THINK SIMULATION! Getting the chemistry right.

Accelerate corrosion prediction accuracy & efficiency with OLI technology

What are you doing with software modeling to reduce risk
and increase confidence in your corrosion mitigation strategies?

TECHNICAL BRIEF

INSIDE

OLI technology addresses corrosion caused by chemical attack.

If you have a water-based system, or a gas system that has potential condensate, then simulation can calculate:

- Corrosive environment simulation
- The tendency for corrosion
- A kinetic rate of uniform corrosion
- A localized corrosion indicator and worst case propagation rate
- Remaining asset life

… and more

Introduction

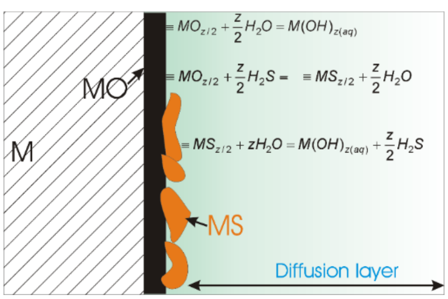
The global cost of corrosion has recently been estimated at US$2.5 trillion, of which 15% - 35% can be saved by judiciously selected corrosion management practices. For example, the oil and gas industry spends billions of dollars annually on integrity management. In oil and gas environments, the forces at play include the extreme conditions, deep water completions, aging assets, and safety requirements. Such factors constitute a significant driving force towards finding more effective corrosion management strategies. Understanding the effects of environment chemistry on corrosion is essential for corrosion management and mitigation. This intelligence reduces cost and risk, and increases confidence in your recommendations. OLI Systems provides proven technology to predict the chemistry effects on corrosion in the chemical process industries.

The Power of Simulation

OLI has technology that reduces cost and risk and increases confidence in corrosion management recommendations. Through core competencies in thermodynamics, corrosion electrochemistry, and in process flowsheet mass and heat balances, OLI has developed tools that augment the following areas of corrosion management:

- General corrosion prediction
- Localized corrosion estimation
- Grain boundary depletion during heat treatment
- Corrosion thermodynamics
- Corrosive environment simulation
- Prediction of corrosion damage via extreme value statistics

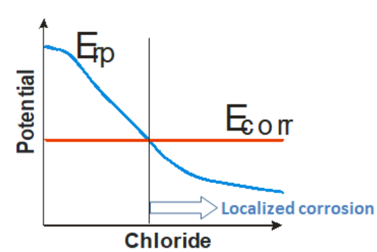
General Corrosion Prediction

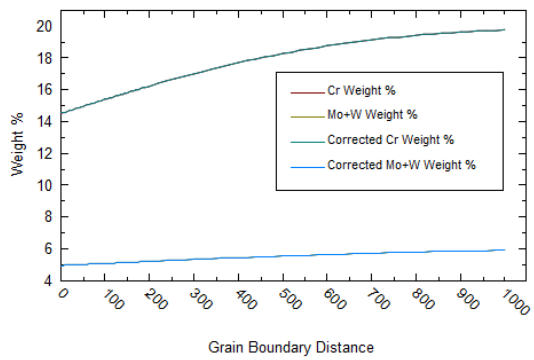


General corrosion manifests through combined effects of water chemistry and surface reactivity. OLI has combined these fundamental electrochemical mechanisms to enable corrosion prediction on carbon steel, Corrosion Resistant Alloys, or CRAs (nickel-base alloys and stainless steels), Cu, and Cu-Ni alloys. The impact of acids, bases, salts, acid gases, temperature, pressure, shear, and film formation are also quantified.

Localized Corrosion Estimation

Predicting pitting and crevice corrosion on CRA's is quite complex. Further, localized corrosion can be a precursor to stress corrosion cracking. OLI researchers have developed mathematical models that predict the propensity of CRAs to undergo localized corrosion and estimates the maximum rate of propagation.





Grain Boundary Depletion

As OLI advances to more complex corrosion processes, a first step is predicting the heat treatment and thermal aging effects on the composition and corrosion susceptibility of alloy grain boundaries. OLI researchers have developed a tool that predicts Cr and Mo depletion at grain boundaries that are caused by carbide formation and metal diffusion.

Corrosion Thermodynamics

Chemical reactions important to corrosion are fundamental to any corrosion prediction. In oil and gas environments, general and localized corrosion depends directly on H_2S and CO_2 activities (an arcane but very important quantity). OLI has completed this work and uses this information in every calculation. It is kept from direct view for convenience, but always available if needed.

Species Fugacities

Row Filter Applied: Only Non Zero Values

Species	psia
Methane	13355.8
Carbon dioxide	74.6076
Water	134.834
Hydrogen sulfide	0.359395

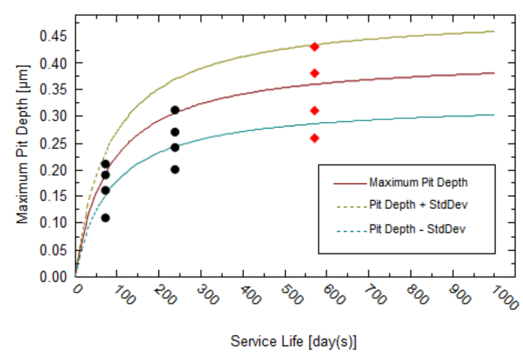
Corrosive Environment Simulation

Calculation Parameters	
Final Temperature (°C)	20.0000
Final Pressure (atm)	80.0000
Vessel Volume (L)	2.00000
Partial Pressure: Carbon dioxide (at	0.0400000
Partial Pressure: Nitrogen (atm)	
Partial Pressure: Oxygen (atm)	20.6000
Partial Pressure: Argon (atm)	0.900000
Compute results at which condition	Ambient

Accurate translation of field conditions to laboratory environments is essential if experimental results are the basis of equipment recommendations. Converting a downhole gas composition to a representative autoclave experiment requires complex and accurate thermodynamic predictions. It is now possible to predict the phase behavior of a downhole fluid and transform these properties into an autoclave formulation.

Prediction of Corrosion Damage via Extreme Value Statistics

Corrosion engineers need to predict long-term corrosion damage (e.g., the maximum expected pit depth or expected service life) using corrosion propagation measurements taken over short or medium time intervals. OLI offers a facility to make such predictions using Extreme Value Statistics, based on natural laws of propagation and repassivation of localized corrosion.



Accessing this Technology

To find out more about how your business can gain the intelligence you need in understanding your corrosion environment with OLI Studio: Corrosion Analyzer, please contact us at sales@olisystems.com and mention this technical brief to arrange a free Application Assessment for your corrosion challenges.

Cost of corrosion reference: NACE Impact: International Measures of Prevention, Application, and Economics of Corrosion Technologies Study, NACE International, 2016, http://impact.nace.org

For more Information

www.olisystems.com

April 2018