APPLICATION NOTE Oil & Gas

Leak detection on a CO_2 pipeline

- CO_2 is removed from natural gas prior to LNG liquefaction
- A 7 km / 4.35 mi pipeline transports the CO_2 to injection wells for permanent storage
- An E-RTTM based pipeline leak detection system is installed on this pipeline

1. Background

Natural gas from the Gorgon gas field in Western Australia contains around 14% naturally occurring CO_2. Prior to converting the natural gas to LNG by cooling it to -162°C / -259.6°F, the CO_2 is removed. To minimize the environmental footprint, the separated CO_2 is not vented but injected in a storage formation. A 7 km long underground pipeline transports the CO_2 from the LNG liquefaction plant to the CO_2 injection wells.

2. Measurement requirements

The CO_2 is transported in supercritical phase at elevated pressures. The underground pipeline has a diameter of 300 mm / 12". Three compressor modules feed CO_2 in the pipeline that transports it to nine injection wells at three drill centers. The measurement requirement for this project was to provide a pipeline leak detection system that provides timely and accurate leak information for the three pipeline-segments between the LNG plant and drill-centers.

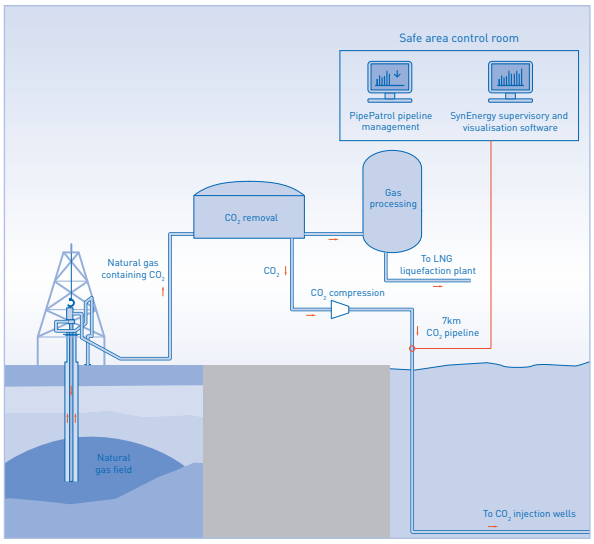
Construction of a pipeline

KROHNE

3. KROHNE solution

KROHNE provided their PipePatrol E-RTTM based leak detection system. Based on flow, pressure and temperature measurement at inlet and outlet of the pipeline, and a digital twin of the pipeline, PipePatrol calculates the flow, pressure and temperature at any given position in the pipeline, using Real Time Transient Modelling.

In case calculated flow, pressure and temperature start to deviate from actual measured value, a proprietary algorithm developed to avoid false alarms, is used to distinguish between a sensor drift and a true leak. The project involved unique conditions, such as the specific thermophysical properties of CO_2 in the supercritical phase and the flow measurements done by orifice plates with a limited rangeability. Still the minimum detectable leak rate in this project is around 1% with a detection time of less than 15 minutes.



Process scheme: Pipeline leak detection on a CO_2 pipeline

A simulated leak test was done under 3rd party review of Lloyds. The test was carried out by offsetting the reading in the SCADA system by of one of the flowmeters with 10 kg/s, resulting in a swift leak alarm from PipePatrol.

KROHNE's SynEnergy III supervisory software has been used for interfacing with the existing SCADA systems and creation of the leak detection HMIs. Running on a virtual server inside the company network, the HMI screens are accessible from anywhere in the network.

4. Customer benefits

A pipeline leak detection system based on E-RTTM supports the safe management of the CO_2 transport pipeline's operations. In case of a leak, whether spontaneous or a small creeping leak, PipePatrol will alarm the customer accordingly.

PipePatrol HMI screen

5. Products used

PipePatrol Leak Detection
- Solution for pipeline leak detection and localisation
- Based on E-RTTM (Extended Real Time Transient Model)
- Highly accurate and extremely reliable leak information
- Meets API 1130, API 1175, AB 864, German TRFL standards and CSA Z662
- Independent system or integrated with existing systems

SynEnergy Supervisory and visualisation software
- Solution for continuous process monitoring and reporting
- HMI/SCADA software for measurement solutions
- Easy integration into existing DCS and ERP networks

Contact

Would you like further information about these or other applications?
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