CORROSION CONTROL – SUPERVISORY MANAGEMENT delivers large-scale reductions in real water loss caused by pipe leaks & bursts

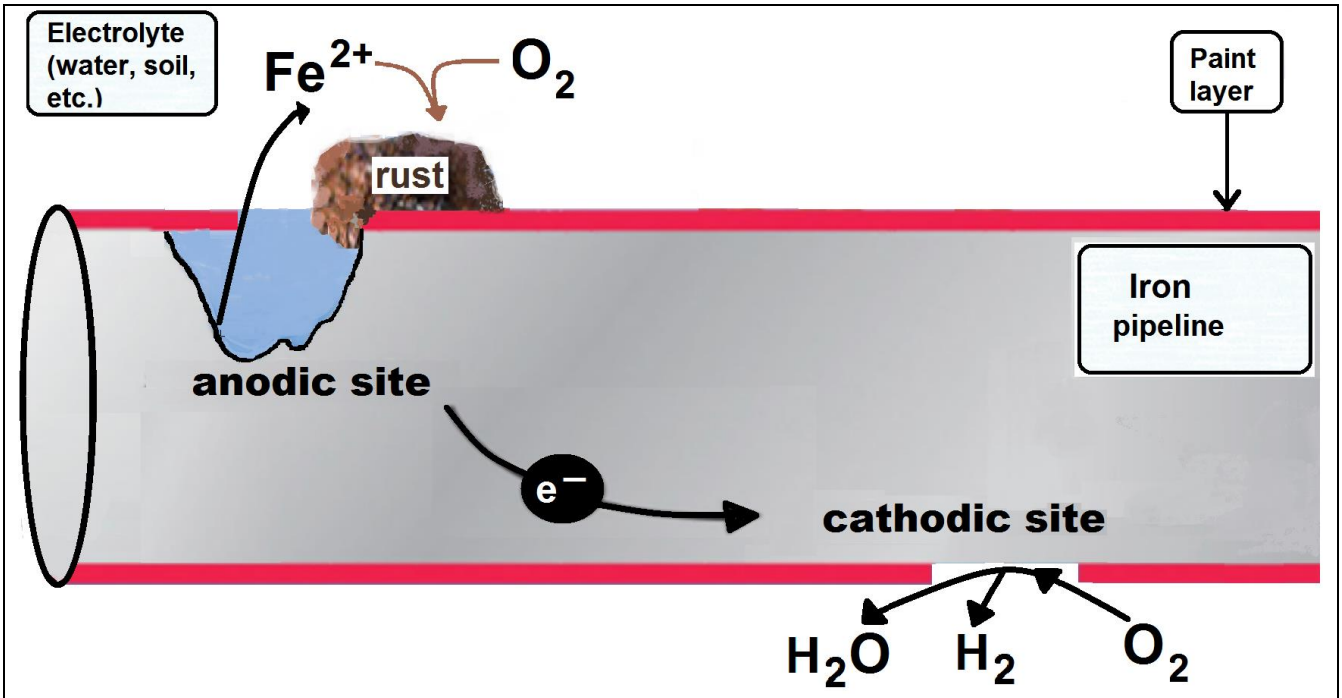
Pipe line corrosion is usually the biggest single cause of real water loss in distribution networks. Supervisory monitoring of Corrosion Potential delivers long-term, large reductions in real water loss caused by pipe leaks and bursts. This Supervisory Management system is simply implemented by the Isoil battery powered flow meter which automatically emails Corrosion Potential Trends to you so you can take informed decisions on managing corrosion.

Corroded pipe with large holes resulting in expensive, real water losses. The first step in reducing long-term water loss by controlling corrosion is to continuously monitor the level of corrosion activity in your network.

People say the only certainties in life are death and taxes. But the corrosion of metal water pipes is also a certainty! In practice you can minimise corrosion, but you cannot eliminate it! Isoil offer an extremely cost-effective and simple way to monitor the corrosion activity at key points in your network so that you can take informed management decisions. This early warning system automatically monitors trends to identify unusual Corrosion Potential shifts, erratic activity or problems with the CP protection equipment on the pipe.

What Causes Corrosion?

Corrosion naturally occurs when an un-coated metallic pipe is buried in soil. The soil is an electrolyte and a voltage develops between the metal and the soil. This spontaneous electro-chemical process causes corrosion.



