



# PROCESS AUTOMATION

Corrosion Monitoring

CorrTran™

**CorrTran™**

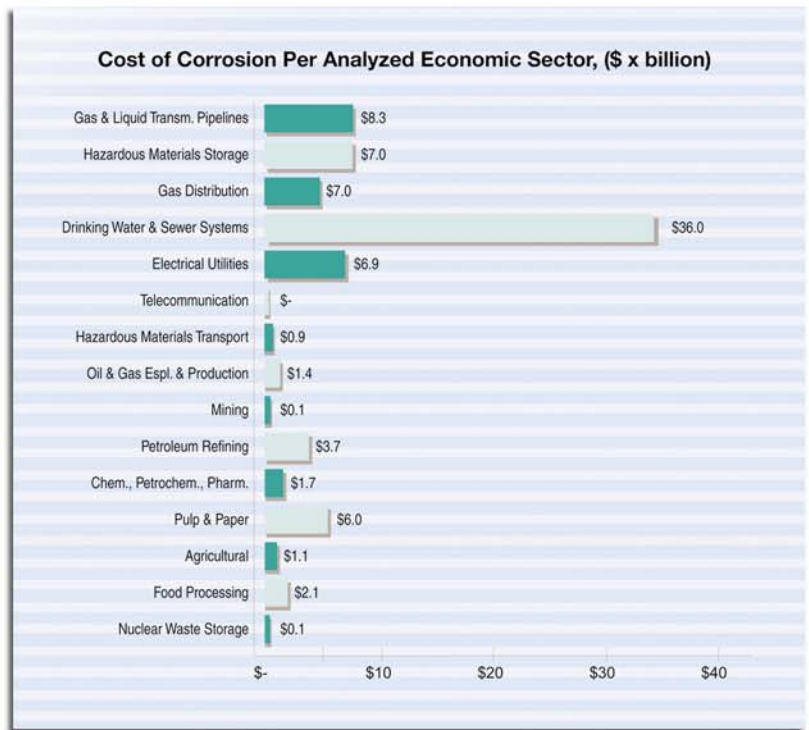


**fP PEPPERL+FUCHS**

# What is Corrosion Costing You?

## Corrosion Costs

It is estimated that industry spends \$276 billion annually on corrosion. These costs arise from a variety of areas. Prevention, monitoring, and repair are the main contributors to this high amount and these values do not even include down time as a result of corrosion. These costs are better controlled when corrosion is viewed as a process variable, rather than as a purely historical value or in a complex, scientific method. P+F can provide an easy-to-use instrument that gives greater insight to the process engineer. CorrTran is a device that pays for itself in a short period of time by helping to reduce needless expenditures on corrosion.



## Traditional Corrosion Monitoring Techniques

### Mass Loss

Commonly referred to as coupons, these sacrificial pieces of metal are inserted directly into the process. Coupons are weighed before insertion and after extraction. Typically after 90 days, they are again weighed and studied to determine a corrosion rate, as well as corrosion type.

### Resistance Measurements

Similar to coupon measurement, resistance measurements use wires that are exposed to the process. Resistance is measured, and as the wires corrode, resistance increases, thus providing an indication that corrosion is occurring.

### Polarization Resistance

Measures the inhibition of the corrosion process. This measurement is inversely proportional to the corrosion current.

### Acoustic Emission

Different types of corrosion emit different sounds. These sounds are recorded and provide information about what is occurring inside the process relative to corrosion.

### Ultrasonic Examinations

As corrosion occurs, the wall thickness of pipe deteriorates. Ultrasonic examinations of the pipe can determine the remaining wall thickness. This calculation is based on the time it takes for nonaudible acoustic waves to travel back and forth.

# Should I Monitor Corrosion the Same Way?

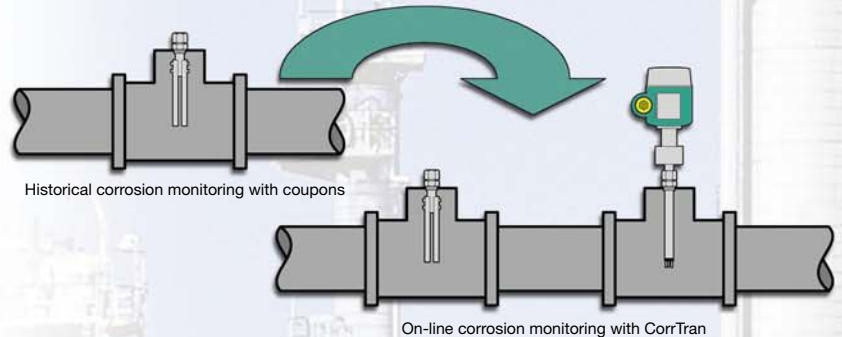
## CorrTran

CorrTran is the first 2-wire, 4-20 mA HART transmitter that evaluates either general or localized (pitting) corrosion in real-time. Meant to take corrosion monitoring out of the laboratory and into everyday process control, CorrTran is a revolutionary approach to corrosion detection. Unlike the traditional coupon method that establishes an average corrosion rate over time, CorrTran can monitor corrosion on-line and in real-time rather than in an historical “after-the-fact” method that misses the possibility of a process-corrosion correlation.



