

## Honeywell Solutions for Corrosion Predict®-SW Corrosion Prediction for Sour Water Systems



**Predict-SW 2.0, based upon extensive real laboratory data and numerical modeling, accurately characterizes sour water environments and accounts for effects of  $\text{NH}_4\text{HS}$  concentrations.**

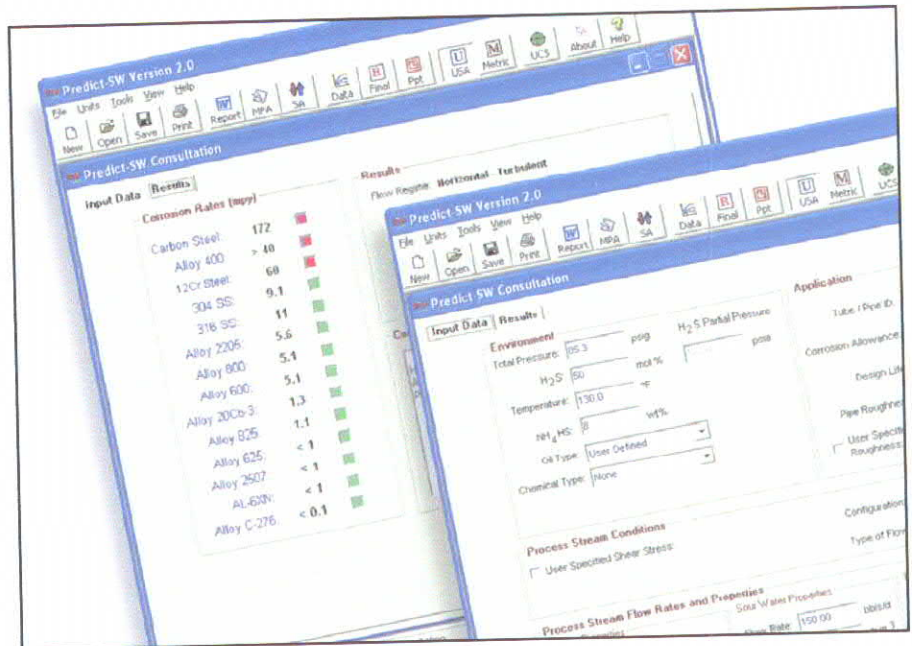
Predict-Sour Water 2.0 software encapsulates inferences, experimental results, and research data from a Joint-Industry research program sponsored by industry leading refining and engineering companies. For the first time, these research results have now been made available in an easy-to-use and high-value software program.

### Benefits

- Predict-Sour Water 2.0 predicts corrosion rates for typical process plant materials in corrosive  $\text{NH}_4\text{HS}$  environments.
- Users can make fact-based financial and engineering decisions with real material performance data in Predict-SW.

The goal of the research program was to develop a quantitative engineering database and decision-support model to predict corrosion in  $\text{H}_2\text{S}$  dominated alkaline sour water systems as a function of critical environmental parameters, such as,  $\text{NH}_4\text{HS}$  concentration,  $\text{H}_2\text{S}$  partial pressure, temperature, hydrocarbon content, and chemical treatments integrated with characterization of flow regimes and wall shear stress. Predict-SW is the resultant product of this extensive research and can:

- Predict corrosion rates for a wide range of applicable conditions for fourteen commonly used materials, including carbon steel, stainless, monel and C-276.
- Perform flow modeling, compute wall shear stress and analyze flow regimes in multi-phase flow.
- Study parametric effects with Sensitivity Analysis tool.



- Account for effects of light and heavy hydrocarbons.
- Correlate flow effects with corrosion rate based on extensive lab data and flow modeling.
- Access lab-data used to support system decision-making and analyses.
- Quantify corrosion in alkaline sour water systems as a function of  $\text{NH}_4\text{HS}$  concentration, velocity (shear stress),  $\text{H}_2\text{S}$  partial pressure, and various additional parametric variables.
- Quantify, characterize and analyze sour water systems helping to prevent unscheduled shutdowns.
- Facilitate multi-point analysis and data sharing using MS Excel, MS Word or Email.
- Guide users to effectively use the software and accurately interpret the results.
- Seamlessly share data with other analysis tools and modeling systems.
- Be easily customized and be made available for web-based deployment.

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## Analysis of H<sub>2</sub>S-dominated alkaline sour systems through in-depth data and interpretation of iso-corrosion curves.

The program interprets and interpolates using real data, derived from comprehensive baseline iso-corrosion curves, to enable determination of corrosion rates for fourteen materials ranging from carbon steel to Alloy C-276 as a function of flow loop velocity and NH<sub>4</sub>HS concentration.

