

Complete Water Analysis

Customer: **WESTERN OPERATING**
 Geographic Region: **Colorado**
 Geographic Location: **Morgan County**
 System Description: **Production**

Equipment Description: **Messenger 1-26**
 Sample Point: **Water Tank**
 Sample ID: **AV18963**
 Account Re : **Shane.Dreiling@championx.com**

Collection Date: **02/18/2023**
 Receive Date: **03/06/2023**
 Report Date: **03/07/2023**
 Location Code: **503501**

Field Analysis

Analysis	Result	Analysis Method
Total Alkalinity (M-Alk as HCO ₃)	976 mg/L	Titration
Dissolved CO ₂	88 mg/L	Titration
Dissolved H ₂ S	8.0 mg/L	Titration
Pressure Surface	25 psi	
Temperature	100 ° F	
pH of Water	7.0	Meter

Sample Analysis

Analysis	Result	Analysis Method
Specific Gravity	1.009	Densitometer
Ionic Strength	0.210 mol/L	Calculation
Total Dissolved Solids	12800 mg/L	Calculation
Calculated pH	7.00	Calculation
Calculated CO ₂ in the gas	6.26 %	Calculation

Cations - Analyzed By ICP

Iron	<0.500 mg/L	Boron	15.9 mg/L	Silicon	15.4 mg/L
Manganese	<0.200 mg/L	Lithium	1.12 mg/L	Aluminum	<0.400 mg/L
Barium	0.492 mg/L	Copper	<0.200 mg/L	Molybdenum	<0.200 mg/L
Strontium	4.12 mg/L	Nickel	<0.200 mg/L	Phosphorus	<0.500 mg/L
Calcium	24.9 mg/L	Zinc	<0.400 mg/L	Measured Sodium	4720 mg/L
Magnesium	7.31 mg/L	Lead	<0.500 mg/L		
Sodium	4720 mg/L	Cobalt	<0.500 mg/L		
Potassium	17.9 mg/L	Chromium	<0.100 mg/L		

Anions - Analyzed by IC

Chloride	6900 mg/L	Sulfate	33.8 mg/L
Bromide	56.4 mg/L		

PTB

	Anhydrite	Barite	Calcite	Celestite	Gypsum	Halite	Iron Carbonate	Iron Sulfide
50°	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
75°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125°	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
150°	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00
175°	0.00	0.00	7.41	0.00	0.00	0.00	0.00	0.00
200°	0.00	0.00	12.51	0.00	0.00	0.00	0.00	0.00
225°	0.00	0.00	15.96	0.00	0.00	0.00	0.00	0.00
250°	0.00	0.00	18.20	0.00	0.00	0.00	0.00	0.00
275°	0.00	0.00	19.61	0.00	0.00	0.00	0.00	0.00
300°	0.00	0.00	20.49	0.00	0.00	0.00	0.00	0.00
325°	0.00	0.00	21.01	0.00	0.00	0.00	0.00	0.00
350°	0.00	0.00	21.33	0.00	0.00	0.00	0.00	0.00
375°	0.00	0.00	21.52	0.00	0.00	0.00	0.00	0.00
400°	0.00	0.00	21.63	0.00	0.00	0.00	0.00	0.00

SI

	Anhydrite	Barite	Calcite	Celestite	Gypsum	Halite
50°	-3.89	0.09	-0.79	-2.38	-3.26	-3.20
75°	-3.68	-0.18	-0.60	-2.40	-3.29	-3.25
100°	-3.49	-0.39	-0.40	-2.39	-3.27	-3.28
125°	-3.31	-0.55	-0.20	-2.34	-3.24	-3.29
150°	-3.13	-0.67	0.00	-2.28	-3.20	-3.30
175°	-2.95	-0.75	0.21	-2.19	-3.16	-3.30
200°	-2.78	-0.81	0.42	-2.19	-3.13	-3.29
225°	-2.61	-0.84	0.64	-1.99	-3.10	-3.28
250°	-2.44	-0.85	0.86	-1.88	-3.08	-3.26
275°	-2.27	-0.84	1.08	-1.76	-3.04	-3.23
300°	-2.10	-0.83	1.31	-1.63	-2.99	-3.20
325°	-1.92	-0.80	1.53	-1.50	-2.90	-3.17
350°	-1.74	-0.77	1.76	-1.36	-2.75	-3.13
375°	-1.56	-0.74	1.98	-1.21	-2.53	-3.08
400°	1.37	-0.71	2.20	-1.07	-2.21	-3.03

Comments

Scaling predictions calculated using Scale Soft Pitzer 2019

Scaling predictions dependent on provided field data. Incomplete/partial field data may impact results generated by scaling software