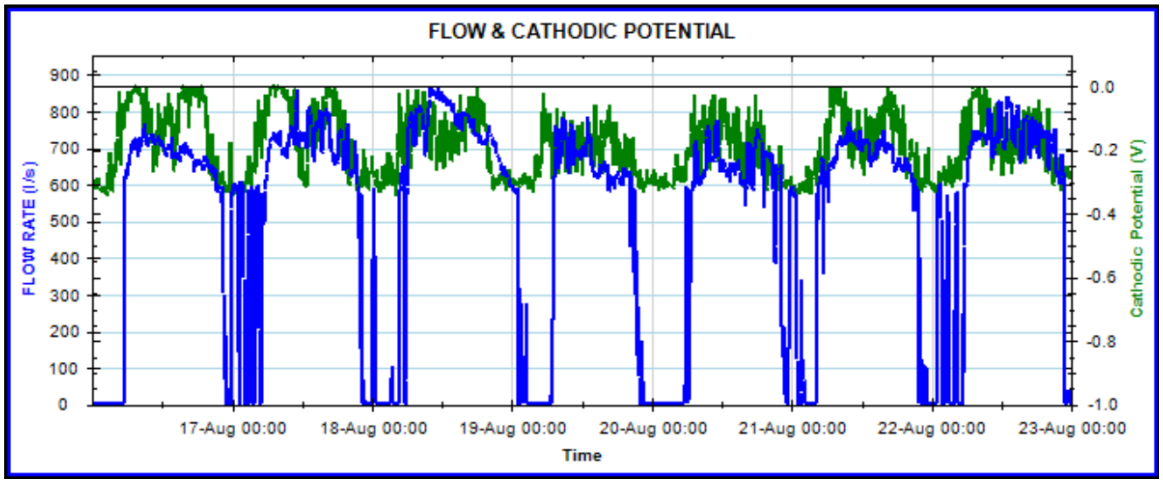
The diagram shows a painted pipe buried in soil. Any break in the paint layer allows corrosion to take place.
Metal loss and rust occurs at the anodic site.
The iron pipe gives off hydrogen gas at the Cathodic Site. This can cause de-bonding of the paint coating, leaving the pipe vulnerable to corrosion.

The most useful protection against corrosion is a coating on the metal pipe. But in the real world coating inevitably acquire nicks or damage due to handling, installation, abrasions, etc., and corrosion commences.

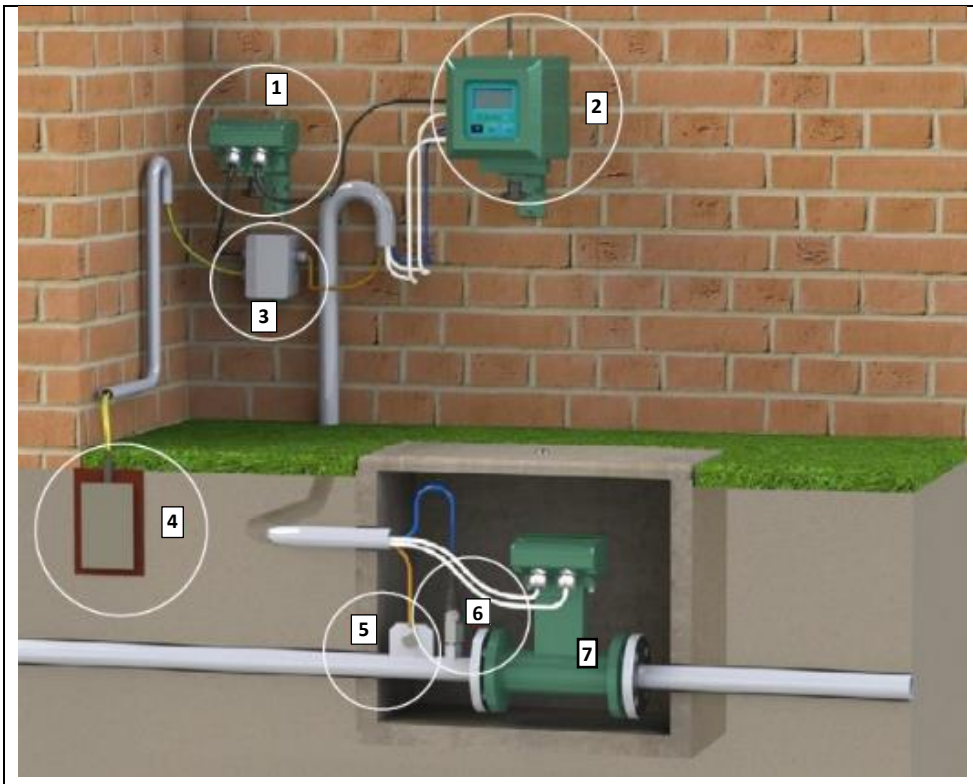
The practical way to minimise corrosion is to maintain the pipe voltage at a potential of -850 mV with reference to the surrounding earth. Cathodic Protection Systems can be installed to maintain this pipe-to-soil potential. Corrosion accelerates where the pipe-to-soil potential deviates from -850 mV in either the positive or negative direction. As the pipe becomes more positive than -850mV, the loss of metal accelerates. When the pipe becomes increasingly more negative than -850mV, hydrogen is produced at a faster rate and the bonding of the coating to the pipe is compromised, creating sites which are susceptible to corrosion.