CorrTran gives plant operators the ability to monitor corrosion rates within their existing software and control system like any other process variable (i.e., pressure, flow, level, temperature, pH). Since CorrTran has a standard 4-20 mA output, it can be easily integrated into a new or legacy system architecture.

With a wide range of mechanical configurations available for both standard and hazardous locations, CorrTran takes corrosion monitoring to a new level – one that makes corrosion data readily available to the process engineer so decisions can be made in real-time and according to current process conditions.



## Features & Benefits

Features	Benefits
On-line/real-time measurement of general corrosion rate or localized corrosion rate (pitting)	<ul style="list-style-type: none"> <li>• Suitable for a wide range of process environments</li> <li>• Monitors general or localized (pitting) corrosion for any metallic material</li> <li>• Reduces guesswork on amounts of inhibitors to use</li> <li>• Corrosion is no longer viewed historically</li> </ul>
Uses three identical electrode arrangement	<ul style="list-style-type: none"> <li>• Accurate corrosion rate using LPR, HDA, and ECN</li> <li>• Wide choice of electrode materials</li> <li>• No requirement for a complicated reference electrode</li> </ul>
Data update rate every 7 minutes	<ul style="list-style-type: none"> <li>• Allows corrosion rate to be another process variable</li> <li>• Trend corrosion rate with other variables</li> <li>• Fast cycle time with integration of 100 data samples</li> </ul>
2-wire, 4-20 mA transmitter, HART® interface	<ul style="list-style-type: none"> <li>• Industry accepted process signal to DCS, PLC or other control systems</li> <li>• Allows corrosion rate to be monitored like other process variables</li> <li>• No special software required</li> </ul>
Adjustable Stern-Geary variable (B value)	<ul style="list-style-type: none"> <li>• Improved accuracy of the corrosion rate measurement for any environment</li> </ul>
Improved LPR measurement algorithm	<ul style="list-style-type: none"> <li>• Applicable to a wide range of corrosion rates</li> <li>• Low frequency measurement aids evaluation</li> </ul>
Rugged field Instrument housing	<ul style="list-style-type: none"> <li>• Type 4X housing for industrial applications</li> </ul>

## A New Way to Monitor Corrosion

Coupons have been used to determine an historical corrosion trend that may extend over a 2 – 4 month period. Once analyzed, this data is used to determine the detrimental effects of corrosion over time; however, it does not allow corrections to be made as corrosion is occurring. On-line, real-time monitoring with CorrTran allows immediate changes to be made to the process as corrosion occurs thus reducing the effects of corrosion and lowering operating costs.

# What are the Types & Detection Methods of Corrosion?

## Types of Corrosion

CorrTran monitors two different types of corrosion, general corrosion or localized corrosion (pitting).



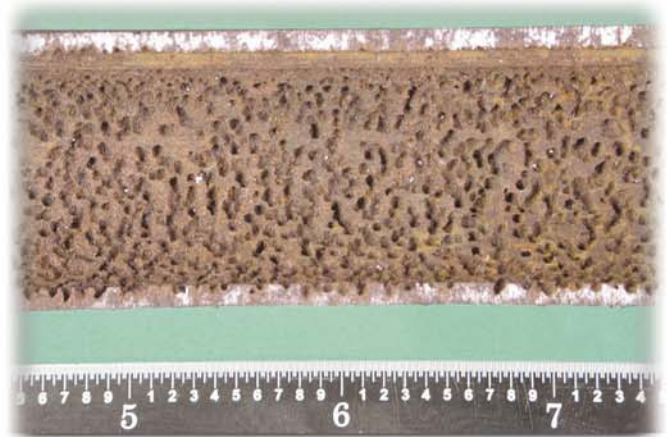
### Example of General Corrosion



#### General Corrosion

With this form of corrosion, the process occurs at nearly the same rate across the surface of the material that is exposed to the corrosive environment.

### Example of Localized Corrosion (Pitting)



#### Localized Corrosion (Pitting)

Based on its appearance, corrosion is more localized. These "pits" are found on the surface of the metal and are not uniform across the surface. Seventy to ninety percent of corrosion failures are attributed to pitting.

## Automated Corrosion Monitoring Techniques

### Linear Polarization Resistance (LPR)

Involves the measurement of the polarization resistance of a corroding electrode to determine the corrosion current. Since the voltage-current response of a corroding element tends to be linear over a small range, determination of the polarization resistance allows the corrosion current to be determined. The slope of the response, the polarization resistance, is inversely proportional to the corrosion current, thus a corrosion rate can be calculated.

### Harmonic Distortion Analysis (HDA)

Measures the resistance of the corrosive solution by applying a low frequency sine wave to the measurement current. Using harmonic analysis, the solution resistance is determined and combined with the polarization resistance of the LPR method to calculate a more accurate general corrosion rate.

