ZPEX
by ecoat.us

AUTOCLAVE TESTING

Pioneer Resources - Permian Coating Assessment

Asset Integrity - 4.30.2019

Testing: 75 day Autoclave's per ASTM D-4060; samples scraped to slightly damage and scraped to bare metal.

Material: Carbon Steel ASTM A 106 Grade B Schedule 40

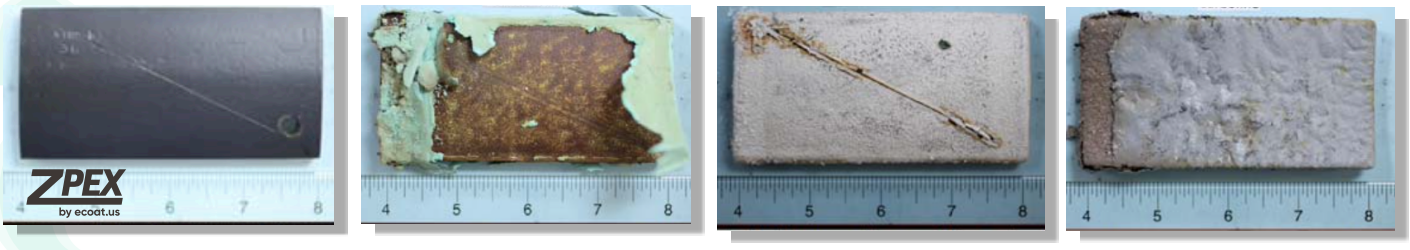
Problem: Corrosion due to H2S (40-300 PPM) CO2 (1.5-2.5 mole%) High SRB (Sulfate Reducing Bacteria) and APB (Acid Producing Bacteria) Counts, Dissolved Oxygen -12 PPM

11 COATINGS SELECTED FOR TESTING

30 Day Surface Test Conditions (30 days):
750 PSI
98° F Temp.
CO2 = 450 ppm
H2S = 300 ppm
O2 = 60 ppb
Min. 20% Brine (200,000 ppm)
80% Wellhead Fluid
pH 7.5

30 Day Sub-Surface Test Conditions (30 days):
5,000 PSI
200° F Operating Temp.
CO2 = 3.5 mole
H2S = 300 ppm
O2 = 12 ppb
Min. 20% Brine (200,000 ppm)
80% Wellhead Fluid
pH 5

Following surface and subsurface testing, samples went through 14 day - 1.5 pH Acid Immersion Test and were then scraped.



SAMPLE COUPONS AFTER TESTING & SCRAPING

ZPEX COATING SYSTEM FINISHED 1ST

Only coating with NO effects after testing.

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CONCLUSIONS & RECOMMENDATIONS

WATER TRANSFER LINES (TB & SWD) RECOMMENDATIONS

- Upstream of SWD tanks:
  - For all water transfer lines at the TB and SWD (surface or buried lines):
    - Use NOV Fiber Glass fit for 10,000 PPM aromatic carryover
- Downstream of SWD tanks:
  - Use NOV Fiber glass system if compatible with vibration
  - HDPE lined surface pipe can be used
  - Tesla special nano coating for high pressure system can be used
  - NOV 15 XT coating
- All valves need to be internally coated with ZPEX coating product
- Above ground fiber glass installation coating spec:
  - Surface prep: remove all grease, dirt, and debris from external surfaces of the pipe. Roughen the exterior surface of the fiberglass to remove all shiny smooth surfaces, this can be achieved with "Brush-off blast clear
  - Application: any form
  - Coating system for 1
    - Tie coat; Amine
    - Top coat; Polyu
  - For higher temperatu d.f.t

■ All valves need to be internally coated with ZPEX coating product

CONCLUSION & RECOMMENDATIONS

- Vessels and Tanks Coating:
  - International product "CeilCoCite 232 Novolac Vinyl Ester Epoxy" passed all tests
  - Carboline product "Plasite 4301 HT Novolac Vinyl Ester Epoxy" had a coh
  - All oth
  - Existir applic
- For water
- FLEX Steel and Dual Line passed the chemical resistance test and fit for protection against MIC
- If you use carbon steel valves make sure they internally coated with ZPEX
- Any future coating product need to be tested under the same conditions used in this study before application in the field guideline will be implemented in the PXD standard
- Training will be provided on tank lining and coatings in the Permian office if you like to attend let us know

■ If you use carbon steel valves make sure they internally coated with ZPEX