Solution Note

Honeywell

Corrosion Solutions for Gas Transmission Pipelines

There are an estimated 1.3 million kilometers of gas transmission pipelines scattered around the globe. Pipeline operators are under increased regulatory pressures to ensure that these pipelines are safe while simultaneously facing intense competitive pressure to maximize pipeline throughput. Internal corrosion of gas pipelines poses a significant threat to both pipeline safety and availability.

Problem: Impact of Internal Corrosion on Pipeline Reliability

Pipeline Integrity Management has become a significant focus of many pipeline operators especially given the increasingly competitive gas market and the high cost of gas pipeline failures (2003 to 2005 estimates were approximately $26.5 million in US property damage). Regulators are placing more responsibility on pipeline owners and operators to demonstrate that they know the condition of their lines to ensure the safety of the environment and communities in which they operate.

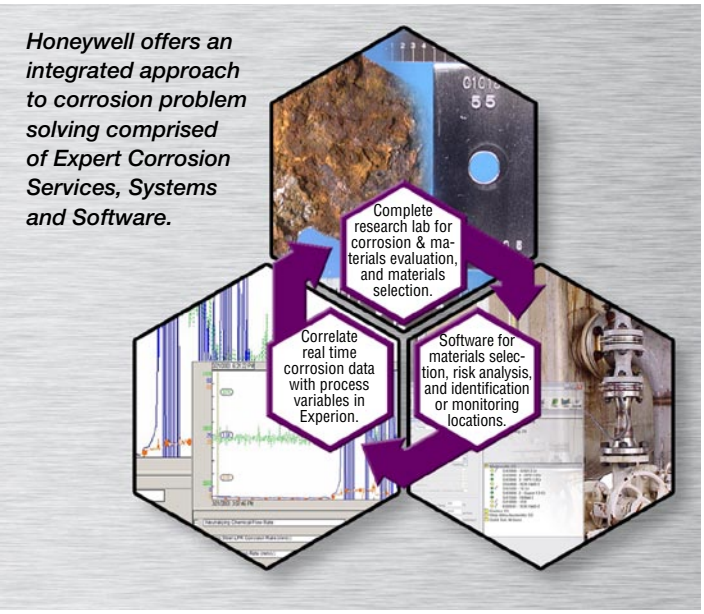
Internal corrosion in 'dry' gas pipelines is often overlooked due to an underestimation of the corrosion risk due to the perceived absence of water in the line. Under normal operating conditions, gas pipelines are under minimal corrosion risk; however, it is not possible to completely eliminate water from these pipelines. Water vapor is constantly condensing in the pipeline and can also enter through periodic upsets that cause water carry-over into the line. This water, coupled with corrosive species such as CO_2, H_2S and O_2, can result in unexpected internal corrosion damage.

Internal and external corrosion causes up to 50 percent of all upstream and midstream pipeline leaks. Recent data shows that over 20 percent of pipeline leaks result from corrosion (14% internal, 9% external) and localized corrosion accounts up to 90 percent of corrosion failures.

For the US, many of the corrosion related pipeline failures have caused catastrophic incidents which has lead to the creation of the Pipeline Safety Improvement Act of 2002 requiring pipeline operators to evaluate pipeline segments in proximity of highly populated or frequented areas for safety risks such as corrosion, welding defects, or incorrect operation. Other regulatory regimes in other parts of the world are also often as demanding.

In addition, the US Department of Transportation Office of Pipeline Safety advises natural gas transmission pipeline operators to review their internal corrosion monitoring programs and operations, and should consider factors that influence the formation of internal corrosion, including gas quality, operating and design parameters.

Traditional monitoring or inspection techniques such as coupons, probes, ultrasonic measurements or smart pigging are not capable of giving the corrosion information needed to identify the changes in operating conditions that led to periods of high corrosivity. Instead, these methods determine an average corrosion rate over a long period of time. Coupons or offline corrosion probes installed at high risk areas such as low spots or 3rd party tie-ins cannot provide the instantaneous corrosion information required to know exactly when corrosion rates are increasing and why, even though this type of information is crucial to minimizing corrosion and ensuring safe and reliable operation of the pipeline system.



Honeywell Solution

With several hundred or thousands of miles to inspect, finding internal corrosion can be very difficult and expensive. Honeywell's corrosion solution offers an integral corrosion management strategy consisting of a portfolio of software packages, corrosion monitoring products, and consulting and technical services. Our complete internal corrosion solution uses a variety of tools to identify problem areas, monitor them and recommend measures to control the problem.

