

Developing Field or Well Specific Corrosion Models

using DownHole SAT®

Develop Field or Well Specific Corrosion Models

History and corrosion modeling can increase your confidence in evaluating and choosing metallurgy for a new well in an existing field. DownHole SAT provides an easy, straight forward method for organizing existing corrosion data for different metalluriges into a field or well specific model.

You need:

- Historic brine analysis, temperature, pCO₂, pH₂S (if applicable).
- Observed corrosion rates on metallurgies of interest.
- Inhibitor dosages, if desired and available.

Model Development

Navigate to the LABORATORY menu and select the INPUT LAB DATA Module. This menu is on the main, Windows style menu.

Choose corrosion rate model development and the initial parameters to model (you can revise the model and parameters at any time).

You can select any parameters that are:

- input into the program (like pCO₂, temperature)
- calculated by the program (like Calcite saturation, buffer capacity).
- Or optional inputs (like corrosion inhibitor dosages).

Entering Data

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New Inhibitor Data Input

Inhibitor Name Raw Data File

Inhibitor Purpose Output File

Property Modeled

Molecular Weight ID #

ACTIVES

% Orthophosphate as PO4 % Pyrophosphate as PO4 % Zinc as Zn

% Organicphosphate as PO4 % Silicate as SiO2

Inhibitor Dissociation Constants

pK0 pK1 pK2 pK3 pK4 Correct for Protonation

pK5 pK6 pK7 pK8 pK9 # of pKs

Property	Variable	Transform	Lower Limit	Upper Limit
	Rate	Log(X)		
Variable 1	pCO2	Log(X)	-99.00000	-99.00000
Variable 2	Buffer Capacity	AS IS	-99.00000	-99.00000
Variable 3	Temperature	1/RT	-99.00000	-99.00000
Variable 4	pH	AS IS	-99.00000	-99.00000
Variable 5	pH2S	LOG(X)	-99.00000	-99.00000
Variable 6	<input type="text"/>	<input type="text"/>	-99.00000	-99.00000

Press CORRELATE

After entering brines and data, press the Correlate button.

New Inhibitor Data Input XX

Print Graph Close

Inhibitor Modelled: CO2 H2S BufTest
Inhibitor Purpose: Corrosion
Raw Data File: c:\dhsat\COR\CO2H2SBufTest.COR
Output File: \DHSAT\INHIB\CO2H2SBufTest.INH

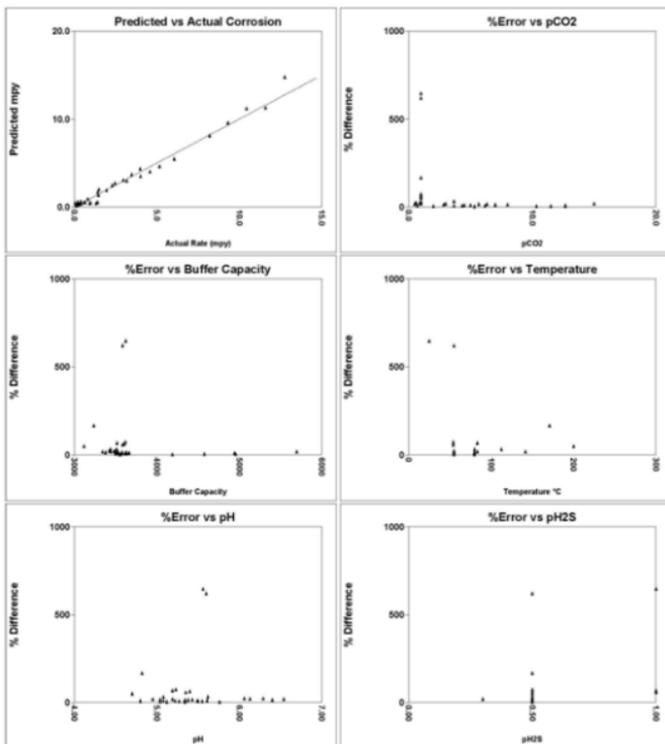
	pCO2	Buf.Cap.	Temp.	pH	pH2S	
	Intercept	LOG(X)	NONE	1/RT	NONE	LOG(X)
Coef.	0.85	1.24	< 0.001	-714.02	-0.17	0.20
Std.Error	1.84	0.14	< 0.001	1192	0.36	0.58
Sig.Level	0.65	< 0.001	0.75	0.55	0.64	0.74

