

Predict[®] Corrosion Suite

Prevent corrosion by intelligently predicting when it occurs



Gain Valuable Corrosion Insight

The fight against corrosion never stops. Refineries, oil and gas operations and pipelines must have a clear understanding of corrosion and its potential damage. Facilities face significant internal corrosion-related threats associated with process conditions, process flows and materials.

Why Detect Damage After It Occurs?

Effective corrosion insight is a priority for all operating companies. However, traditional methods of corrosion control and monitoring are inadequate. Direct equipment inspection is cost-intensive and provides no timely information when corrosion takes place. Traditional monitoring techniques cannot provide any insight on what will happen to corrosion rates when process conditions change.

All too often, corrosion is only found after damage has occurred.



Honeywell Understands Your Needs

Honeywell is a recognized global leader in corrosion prediction systems. We've spent years addressing industry's most difficult corrosion challenges. Our customers include many of the world's leading oil & gas, refinery operators, material suppliers and EPCs.

We Give You the Power to Predict

The Honeywell Predict® Corrosion Suite provides the most accurate corrosion prediction, monitoring and modeling solution available today. The software enables new levels of operational flexibility while enhancing reliability – helping you prevent and mitigate equipment failures and protect asset integrity, while driving improved profitability for the business.

Take a Smarter Approach to Monitoring

Honeywell maintains a world-class laboratory dedicated to the science of corrosion. Research and development work is undertaken through our Joint Industry Programs (JIPs) which enlist leading operating companies, engineering firms, material suppliers and other stakeholders to help identify the common causes of corrosion.

Honeywell's laboratory replicates real-world plant conditions employing a variety of operating strategies, and uses repeatable measurement data to generate accurate corrosion models.

Honeywell's scalable, model-based solution predicts expected corrosion rates ahead of time. This approach is critical in terms of material selection and plant design. It is also beneficial from an operational standpoint, since there is no need to install hundreds of sensors to keep track of corrosion as it is happening across a facility.

Honeywell enables corrosion rates to be reliably monitored without the need for hardware installation and process interruption. Customers can easily optimize their inspection and maintenance schedule based on real-time measurements, run "what-if" scenarios, and take action before corrosion becomes a serious threat. Together, our robust software solutions provide a strong technical basis to focus corrosion management resources where they are most needed.



Ensure Safe and Optimized Operations

Honeywell has the experience and know-how to handle demanding corrosion applications, including oil & gas production, midstream transportation, and petroleum refining. Our Predict software solutions are tailored to the needs of:

- Engineering & Design:** Improve recommendation and selection of plant materials, including the ability to use a proven software solution to evaluate different materials based on specific design parameters and typical operating conditions.
- Feedstock Planning:** Utilize a wider selection of feedstock without exceeding operating limits or increasing plant corrosion rates, while maintaining profitability. Improve flexibility in supply chain planning, including the ability to process less expensive feedstock within operating limits without raising corrosion levels throughout the facility.
- Reliability & Maintenance:** Add real-time visibility into corrosion rates and real-time asset integrity to allow for updated inspection schedules while still complying with industry standards, regulatory requirements, company guidelines and good engineering practices. Enable “what-if” analysis during investigations of unexpected corrosion issues. Evaluate design and material changes to the process. Define Integrity Operating Windows(IOWs) and include corrosion as a process variable.
- Operations & Processing Engineering:** Optimize operations and understand how changes in operating conditions can lead to unacceptable corrosion rates. As part of operations monitoring, use IOWs and corrosion rates to minimize the impact of corrosion on process equipment.




The cost of corrosion for industrial manufacturers is continuing to rise. NACE International, an authority on the adverse effects of corrosion, estimates the global cost of corrosion to be

US\$2.5
trillion, equivalent to roughly **3.4%** of the global Gross Domestic Product (GDP).

In the process industries, direct costs associated with corrosion are approaching

US\$50
billion annually—and rising.

For Oil & Gas and Refining industries seeking to move from reacting to corrosion damage to a more proactive and effective approach, Honeywell Predict® Corrosion Suite provides the next generation of corrosion management solutions. Unlike conventional corrosion management methods, we employ unique prediction models that encapsulate deep expertise and extensive process data to correlate corrosion rates to specific process units, damage mechanisms, and operating conditions. Using Honeywell’s tools, global major companies have achieved significant operational and business benefits (US\$)

- \$10M+** savings through optimized metallurgy selection (offline what-if analysis & prevent)
- \$60M+** savings by proactively identifying risk targets and avoiding unit failures (what-if analysis & prevent)
- \$5M-\$10M** annual savings for safely processing opportunity crudes* (real-time prediction/monitor & plan)



Implementing corrosion prevention best practices could result in global savings of between **15-35%** of the cost of damage, or between

\$US375-875 billion.

