 9/13/2023, 11:14:13 AM | Venting | 6 days, 7 hrs, 11 mins |





Tank battery catwalk to access hatches

## Hatch State Trend

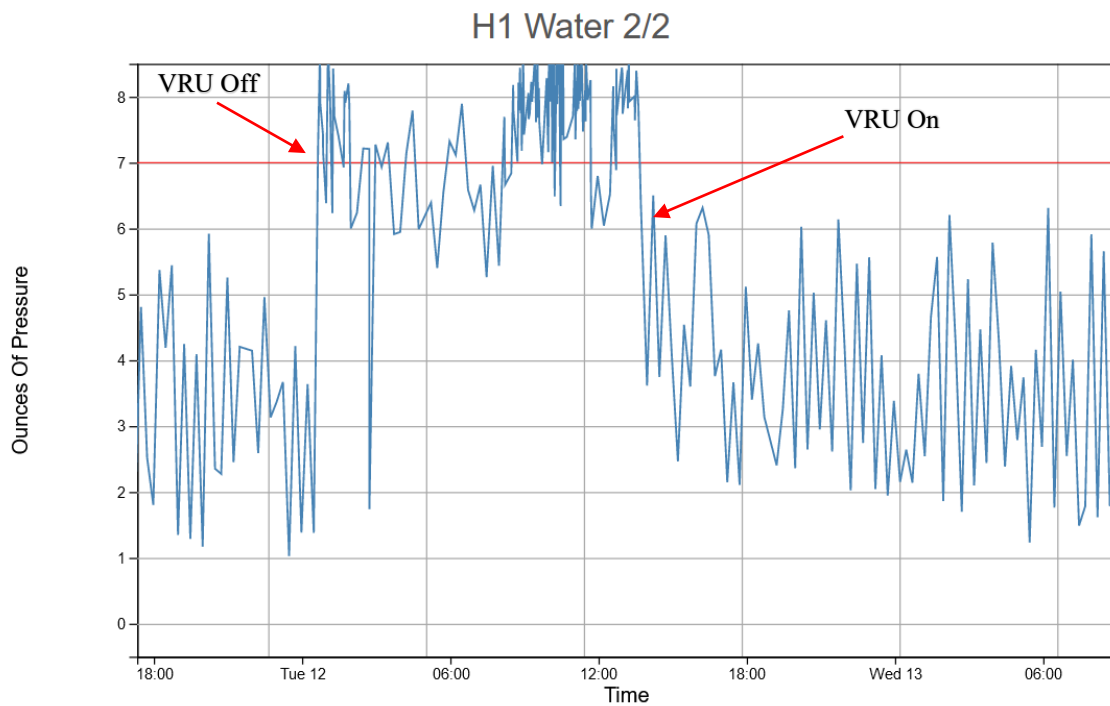


Figure 1 Advantis Hatch Scout Response

Daily Vented Volume: **NEW Loc**

**Toggle Filter**

Location:  Hatch:

Start Date:  End Date:

**Filter**

| Hatch   | Date     | Volume (Ft³) |
|---------|----------|--------------|
| O-4 1/2 | 11/04/23 | 394.12       |
| O-4 1/2 | 11/05/23 | 1,367.69     |
| O-4 1/2 | 11/08/23 | 194.49       |
| O-4 1/2 | 11/07/23 | 22,263.28    |
| O-4 1/2 | 11/09/23 | 87,527.78    |
| Total   |          | 111,747.37   |

Figure 2 Hatch Scout Volume Measurement

This field test has been ongoing for over 5 months. Installation of the Hatch Scouts was easy, requiring about 4 hours with two people to install the two Site Managers (SM-3) and ten tank hatches. Variation in hatch gasket condition caused some issues for calibration; after replacement with new gaskets remedied the issue. Hatch Scout highlighted that some operators may have some issues with their VRU system not aligned to hold the tank pressure low enough to prevent hatch seal leaking. The operator is very pleased with the field trial and is publicizing their success in industry forums.

**Conclusion:**

The Advantis Hatch Scout sets a new standard in the industry to monitor in real time the largest non-repairable source of methane emissions in the oilfield.