R-SQ=0.0842 Correlation Problems? NO

ANAL.#	OBSERVED	PREDICTED	DIFFERENCE	% ERROR
0	0.10000	0.11567	0.0156	15.67251
1	0.15000	0.13027	-0.0197	-13.15196
2	0.21000	0.16709	-0.0429	-20.43258
3	0.28000	0.26457	-0.0154	-5.51014
4	0.35000	0.28557	-0.0644	-18.40807
5	0.42000	0.32997	-0.0900	-21.43561
6	0.51000	0.62644	0.0164	2.03071
7	1.46000	1.30714	-0.1528	-10.46963
8	1.95000	1.84527	-0.1047	-5.37073
9	2.46000	2.65037	0.1903	7.73891
10	2.96000	2.99932	0.0393	1.32862
11	3.47000	3.62592	0.1559	4.49342
12	3.99000	4.28214	0.2921	7.32183
13	4.50000	0.35901	0.3090	618.02058
14	0.83000	0.37892	-0.5590	-60.11589
15	1.22000	0.38203	-0.8379	-71.05773
16	0.64000	0.45582	-0.1841	-28.77742
17	0.59000	0.49348	-0.0935	-16.35826
18	0.20000	0.52925	0.3292	164.62966
19	0.38000	0.56215	0.1821	47.93531
20	0.65000	0.37213	0.3221	644.27499

Significance Levels

Check significance levels for each parameter. If desired go back to the spec sheet to change the parameters modeled.



Prepare Metallurgy File (Product File Format)

Prepare a metallurgy file in the Input Product / Input Metallurgy form.

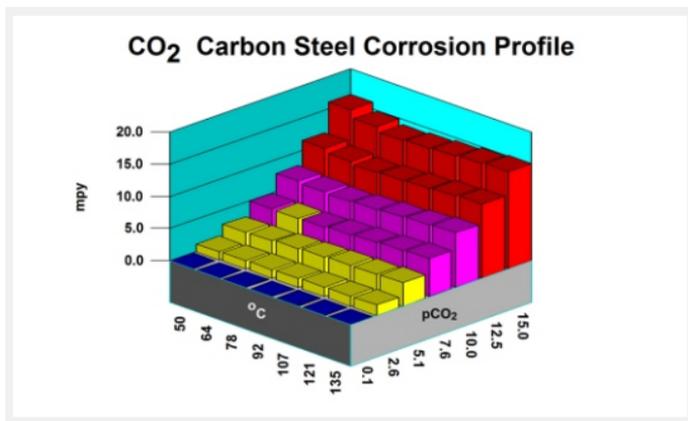
Inhibitor Formulation Input Form

Formulation Name	<input type="text" value="CO_2 Carbon Steel"/>	Description	<input type="text" value="Example"/>
Product File Name	<input type="text" value="co2example.prd"/>		
Inhibitor 1	<input type="text" value="CO2 H2S Buf Test"/>	<input type="text"/>	<input type="text" value="100.000"/> %
Inhibitor 2	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Inhibitor 3	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Inhibitor 4	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Inhibitor 5	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Inhibitor 6	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Inhibitor 7	<input type="text"/>	<input type="text"/>	<input type="text"/> %
Minimum Dosage	<input type="text" value="0.000"/> (mg/L)	% Actives	<input type="text"/> %
Password	<input type="text"/>	% Water	<input type="text"/> %

OK Calc % Set Limits More ENCRYPT ON Delete File Help Cancel

Modeling

Evaluate the model in the Source Water, Waterflood, or Multi-Mix modules by selecting the appropriate Product/Metallurgy Model file. Predictions output as graphs and in tables.



You can compare TREATED versus UNTREATED profiles when corrosion inhibitor dosage data is used to develop the models.

There are ultra-expensive general models available which include parameters to make models applicable to a very broad range of wells. These can be difficult to use, require unavailable specifications and data, may or may not accurately. Modeling a specific well or field eliminates the need for many of the variables that expand a model from a specific, to a general model.

The DownHole SAT Laboratory Edition provides an alternative and allows increased accuracy in many cases. Similar models can be used for inhibitor modelling, when data is available. View the Video Tutorial: <http://www.frenchcreeksoftware.com/tutorial/create-oilfield-corrosion-model/>

French Creek

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