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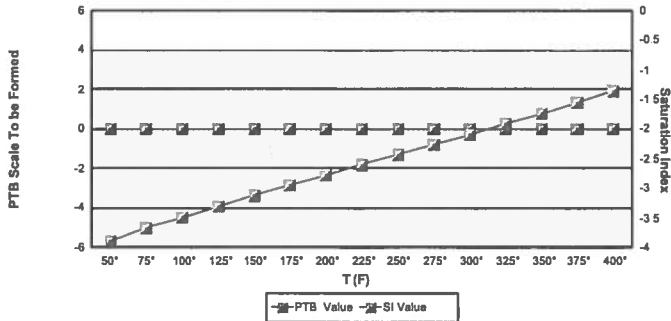
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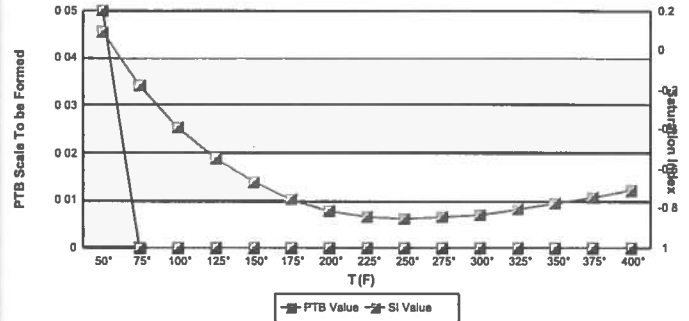
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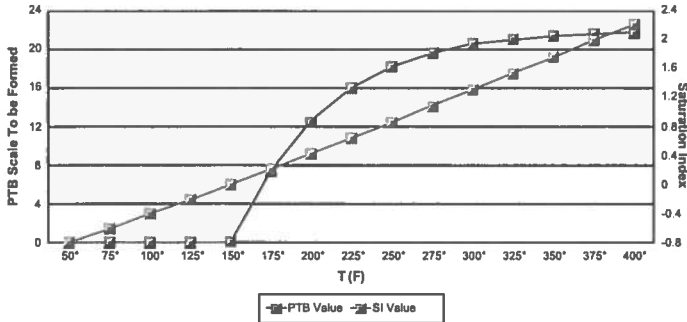
Anhydrite CaSO₄



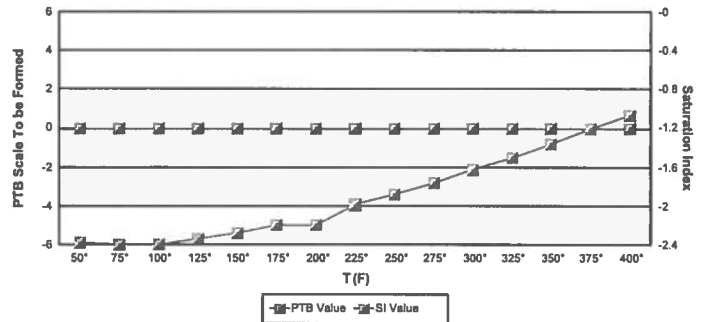
Barite BaSO₄



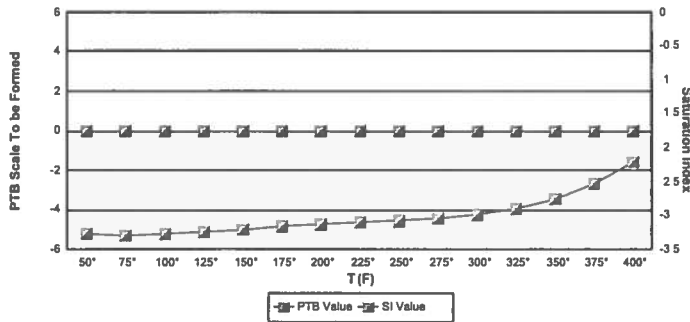
Calcite CaCO₃



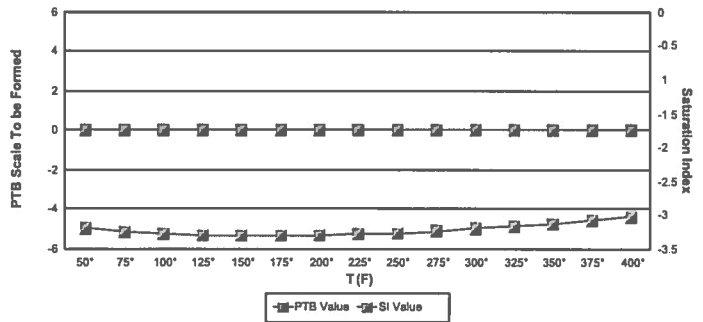
Celestite SrSO₄



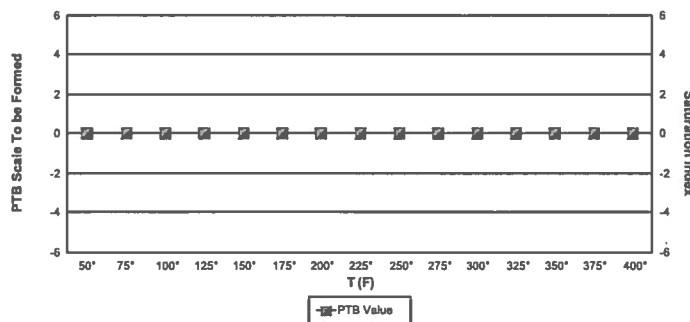
Gypsum CaSO₄



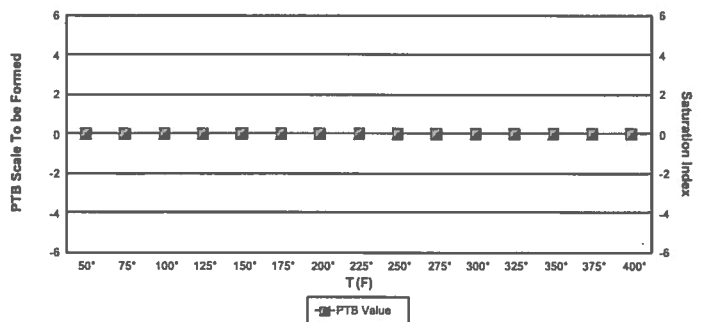
Halite NaCl



Iron Carbonate FeCO₃



Iron Sulfide FeS



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03/07/2023