



EMERSON™

Corrosion and Erosion Monitoring

**Maximize Performance with
Comprehensive Corrosion and
Erosion Monitoring**

Emerson combines the broadest technology portfolio with vast industry expertise to help companies unleash production potential and safely optimize operations.



Drive Operational Reliability, Safety, and Profitability

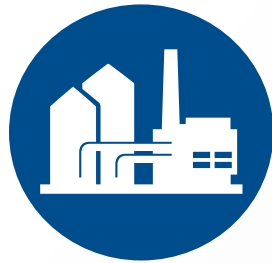
Corrosion and erosion invisibly attacks your plant from the inside. If not well-understood or controlled, it can lead to poor plant availability, high reactive maintenance costs and potentially major incidents due to loss of containment of the process fluid. Corrosion and erosion are also limiting factors in terms of how hard you can drive your plant. In order to drive your plant to its maximum capability, you need to monitor both the risk of corrosion or erosion and the impact it is having on the plant's integrity.

Emerson's robust portfolio of complementary corrosion and erosion monitoring technologies helps us recommend a solution that fits your specific industry and application best.

Industries Served



Upstream



Refining



Chemical



Others



Corrosion and Erosion Technologies

It is essential for operators to monitor both the risk of corrosion and erosion and the impact on asset health. Emerson is uniquely positioned to provide true insight into your plant's health and performance. Emerson's corrosion and erosion monitoring solutions deliver real-time data and insights, enabling enhanced decision making to help you drive your assets to their maximum capability.

Monitor Risk

Coupons



- Any process
- Verification
- Corrosion mechanism analysis
- MIC verification
- Periodic data only

Inline Probes



- Quick response time
- Detect process changes
- Chemical treatment verification

Acoustic Sand Monitor (SAM)



- Quick response time
- Enables production optimization and sand separator efficiency monitoring

Monitor Impact

Ultrasonic Thickness (UT)



- Flexible, highly distributable, single point wall thickness integrity measurements

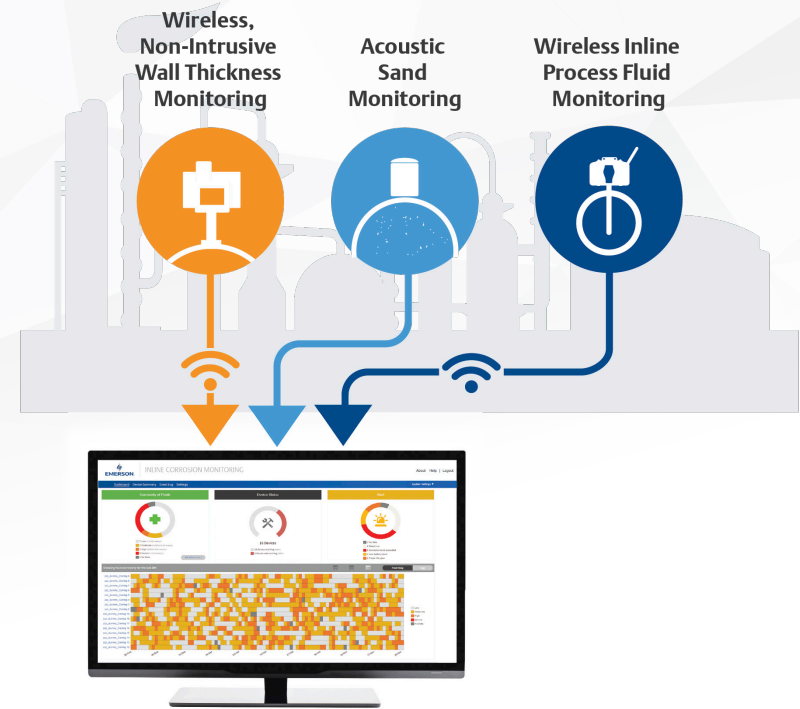
Measures with the highest sensitivity and provides the quickest response

Measures actual metal thickness and loss

Digitally Transform Your Corrosion & Erosion Monitoring System

Customers can find new ways to automate processes and increase connectivity to future proof their facilities and keep a competitive edge. Emerson's Plantweb™ digital ecosystem provides pre-built software applications to transform facility data into actionable insights using best-in-class visualizations and analytics to assess the impact of corrosion and erosion.

