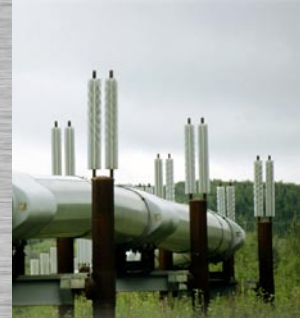


Corrosion Solutions for Multiphase Oil & Gas Production



The production of oil and gas is subject to the pressures of global demand leading to supply shortages. Therefore, reliability is a key issue that can be compromised by corrosion of pipelines and gathering facilities. The search for oil and gas has also progressively gone to more remote locations and increasingly more corrosive production environments making implementation of corrosion control programs more difficult.

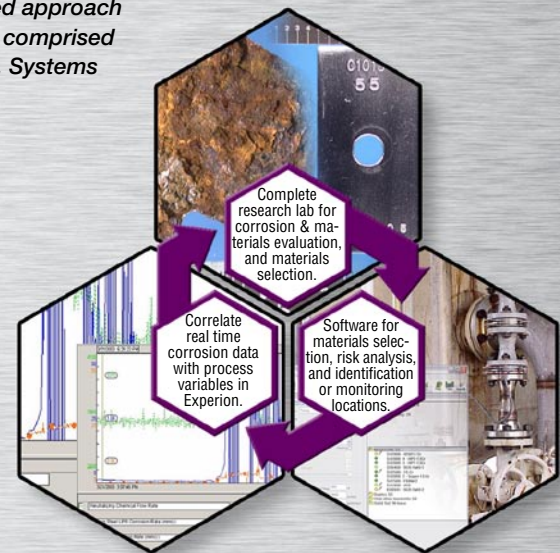
Problem: The Pressures of Competing in Today's Global Market

In an effort to reduce facilities requirements and associated field operational costs, most operators have also minimized the use of field separation of multiphase production. While potentially reducing costs, use of long-run multiphase pipelines can also bring difficult consequence such as high water content, slug flow, excessive corrosion and expensive failures. Operators rely on contractors to provide chemical treatment of corrosion, but they typically use off-line methods for monitoring corrosion, such as coupons or probes, that view average corrosion rates over long time periods (weeks to months). These methods do not provide an accurate view of maximum corrosion rates nor do they identify changes in operating conditions that lead to periods of high corrosivity. Furthermore, these procedures are labor intensive and can not be easily integrated with real-time production control and automation systems. Most importantly, many conventional corrosion monitoring techniques do not work in multiphase environments and therefore do not provide quantitative data on corrosion rates or any information on pitting corrosion that leads to a majority of the failures experience in pipeline systems.

Honeywell Solution for Corrosion

Honeywell corrosion solutions offer an integral corrosion management strategy with a portfolio of software packages, corrosion monitoring products, consulting and technical services. Honeywell has developed a range of capabilities including remote, real-time corrosion monitoring (SmartCET®), and software tools (Predict®) for assessment of corrosion based on production conditions and identification of critical locations in the production system where monitoring and/or inspection needs to be concentrated.

Honeywell offers an integrated approach to corrosion problem solving comprised of Expert Corrosion Services, Systems and Software.



Honeywell's SmartCET line of corrosion transmitters provide operators with virtually instantaneous corrosion information that they can use to proactively manage corrosion. SmartCET technology is the only field corrosion measurement tool that combines online, real-time ability with three, industry-established measurement techniques to provide accurate and easy to understand information about corrosion rate and mechanism. A network of SmartCET sensors allows the process automation system to monitor the effectiveness and economics of inhibitor programs, quickly identify the on-set of corrosive upsets and their locations, and implement operational-level remedial actions before substantial damage has occurred. Honeywell's ability to make electrochemical measurements in multiphase environments results from a combination of probe selection know-how, knowledge of

multiphase flow, and the ability of SmartCET to determine certain corrosion proportionality factors not possible with other electrochemical devices. This latter ability also gives it the ability to work effectively in sour (H_2S -containing) environments where conventional electrochemical techniques falter.

Online, real-time corrosion monitoring is just one aspect of our corrosion solution. Another aspect is the ability of Honeywell's corrosion specialists to utilize software tools such as Predict in assisting and identifying monitoring locations that will provide the best coverage and give the most impact, or for evaluation of planned system modifications before the changes are made. Also, Honeywell corrosion specialists have access to other software tools and a complete corrosion laboratory for corrosion troubleshooting, simulation of service

environments, materials testing, and corrosion inhibitor evaluations in accordance with all related NACE, API, ASTM standards, and failure analysis. Combining these tools with the wide experience of our consultants; Honeywell can offer a complete corrosion management strategy for oil and gas surface installations.

Honeywell's solution embraces the integration of corrosion with the automation and control system whether Experion, legacy Honeywell, or third-party control systems. The output from the SmartCET transmitter can be connected directly into any DCS, SCADA or PLC system via 4-20 mA signals and/or HART communication protocol. This allows corrosion data to be collected, viewed and stored along with all other relevant process information and gives reliability, process and operations groups the timely data that they need to ensure unit uptime is maximized and unit costs are minimized. Furthermore, Honeywell can also provide advanced applications, such as:

- **Profit Loop:** single point advanced inhibitor dosing control in real time to maintain target pitting and generalized corrosion rates for varying flow rates and process conditions.
- **Profit Controller:** multi-point multivariable control dosing control in real-time for piping networks to optimize inhibitor dosing subject to meeting corrosion rate targets with multiple varying flows and process conditions.
- **Early Event Detector:** identify and avoid the process conditions that cause short duration extreme corrosion rates.
- **UniSim/Predict:** optimizes process design considering corrosion in the economic objective function.

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.

Automation & Control Solutions

Process Solutions

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Benefits

With the Honeywell corrosion solution you can get the following benefits:

- Achieve and maintain compliance with regulators for use of "best practice" corrosion technology with SmartCET transmitter and Predict software.
- Use SmartCET to optimize chemical treatment of corrosion while reducing inhibitor costs from 20 to 60 percent.
- Use Predict to assess corrosion based on process conditions to identify critical pipeline segments giving superior prioritization of inspection, reduce failures and unplanned outages.
- With a network of SmartCET corrosion transmitters, see real upsets, correlate corrosion upsets to process conditions, and reduce their magnitude and frequency leading to extended run-time allowing costly in-line ("smart-pigging") inspection and costs to be deferred from 6 to 12 months.
- Actively evaluate operational integrity boundaries with real-time corrosion monitoring to increase throughput by 5 to 15 percent.
- Evaluate corrosion inhibitors in the laboratory and the field using SmartCET for more accurate selection and application of inhibitor treatment chemicals.
- Monitoring active online corrosion can identify real-time changes in corrosivity related to adjustments in chemical treatment.
- SmartCET real-time monitoring has been used to build a strong case for reducing the frequency of costly in-line inspection. Moving this inspection out one year can result in a 40 percent reduction in annualized inspection costs.

Honeywell SmartCET® Corrosion Transmitter



Summary

Honeywell's oil and gas corrosion solution provides key tools for prediction, assessment and real-time measurement of corrosive conditions, identification of critical corrosion-prone pipeline segments, and optimization of chemical treatments for successful corrosion mitigation for improved reliability and profitability. These offerings include Honeywell's SmartCET online, real-time corrosion monitoring transmitter and software tools such as Predict corrosion Prediction software, all supported by Honeywell's corrosion experts and supporting laboratory capabilities.

Honeywell