By trending the pipeline Corrosion Potential daily, you can determine at a strategic level whether the pipe coating is deteriorating, stray currents are present and/or whether the Cathodic Protection System is operational. When changes the Cathodic Potential trends are noted, corrective action can be implemented rapidly to mitigate the irrecoverable loss of pipe metal.

CASE STUDY: CATHODIC POTENTIAL TREND SUGGESTS ACTIONS REQUIRED TO REDUCE CORROSION



- The green line is the Cathodic Potential trend at a pump station in Gauteng. The Cathodic Potential values which are between -300mV and 0 mV indicates high vulnerability to corrosion. Probably the Cathodic Protection system is not operation. A site investigation is required.
- The Cathodic Potential trend rises during the day and drops at night, suggesting increased electrical activity in the earth during the day. This could also correlate to a commuter train line located in the vicinity; high frequency, large spikes occur during the day when trains run frequently; the trend is much more stable during the night when few trains run.
- The blue line is the flow trend.



1. Cathodic Potential Module

2. Isoil battery powered flow meter convertor

3. Connection box

4. Earth reference electrode

5. Electrical connection to the pipe.

6. Pressure Sensor (optional)

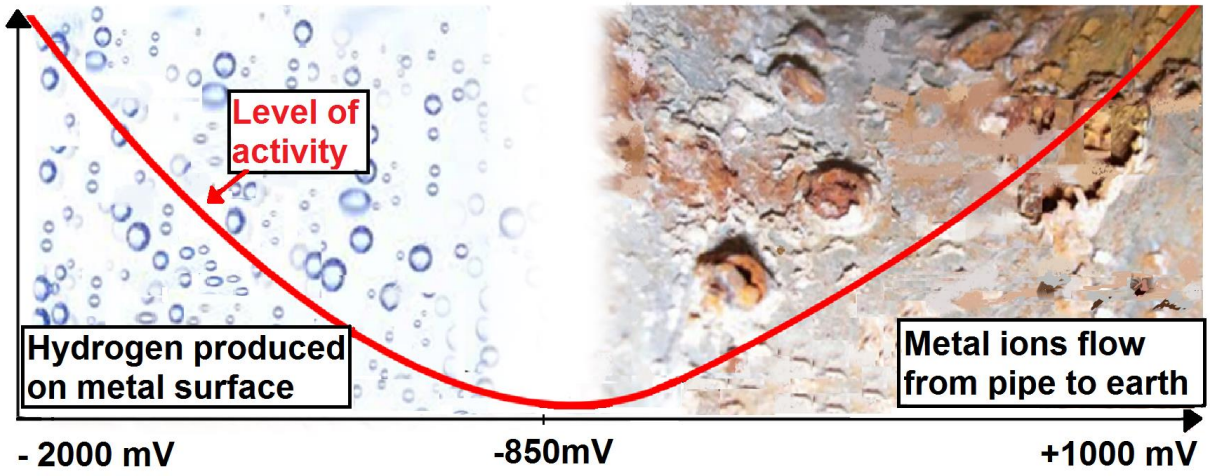
7. Isoil battery powered flow sensor

Isoil battery powered flow meter with optional Cathodic Ppotential monitoring. In this configuration the meter measures flow rate, flow totals, line pressure and cathodic potential

The **Isoil battery powered flow meter** is an ideal way to economically and automatically monitoring pipe Corrosion Potential. This flow meter has an optional Corrosion Potential Module which measures the pipe-to-soil voltage typically at 15 minute intervals. This information is sent daily by GPRS to a web-based monitoring system which automatically emails trends and measurements to user defined personnel. These trends of the pipe-to-soil potential reveal changes in corrosion pattern over time. **The incremental capital cost of the Isoil cathodic potential monitoring is small, and incremental running costs are zero. This efficient and cost-effective monitoring system enables informed managers to take control of the pipe corrosion scenario.**

Isoil Cathodic Potential Module

HOW WATER LEAKS DEVELOP



Corrosion activity is at a minimum when the electrical potential of the pipe is approximately 850mV below the potential of the soil. The bigger the deviation from -850mV the higher the level of corrosion activity.

- *If the pipe potential is higher* than the optimal level, for example +1000 mV, metal ions will flow from the pipe into the earth at places where insulation has been damaged and the soil is moist. This removes metal from the pipe resulting in thinning and corrosion. Pin holes form. These grow into larger holes and the pipe bursts.

- *If the pipe is more negative*, for example -2000 mV compared to earth, hydrogen gas builds up on the surface of the pipe. This loosens the anti-corrosion coating which allows moisture and oxygen to come into contact with the metal, stimulating corrosion.