



## Leak Detection & TPI for a 72 km CO<sub>2</sub> Injection Pipeline

### United Arab Emirates

#### Project Overview

The operators of a 72 km CO<sub>2</sub> pipeline required a reliable, fast, and accurate system for leak detection and third party intrusion (TPI) monitoring to safeguard their critical infrastructure. Transporting CO<sub>2</sub> under high pressure (278 bar) through an eight-inch pipeline at a flow rate of 16 MMSCFD (one million standard cubic feet per day), the system needed to ensure operational safety and efficiency. AP Sensing delivered a state-of-the-art solution, combining Distributed Temperature Sensing (DTS) and Distributed Vibration Sensing (DVS), to provide comprehensive monitoring and protection.

#### Solution

AP Sensing implemented an integrated solution utilizing both DTS and DVS technologies:

- **Leakage Detection With DTS:** Three DTS interrogators were installed along the pipeline to monitor temperature changes. In the event of a leak, the rapid cooling caused by the Joule-Thomson effect is detected, triggering an immediate alarm. This thermal-based method delivers a high Probability of Detection (POD) and minimizes Nuisance Alarm Rates (NAR).



#### Background

- The 72 km CO<sub>2</sub> pipeline has an 8" diameter and operates under 278 bar pressure
- Transporting 16 MMSCFD of CO<sub>2</sub> requires robust monitoring to ensure safety and efficiency
- Operators needed a reliable system for both leakage detection and Third Party Interference



#### Solution & Benefits

- **Advanced technology:** DTS provides precise leakage detection with high POD and low NAR, while DVS ensures accurate detection of TPI events
- **SmartVision integration:** Real-time data visualization and alarm management streamline pipeline monitoring
- **Operational efficiency:** The solution enables reliable CO<sub>2</sub> transport with improved safety and reduced downtime risks

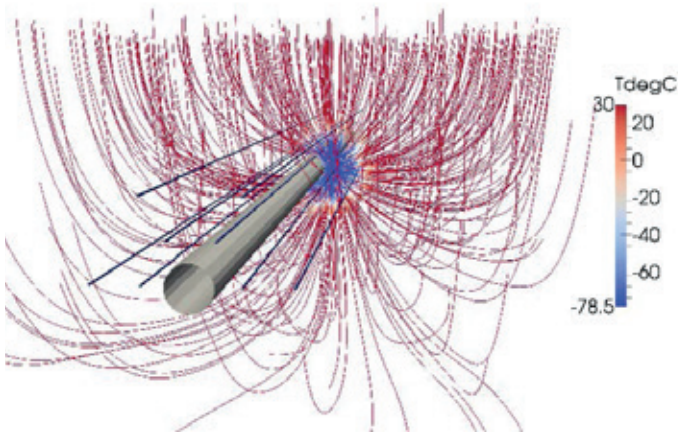


Figure 1: AP Sensing's finite element modeling tool for leak detection simulation

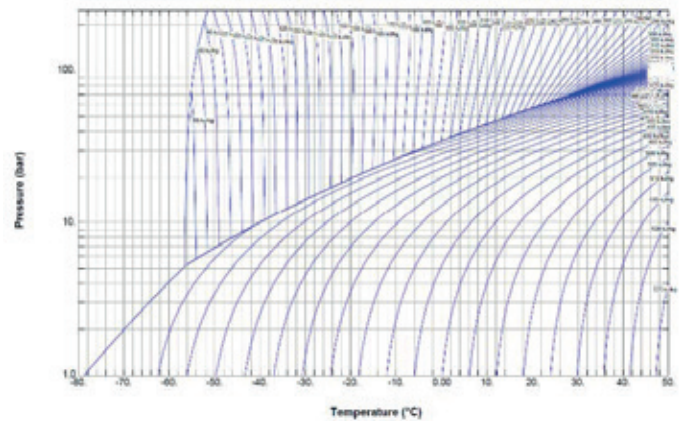


Figure 2: P/T graph for CO<sub>2</sub>: Determining the physical state of transported materials

- **TPI Monitoring With DVS:** Two DVS units were deployed to identify acoustic and ultrasonic patterns associated with TPI events like manual or machine digging. The DVS system also tracks pipeline integrity by monitoring pigging (Pipeline Inspection Gauge) activities.

The fiber optic cable, double-sheathed and steel-armored, serves as a backbone for leakage detection, TPI monitoring, and Ethernet/SDH communication.

## SmartVision

SmartVision serves as the central hub for monitoring data, integrating real-time information from all devices and making it accessible to multiple users across various locations. Operators stay informed of alarm conditions through a clear and intuitive graphical user interface (GUI), enabling swift and effective decision-making.