Identifying Corrosion Risk Areas: Honeywell's corrosion experts can help identify your problem areas quickly and more economically than running smart inspection tools through the length of the line. PredictPipe is a software-based corrosion prediction tool that addresses one of the most significant issues in pipeline corrosion evaluation, i.e., assessment of corrosion rates in gas transmission pipeline systems exposed to corrosive environments due to water condensation or accumulation.

Honeywell SmartCET® Corrosion Transmitter

Predict-Pipe® automates Internal Corrosion Direct Assessment (ICDA) by quickly identifying the areas prone to water hold-up, identifying the conditions when water hold-up will occur, and accurately predicting the corrosion rates to be expected in those areas. With this knowledge operators are better equipped to deploy inspection, monitoring and mitigation resources to the places where they are most needed or will have the highest impact. Our corrosion team can also audit current and past inspection and monitoring data to compliment our software analysis.

Online real-time corrosion monitoring: With corrosion risk areas identified in Predict-Pipe, Honeywell recommends deploying online monitoring tools to track the corrosion activity at each risk area. SmartCET® is Honeywell's new corrosion transmitter embedded with proprietary corrosion measuring technology to provide online and real-time corrosion monitoring data for any process control system. Using our field proven, industry accepted technology, SmartCET is able to accurately measure the corrosion rates experienced within the pipeline as well as give indication of pitting activity (localized corrosion). Pitting activity is vital information for pipeline operators since up to 90% of all pipeline failures resulting from internal corrosion are caused by pitting. Additionally, with an online corrosion sensor, it is possible to quickly identify upset conditions, such as water carryover or condensation that result in increased corrosion activity. As a process automation specialist, Honeywell is also able to utilize online SmartCET monitoring to enable enhanced corrosion protection through features as simple as corrosion rate alarming to more complex solutions such as closed-loop chemical inhibitor control.

Corrosion control strategy: In addition to providing tools for the prediction and measurement of internal corrosion, our fully equipped corrosion testing facilities and roster of corrosion experts allow us to provide a complete corrosion solution that includes not only an assessment of where your corrosion problems are, but also how to control them. Honeywell's complete corrosion capabilities range from routine analytical laboratory services to failure analysis, chemical inhibitor evaluations and expert consultation on complex metallurgical or material issues. Our corrosion testing and sensing capabilities coupled with our advanced process control applications give the pipeline operator the ability to define operating windows and operate their pipelines within those limits so that corrosion damage can be stopped before it even starts. This practical approach to corrosion management represents a significant shift in the 'find-it-fix-it' approach that is prevalent in the industry today.

Benefits

Honeywell's corrosion solutions offer a cost-effective way for early detection and prevention of internal corrosion damage, which can minimize corrosion-induced failures.

- Maximize asset life: The overall goal of the pipeline industry is to preserve the pipeline as an asset (estimated replacement cost is approximately $1.2 million per mile). Corrosion deteriorates the pipeline, making corrosion prevention a critical part of any strategy. A corrosion monitoring program that includes predictive modeling, real-time corrosion measurements and advanced control strategies can significantly contribute to financial performance by minimizing failures, thus avoiding costly repairs and associated downtime.
- Inspection planning: The "find it and fix it" mentality by means of inline inspection (e.g. "smart pigging") has a significant cost, which is estimated to be as high as $35 billion presently. The cost of a single "smart pigging" assessment is upwards of $1.0 million. This type of inspection strategy, at the expense of using corrosion prevention methods (e.g. corrosion modeling, online monitoring), will increase capital expenditures for pipeline replacement and major rehabilitation in the long-term. Significant savings can be achieved by optimizing or reducing inspection frequencies with the help of corrosion prevention strategies that include corrosion prediction tools and online real-time monitoring. Inspection budgets can be allocated to the areas where it is needed most and away from lower priority areas that require minimal attention.
- Control strategy: An online real-time monitoring system integrated to advanced control solutions can accurately optimize chemical usage by identifying required inhibitor dosage, frequency, injection points and performance over time. Cost savings realized through adjusting the dosage of chemical injection have been as high as 60 percent; however, the primary benefit of optimizing chemical injection is achieved by managing the performance of the chemical and not just the cost.

Additionally, identification of critical water hold-up zones in a pipeline along with the ability to model the effects of flow, temperature and pressure allow operators to tune the system so that water hold-up is minimized. Operators can be alerted to situations where significant hold-up has occurred so that appropriate measures (pigging, inhibitors etc.) can be implemented.

More Information

For more information on any of Honeywell's Products, Services, or Solutions, visit our website www.honeywell.com/ps or contact your Honeywell account manager.

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70-82-57-20 KP0000
August 2006