

Submitted Electronically

Complete Water Analysis

Customer: **SHAKESPEARE OIL COMPANY**
 Geographic Region: **Kansas**
 Geographic Location: **Lane County**
 System Description: **Production System**

Equipment Description: **McIesh 3-19**
 Sample Point: **Bleeder**
 Sample ID: **AV13078**
 Account Rep: **Michael.Walters@championx.com**

Collection Date: **02/16/2023**
 Receive Date: **02/22/2023**
 Report Date: **02/23/2023**
 Location Code: **430650**

Field Analysis

Analysis	Result	Analysis Method
Total Alkalinity (M-Alk as HCO ₃)	200 mg/L	Titration
Dissolved CO ₂	220 mg/L	Titration
Dissolved H ₂ S	87 mg/L	Titration
Pressure Surface	25 psi	
Temperature	100 ° F	
pH of Water	7.5	Meter

Sample Analysis

Analysis	Result	Analysis Method
Specific Gravity	1.037	Densitometer
Ionic Strength	0.880 mol/L	Calculation
Total Dissolved Solids	47000 mg/L	Calculation
Calculated pH	7.50	Calculation
Calculated CO ₂ in the gas	0.0900 %	Calculation

Cations - Analyzed By ICP

Iron	4.02 mg/L	Boron	18.3 mg/L	Silicon	9.01 mg/L
Manganese	<0.200 mg/L	Lithium	<1.000 mg/L	Aluminum	<0.400 mg/L
Barium	2.38 mg/L	Copper	<0.200 mg/L	Molybdenum	<0.200 mg/L
Strontium	340 mg/L	Nickel	<0.200 mg/L	Phosphorus	0.637 mg/L
Calcium	1620 mg/L	Zinc	<0.400 mg/L	Measured Sodium	14700 mg/L
Magnesium	602 mg/L	Lead	<0.500 mg/L		
Sodium	14700 mg/L	Cobalt	1.15 mg/L		
Potassium	239 mg/L	Chromium	<0.100 mg/L		

Anions - Analyzed by IC

Chloride	28300 mg/L	Sulfate	904 mg/L
Bromide	44.9 mg/L		

PTB

	Anhydrite	Barite	Calcite	Celestite	Gypsum	Halite	Iron Carbonate	Iron Sulfide
50°	0.00	1.38	14.82	128.00	0.00	0.00	0.00	2.22
75°	0.00	1.35	14.66	125.30	0.00	0.00	0.00	2.21
100°	0.00	1.31	14.70	128.99	0.00	0.00	0.00	2.21
125°	0.00	1.26	14.95	136.67	0.00	0.00	0.00	2.21
150°	0.00	1.20	15.42	146.63	0.00	0.00	0.00	2.20
175°	0.00	1.14	16.07	157.60	0.00	0.00	0.00	2.20
200°	0.00	1.08	16.86	168.67	0.00	0.00	0.00	2.20
225°	0.00	1.03	17.78	179.28	0.00	0.00	0.00	2.20
250°	60.64	0.98	18.81	189.10	0.00	0.00	0.00	2.21
275°	141.03	0.94	19.93	197.94	0.00	0.00	0.00	2.21
300°	204.85	0.90	21.15	205.74	0.00	0.00	0.00	2.21
325°	255.75	0.86	22.46	212.53	0.00	0.00	0.00	2.21
350°	296.46	0.81	23.87	218.35	0.00	0.00	0.06	2.21
375°	329.03	0.77	25.36	223.26	0.00	0.00	0.08	2.21
400°	355.01	0.70	26.92	227.32	0.00	0.00	0.04	2.21

SI

	Anhydrite	Barite	Calcite	Celestite	Gypsum	Halite	Iron Carbonate	Iron Sulfide
50°	-1.17	1.59	0.44	0.41	-0.56	-2.18	-0.83	2.93
75°	-0.96	1.34	0.44	0.40	-0.58	-2.22	-0.72	2.65
100°	-0.78	1.13	0.46	0.42	-0.58	-2.24	-0.61	2.45
125°	-0.61	0.96	0.49	0.45	-0.56	-2.26	-0.52	2.31
150°	-0.46	0.82	0.53	0.50	-0.54	-2.27	-0.43	2.24
175°	-0.31	0.71	0.58	0.56	-0.54	-2.27	-0.34	2.20
200°	-0.18	0.63	0.65	0.56	-0.54	-2.27	-0.26	2.21
225°	-0.05	0.56	0.72	0.70	-0.55	-2.26	-0.19	2.24
250°	0.08	0.51	0.81	0.78	-0.57	-2.25	-0.13	2.29
275°	0.20	0.47	0.90	0.85	-0.59	-2.23	-0.08	2.37
300°	0.31	0.44	0.99	0.93	-0.59	-2.22	-0.04	2.46
325°	0.43	0.40	1.09	1.01	-0.56	-2.19	-0.01	2.56
350°	0.54	0.37	1.20	1.09	-0.48	-2.17	0.01	2.66
375°	0.65	0.34	1.30	1.17	-0.33	-2.14	0.02	2.77
400°	0.77	0.30	1.40	1.25	-0.09	-2.10	0.01	2.89