The main server for the leak detection system is located at the remote de-gassing station, where SmartVision manages all temperature and vibration alarms. With its TCP/IP-based client architecture, SmartVision seamlessly interfaces with the SCADA/DCS platform, providing comprehensive system and alarm status updates.

AP Sensing's solution integrates both DTS and DVS technologies into a single platform, ensuring the reliable transportation of CO<sub>2</sub> to the BAB Far North Flanks while maintaining safety and efficiency.



Figure 4: AP Sensing SmartVision in the remote control room

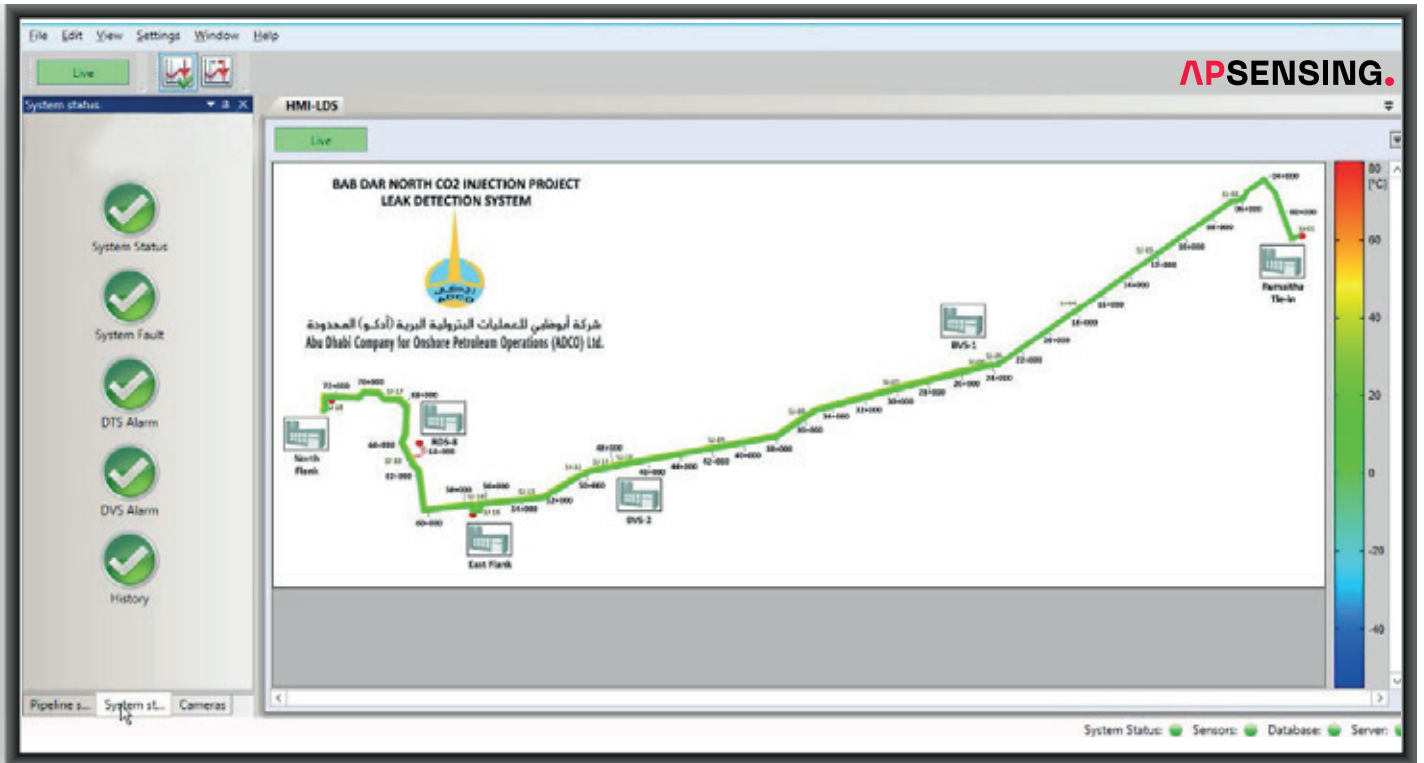


Figure 5: SmartVision - Graphical overview of the pipeline route

## Conclusion

AP Sensing's comprehensive solution has enhanced the operational safety and reliability of the 72 km CO<sub>2</sub> pipeline. By leveraging DTS and DVS technologies integrated into a unified SmartVision platform, operators have a complete view of the pipeline conditions. The project's success was bolstered by AP Sensing's experienced Project Management and Engineering team, who ensured smooth installation, commissioning, and cable splicing. The solution provides robust protection against leaks and interference, ensuring safe and uninterrupted CO<sub>2</sub> transport.



Figure 3: System installation and configuration