These iso-corrosion curves have already had a profound impact on the refinery industry. They represent the first comprehensive set of NH<sub>4</sub>HS corrosivity data available to the industry for use in evaluating corrosion in, and selecting materials of construction for, various process units containing alkaline sour water.

## Improved rules and data to account for more accurate corrosion rate predictions at for different levels of H<sub>2</sub>S.

By incorporating the baseline data and additionally characterizing the role of several key process variables on the corrosion rate in NH<sub>4</sub>HS environments, Predict-SW is made more accurate in that it accounts for the effects of H<sub>2</sub>S partial pressure, temperature, and chloride concentration. H<sub>2</sub>S partial pressure has been shown to be a major variable leading

to significant increases in corrosion rate, particularly with increasing NH<sub>4</sub>HS concentrations.

Secondary to the effect of H<sub>2</sub>S partial pressure is the effect of temperature. Predict-SW includes the effect on corrosion rates due to increasing temperature. The program data show that the effect is more pronounced at low than at high NH<sub>4</sub>HS concentrations.

In addition to accounting for key process variables, Predict-SW features an enhanced flow modeling module that provides key insights into understanding contribution of typical flow-induced corrosion parameters. The in-depth, flow modeling module automates computation of fluid dynamic parameters such as pressure drops, flow regimes, void fractions and wall shear stresses. This module eliminates the complexities associated with flow modeling, and provides the capability to include momentum transfer effects into corrosion rate predictions.

The system also facilitates assessment of the benefit of hydrocarbons and two types of chemical treatments on reducing corrosion rates. Program data show substantial protection from hydrocarbons attained with hydrocarbon contents greater than 25 vol% on carbon steel and with as little as 10 vol%

on the other alloys studied. Predict-SW characterizes two common chemical treatments (ammonium polysulfide (APS) and imidazoline) for use with carbon steel.

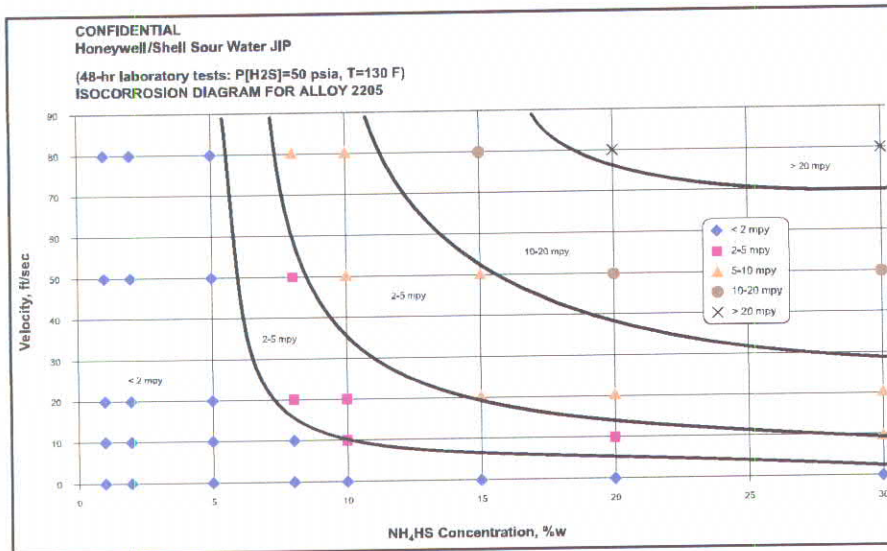
## Predict-Sour Water 2.0 In Use

Users will find that it takes very little time to be proficient in using Predict-SW and to get real results. The intuitive user interface requires commonly available process data, such as:

- Pressures, temperature, concentrations, etc.
- Application information like pipe ID, corrosion allowance, etc.
- Process stream conditions.
- Process flow rates and properties including vapor, sour water, and hydrocarbon properties.

## Predict-Sour Water 2.0 outputs corrosion rates for each material and the calculated wall shear stress for your review and analysis.

Users can securely and electronically access the actual laboratory test data, program reports and presentations used within Predict-SW. Predict-SW runs on any Windows-based workstation and/or network. Licenses are available as single user and network (multi-user) licenses.



The original research program was "Prediction and Assessment of Ammonium Bisulfide Corrosion Under Refinery Sour Water Service Conditions". The program was conducted between March 2000 to February 2003 and was jointly sponsored by a group of refining and engineering companies, led by Honeywell corrosion scientists.

## Find out more

For an on site demo or further information contact your Honeywell representative. For a contact in your area visit [www.honeywell.com/imc](http://www.honeywell.com/imc)

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March 2006  
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