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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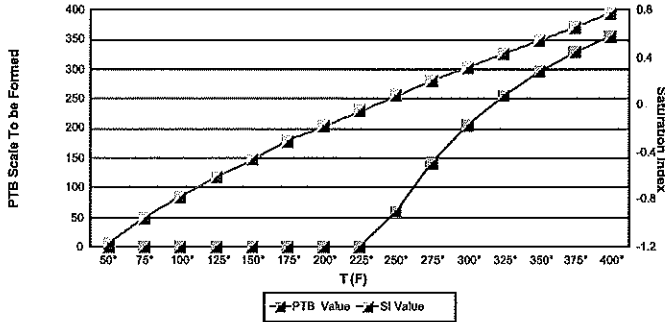
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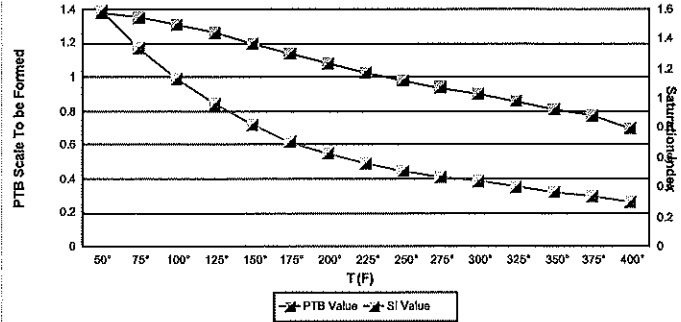
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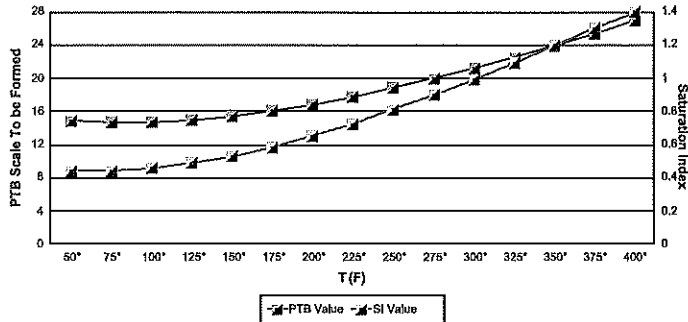
Anhydrite CaSO₄



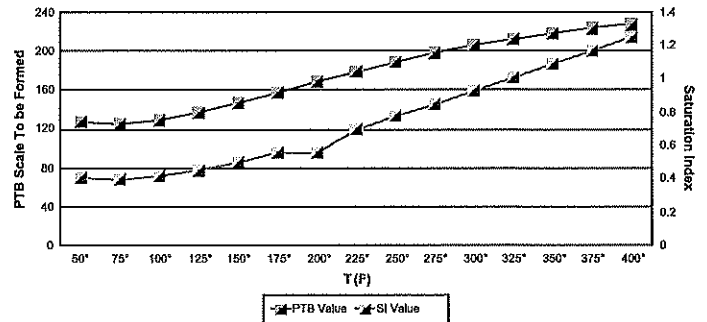
Barite BaSO₄



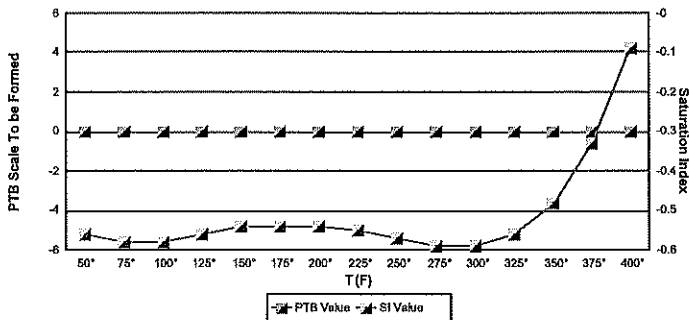
Calcite CaCO₃



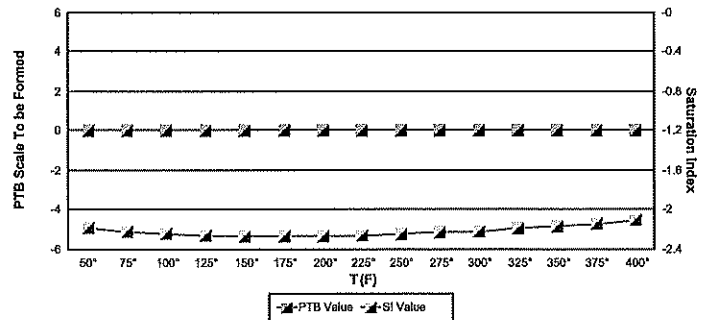
Celestite SrSO₄



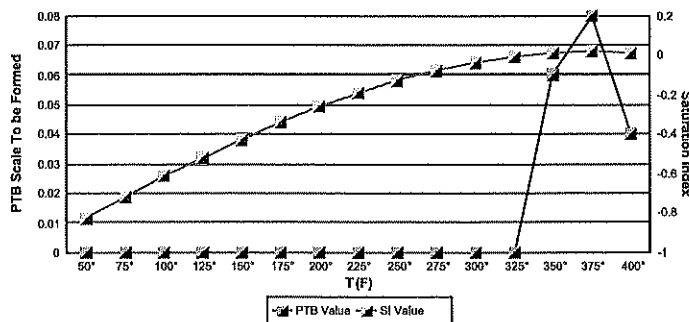
Gypsum CaSO₄



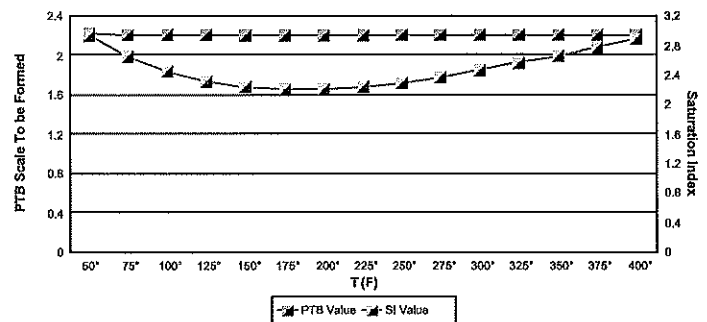
Halite NaCl



Iron Carbonate FeCO₃



Iron Sulfide FeS



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