Product Test Report

PTR-388

Swagelok Company
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TITLE

Sodium Chloride Stress Test (Reference ASTM B117-95) of Stainless Steel Swagelok® Tube Fittings

PRODUCT TESTED

Ordering Number	Form	Tubing Size in.	Tubing Hardness HRB	Tubing Working Pressure psig (bar)	Quantity
SS-400-1-4	Bar stock	1/4 × 0.065	82	10 200 (702)	8
SS-400-9	Forging				
SS-600-1-4	Bar stock	3/8 × 0.065	83	6500 (447)	8
SS-600-9	Forging				
SS-810-1-4	Bar stock	1/2 × 0.083	86	6700 (461)	8
SS-800-9	Forging				

PURPOSE

These assemblies were tested under laboratory conditions to observe the effect of an environment that promotes stress corrosion cracking (SCC) on 316 stainless steel Swagelok tube fittings with advanced geometry back ferrules.

TEST CONDITIONS

Original test date: December 2001

TEST METHOD

1. Eight samples were prepared per size. Each sample consisted of two fittings assembled to a 2 1/2 in. (64 mm) length of tubing.
2. Half of the fittings were assembled according to Swagelok tube fitting installation instructions, 1 1/4 turns past finger-tight (TPFT). The other half were assembled 1 7/8 TPFT.
3. Each sample was pressurized to working pressure of tubing with nitrogen and monitored for leakage prior to the stress corrosion test.
4. Samples were placed into a salt spray chamber.
5. Samples were pressurized with water to working pressure of tubing.
6. Chamber temperature was elevated to 140°F (60°C) and the salt spray was initiated.
7. Upon completion of 50 and 500 hours in the salt fog, the samples were removed and rinsed with de-ionized water.
8. The samples were then pressurized to working pressure of tubing with nitrogen and monitored for leakage.
9. After completing 500 hours in the salt fog, samples were then sectioned and metallurgically examined by a scanning electron microscope for signs of SCC.

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TEST RESULTS

- All samples successfully passed 50 and 500 hours in the salt spray chamber without loss of pressure.
- All samples successfully passed the post salt spray nitrogen gas pressure test without leakage.
- Metallurgical evaluation of the sectioned fittings found no evidence of SCC propagation beyond surface structures into the fitting body, nut, ferrules, or tube. This same result was generated even when the ferrules were overstressed by pull-ups of 1 7/8 TPFT.
- The resistance of the fittings to chloride cracking can be considered excellent, since the fittings did not fail in spite of the long testing time of 500 hours (~3 weeks) and also in spite of the higher testing temperature of 140°F (60°C), which would particularly accelerate SCC in stainless steel. The ASTM B117-95 specified temperature is 95°F (35°C).

The tests were conducted beyond the product's recommended operating parameters and do not modify the published product ratings.

These tests were performed to consider a specific set of conditions and should not be considered valid outside those conditions. Swagelok Company makes no representations or warranties regarding these selected conditions or the results attained. Laboratory tests cannot duplicate the variety of actual operating conditions. Test results are not offered as statistically significant. See the product catalog for technical data.

SAFE PRODUCT SELECTION

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Referenced Documents

ASTM B117-95: *Practice for Operating Salt Spray (Fog) Apparatus,* ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428