With continuous, real-time corrosion and erosion monitoring, operators can assess risk and asset health data directly from their desk using the Plantweb Insight Inline Corrosion and Plantweb Insight Non-Intrusive Corrosion applications.



Building Blocks of Digital Transformation

Data



A **portfolio of innovative sensors** that is easy to install and maintain

Connectivity



A set of **architectural designs** that ensures data in existing systems are seamlessly connected to operational applications

Analytics



A portfolio of **scalable applications** to deliver information and actionable insights

Services



Delivering access and outcomes through **monitoring solutions and new commercial models**

Corrosion Monitoring in Refineries & Chemical Plants

Refineries are complex plants, with a range of processes and materials, leading to variable and invisible corrosion risk with unknown impact on the asset health. Corrosion is the root cause for many of the maintenance, integrity, and safety issues faced by refiners today.

Benefits of Corrosion Monitoring

Improved Safety



Industrial accidents are often related to uncontrolled or unexpected corrosion. By monitoring corrosion the elevated risk and damage are detected long before loss of containment improving operational safety for the plant, personnel, and the environment.

Increased Uptime



A data-driven corrosion and integrity management program will ensure that asset conditions are known. As a result, maintenance and repair strategies can be optimized in timing and scope, and unplanned outages can be avoided.

Optimized Crude Usage



Low-cost, low-quality crudes offer huge potential for increasing profitability but bring increased corrosion risk into the refinery. Comprehensive corrosion monitoring is needed to validate how the plant can cope with the increased risk or inform upgrade decisions.

Process and Corrosion Control Optimization



Visibility of corrosion risk and plant health enables better informed operational decision making. Processes and corrosion inhibition strategies can be optimized to balance the risk of corrosion damage against efficiency and profitability.



Real-time Risk and Asset Health Monitoring in Refineries and Chemical Plants

Leverage Emerson's deep industry expertise, tailored solutions, and local service capabilities to transform the way you drive your plants operational reliability, safety, and profitability. Bring together leading corrosion sensing technologies, class-leading visualization, and analytics software to implement a comprehensive monitoring solution.

Monitor Corrosion Impact



Rosemount™ Wireless Permasense Sensors

- Direct metal thickness measurement
- Easy to install, even on live plant: non-intrusive and cable-free

Monitor Corrosion Risk



Transmitters and Inline Corrosion Probes and Coupons

- Highest sensitivity (nano-meters) and fastest quantification / response to changed corrosion rates
- Full range of wireless, wired, and offline options



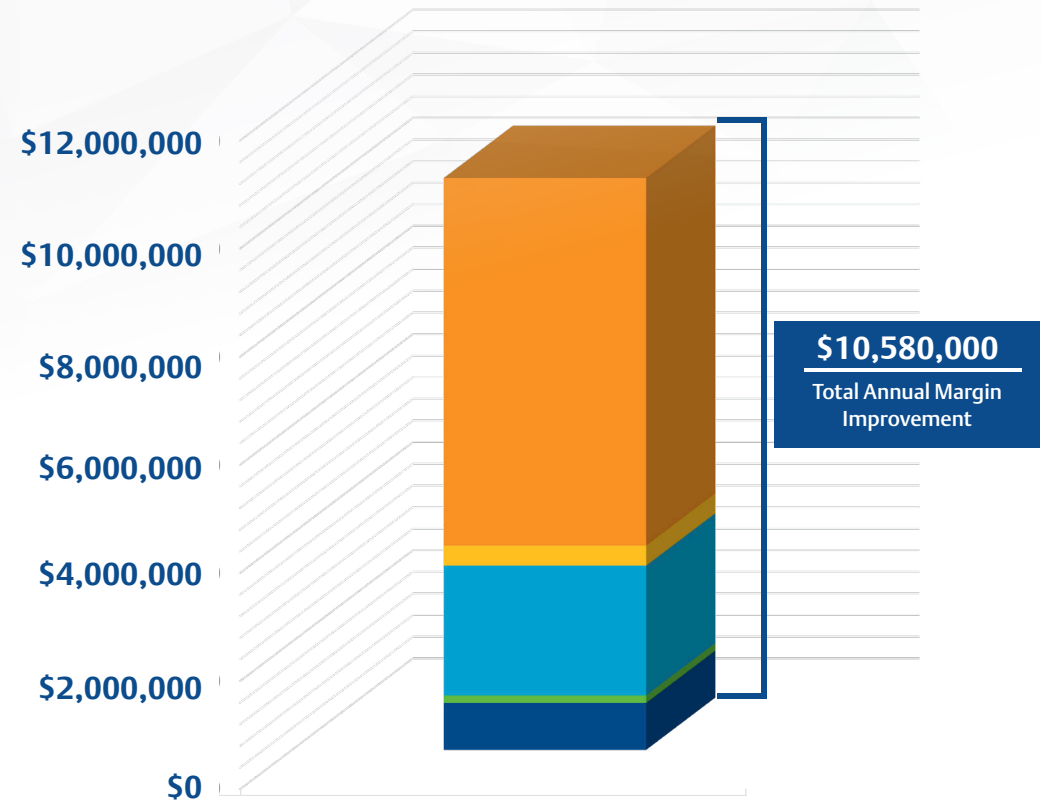
Emerson's Plantweb™ Insight brings you corrosion data into an easy-to-use analytics platform, using WirelessHART® to provide you refinery with timely, actionable insights