*Basis: 250,000 bbl/day refinery

Enabling Real-time Intelligence

The Honeywell Corrosion Team has over 25 years of experience dealing with corrosion. This includes developing models and tools for corrosion prediction and material selection. Our software's proprietary engineering models encapsulate deep expertise and transform process data into valuable corrosion intelligence – providing insight whether a process change will be positive, negative or have no impact on future corrosion rates.

Prediction and Material Selection Software

Honeywell delivers proven solutions for critical corrosion, cracking and materials selection applications in process plants and other industrial environments:

- Oil & Gas production
- Oil & Gas transmission
- Refinery systems
- Crude units
- Amine units
- Sour water systems



Driving a New Approach to Corrosion Management

The Honeywell Predict Corrosion Suite is a unique solution for today's operations, which is driving a paradigm shift in tackling difficult corrosion problems, and achieving efficient and safe operations. These software solutions enable users to move away from a reactive response to corrosion based on qualitative, manual inspections, to a proactive, reliability-centric predictive approach based on quantitative information from soft sensors and sound process deviation management and "what-if" scenario analysis tools.



UNDERSTAND

- Use prediction models/what-if analysis to identify critical corrosion locations
- Establish IOWs with respect to corrosion
- Plan and design to avoid corrosion failures
- Optimize feedstock selection with visibility into corrosion impact



MONITOR

- Correlate process changes to corrosion rates
- Know and correctly quantify current health of assets
- Push operations to corrosion limits with visibility and assurance
- Regard corrosion as a process variable



PRIORITIZE

- Deploy resources to support asset integrity/reliability programs
- Provide visibility for responsive actions
- Ensure economic agility for feedstock and corrosion optimization

Corrosion rates are visible together with operating data and are relevant to operational teams working on preventing damage and extending equipment life. Multiple stakeholders can leverage corrosion information for a more proactive approach to corrosion management that includes collaboration across the business.

Comprehensive Solutions Portfolio

The Honeywell Predict Corrosion Suite uniquely combines proprietary engineering models with decades of industry-specific research – resulting in software applications that transform process data into valuable corrosion intelligence.

Honeywell has developed a wide range of corrosion prediction solutions to address specific industries and applications.



Oil & Gas

- **Predict** – Predict corrosion and erosion in carbon steel
- **Predict-Pipe** – Automate pipeline Internal Corrosion Direct Assessments (ICDA)
- **Socrates** – Select corrosion-resistant alloy material for oil & gas applications
- **Strategy-A** – Evaluate and select steels for sour pipeline operations
- **Risk-IT** – RBI for oil & gas surface facilities



Refining

- **Predict-Amine** – Predict corrosion in rich and lean amine systems
- **Predict-SW** – Predict and model sour water corrosion in NH_4HS environments
- **Predict-Crude** – Quantify corrosion to enable safe crude unit operations
- **Predict-SA** – Quantify corrosion in sulfuric acid alkylation units
- **Predict-RT** – Real-time, intelligent corrosion analytics

Benefits to Your Operation

Corrosion is expensive as measured in equipment maintenance and system failures. Honeywell can help you manage your corrosion risks using software that accurately determines corrosion rates and, ultimately, optimizes operational and business performance.

The advantages of Honeywell's approach to corrosion management are evident across the enterprise:

SAFETY & RELIABILITY

- Failure Prevention
- Risk Reduction
- Prioritized Inspections & Resource Deployment
- Reduction of Unplanned Shutdowns

OPERATING & MAINTENANCE COSTS

- Reduced chemical inhibitor expenditures
- Increased turnaround intervals
- Improved reliability & maintenance programs

SUPPLY CHAIN

- Increased Feedstock Optionality
- Improved Margins

REDUCTION IN CAPITAL EXPENDITURES

- Optimized metallurgy selection for assets and processes

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“Honeywell’s online real-time corrosion monitoring system is enabling us to monitor the changes in corrosion rate in real-time manner that was not possible with older offline monitoring tools.”

– Binh Son Refining and Petrochemical company Limited

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Why Honeywell?

Your operation can benefit from partnering with a proven leader in corrosion asset integrity and preventive/predictive corrosion management. Honeywell has extensive intellectual property in the corrosion field, including unique corrosion prediction and material selection models, and patented corrosion monitoring technology. Our deep expertise includes an in-house team of experts with decades of experience in developing corrosion solutions. Honeywell's IP-based models are licensed and used by many global oil & gas majors, and our company has a proven track record of world-class execution of projects.

Honeywell has also established a unique corrosion knowledge community through our Center of Excellence (COE). We assist customers with expert local and remote support. Our state-of-the-art corrosion and materials research and engineering laboratory provides a host of standard and tailored services. Utilized in Joint Industry Programs and customized testing, this facility can simulate any service environment.

For more information

To learn more about the Honeywell Predict Corrosion Suite, visit www.honeywellprocess.com or contact your Honeywell account manager.

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