### Electrochemical Noise (ECN)

Evaluates the fluctuation in current and voltage noise generated at the corroding metal-solution interface. This technique is generally used to detect nonuniform or localized corrosion.



Uses all three automated corrosion monitoring techniques, LPR, HDA and ECN, to provide the most comparable corrosion rate to the traditional coupon method. CorrTran is the first field device to use the strengths of each of these techniques to provide a corrosion rate in the form of a 4-20 mA process signal.

# Which Monitor is Right for Me?

## Model Selection

CorrTran is available in two basic mechanical configurations – direct or remote mount. A direct mount version is configured with the transmitter's electronic housing secured directly to the probe while the remote version allows the housing to be mounted up to 12' from the probe. The direct mount version is considered the standard unit for most applications due to its rugged construction while the remote mounted CorrTran is most suited for space critical applications. The electronic housing is built of rugged aluminum with two 3/4" NPT electrical connections for easy wiring. Once inside the housing, the electronics are completely enclosed within a plastic housing for superior protection.

Direct Mount



Remote Mount

Fixed probe type: fitting is welded to the probe.



Adjustable probe type: able to slide fitting along probe.



A wide assortment of probes is also available for CorrTran. Typically made of stainless steel, the probes can be built for various applications and mounting requirements relating to pressure, temperature and size. CorrTran probes are available in adjustable and fixed length, retrievable and threaded or flange process connection. In addition to the wide probe selection, a complete offering of electrode materials is available for nearly any type of metal tank or pipe.

Once the proper mechanical configuration has been specified, CorrTran will be configured as either a general or localized (pitting) corrosion transmitter. Both versions come as a standard loop-powered, 2-wire, 4-20 mA output with HART. Normally, both general and localized transmitters will be strategically placed throughout a plant or facility for the ultimate in on-line corrosion monitoring.



# The Global Leaders in Process Automation

Providing solutions is an integral part of the Process Automation department. We take great pride in our ability to solve problems with products that nobody else can match. Pepperl+Fuchs offers the versatility you need to complete the most difficult job with a full line of dependable products.



## Purge & Pressurization

P+F offers the largest and most comprehensive selection of equipment for purge & pressurization systems. Our product line meets both North American and European safety requirements and can be used in Division 1/2 or Zone 1/2 applications.

## Fieldbus Solution



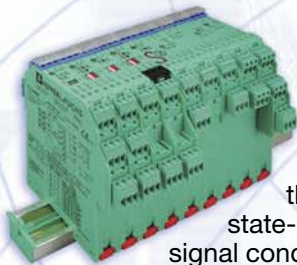
Our FieldConnex™ product group contains a wide range of instruments to make fieldbus projects easy to install and are reliable while maintaining stable communication signals and component reliability.

## Remote I/O



P+F has two unique systems to solve your remote I/O applications in hazardous locations. These I/O platforms are designed with open communication protocols for controller-independent operation. Mountable in Division 1 and 2, or in a safe area, these systems are designed for optimal efficiency and cost savings.

## K-System



P+F's K-System is the most advanced line of signal transfer and protection instruments for the automation industry. With state-of-the-art galvanic isolation, signal conditioning, and explosion protection, K-System consists of over 150 different modules to solve even the most difficult applications.

## Interface Products



P+F is the world's top supplier of HART interface products and your reliable source for high integrity N+1 redundant power supplies and SafeZap surge protectors.

## Intrinsic Safety



From our traditional industry-leading point-to-point solutions, to cutting-edge technologies, P+F is the intrinsic safety expert. No other company can match our history, knowledge, or product selection.

## Level Measurement



Our level measurement products consistently outperform others when it comes to meeting the tough demands of our customers. P+F's level measurement technology provides point and continuous level monitoring in any environment.

## www.am.pepperl-fuchs.com

Learn more about the impressive capabilities of Pepperl+Fuchs' K-System on the web. Visit us at [www.am.pepperl-fuchs.com](http://www.am.pepperl-fuchs.com) where you can find the latest white papers and application guides, specification and data sheets, and advice from a K-System expert. Pepperl+Fuchs is committed to providing exceptional service and customer support, anywhere in the world.



The GreenTeam is P+F's network of experts dedicated to providing customized process solutions.

 **PEPPERL+FUCHS**

Pepperl+Fuchs® Inc. • Telephone (330) 486-0002 • FAX (330) 425-4607 • E-mail: [greenteam@us.pepperl-fuchs.com](mailto:greenteam@us.pepperl-fuchs.com) • [www.am.pepperl-fuchs.com](http://www.am.pepperl-fuchs.com)

"Terms & Conditions of Sale" information is printed on every order acknowledgement; copies are available upon request.

We reserve the right to make modifications and no guarantee of the accuracy of the information contained herein is given.

© 2004 Pepperl+Fuchs® Inc., Twinsburg, Ohio  
COR 0904 (905868) Printed in U.S.A.



<http://www.experitec.com>