Return on Investment Achieved within Three Months

Implementing our corrosion and erosion monitoring solution, an average medium-sized refinery has the potential to achieve a \$10.58M USD return on their investment annually. This return is from multiple sources including, preventing major unplanned maintenance expensed, savings from chemical expenses, availability improvement, turnaround cost savings through scope management, and opportunity crude mix advantages.

We can design a corrosion and erosion monitoring solution for your specific application needs through scalable options, starting with a single unit and expanding over time.

Margin Improvement



Opportunity Crudes	\$6,800,000
Turnaround Scope	\$370,000
Availability & Utilization	\$2,400,000
Chemicals & Additives	\$140,000
Unplanned Maintenance Savings	\$870,000

Currency is measured using USD.

Corrosion and Erosion Monitoring in Upstream Applications

Constantly changing market dynamics make it difficult for upstream oil and gas companies to meet their business goals. Moreover, unmonitored solids production and erosion force operators to deploy conservative production strategies, reducing the reservoir's output as much as 75%. Additionally, the total annual cost of corrosion equals \$589 million* on surface pipeline and facility costs and \$320 million* in corrosion-related capital expenditures just in the US. Corrosion and erosion poses a major threat to achieving targets.

Benefits of Corrosion Monitoring

Improved Profitability



Combining sand management for erosion control and tuning for maximum allowable production rates, facilities can see higher profits.

Operational Certainty



Gain better oversight and improve operations through controlling and verifying corrosion mitigation through chemical inhibitor injection.

Improved Safety



Industrial accidents are often related to uncontrolled or unexpected corrosion or erosion. Through online monitoring, elevated risk and damage are detected long before loss of containment improving operational safety for the plant, personnel, and the environment.

Increased Uptime



A data-driven corrosion and integrity management program will ensure that asset conditions are known, and as a result, maintenance and repair strategies can be optimized in timing and scope, and unplanned outages can be avoided.

*NACE - The United States Cost of Corrosion Study



Real-time Risk and Asset Health Monitoring in Upstream Applications

Drive operational reliability, safety, and profitability in your process by bringing together leading corrosion and erosion sensing technologies, class-leading visualization, and analytics software. Emerson's comprehensive corrosion and erosion monitoring solutions are tailored to your toughest challenges.

Monitor Corrosion and Erosion Impact



Rosemount™ Wireless Permasense Sensors

- Direct metal thickness measurement
- Easy to install, even on live plant: non-intrusive and cable-free
- Measures through coating/paint

Monitor Corrosion and Erosion Risk



Transmitters and Inline Corrosion Probes and Coupons

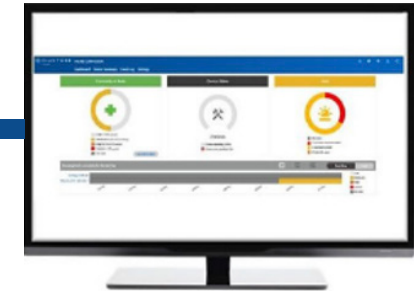
- Highest sensitivity (nano-meters) and fastest quantification / response to changed corrosion rates
- Full range of wireless, wired, and offline options
- Unique Erosion probe with multiple elements for sand detection across the flow regime
- Retrieval operation up to 10k psi pressure

Monitor Erosion Risk



Roxar™ Sand Acoustic Monitor (SAM)

- Immediate warning of solids production
- Increase production according to an Acceptable Sand Rate (ASR) strategy
- Easy to install, even on live plant: non-intrusive



Emerson's Plantweb™ Insight and Roxar Fieldwatch can integrate your corrosion and erosion data into a software platform, providing a more comprehensive view with valuable insights.

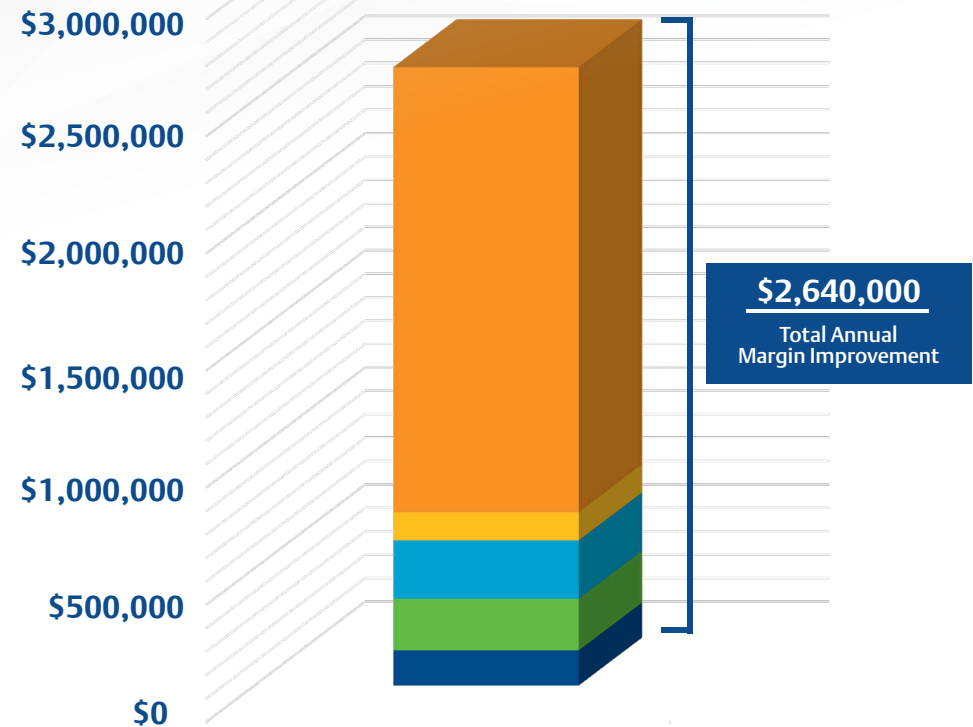
Our Connected Services experts can help you maximize your investment by analyzing corrosion and erosion data to make more informed decisions.

Return on Investment Achieved within Four Months

Implementing our corrosion, sand, and erosion monitoring solution in a 10,000 barrels per day upstream process has the potential to achieve a \$2.64M USD annual return on investment. This return is from various sources including, preventing major loss of contingency, minimizing rotating equipment damage, savings from chemical expenses, and increasing production contributing to these figures.

Each corrosion and erosion monitoring solution is designed specifically for your applications needs. Many customers start with a single well and scale up to additional wells and downstream units.

Margin Improvement



Availability & Utilization	\$1,900,000
Chemicals & Additives	\$120,000
Rotating Equipment	\$250,000
Piping and Vessels	\$220,000
Workover	\$150,000

Currency is measured using USD.

Global Services from a Trusted Partner

Emerson's corrosion and erosion portfolio applies industry expertise and innovative solutions to your business challenges. Our global network of resources and service capabilities is the partner of choice for companies like yours.

From initial start-up and commissioning services, to training, and Connected Services for data monitoring, Emerson has a range of services to fit your facility's needs. We have the expertise to help you dependably define, execute, and support your service strategy throughout the lifecycle of your operation while ensuring your workforce is up to the task.

Emerson Expertise at Your Service

Lifecycle Services



- Extensive global channel to support you anytime, anywhere
- Leverage technical expertise to operate safely, improve asset reliability, and optimize process capabilities

Training Services



- Empower new and existing workforce with training opportunities
- Courses are available online, on-site, or hands-on

Consulting Services



- Envision the value of innovative technologies
- Accelerate a sustainable competitive edge

Project Services



- Improve project performance to meet or exceed start-up and long-term goals
- Increase competitive advantage through cost-effective modernization





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00803-0200-4210 Rev AA



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