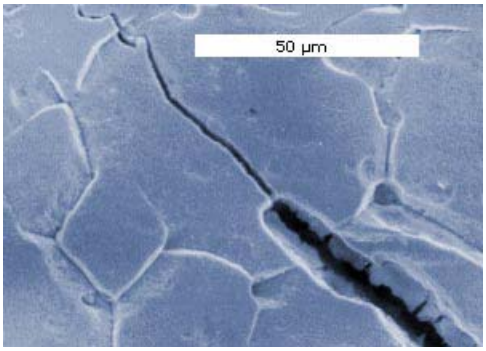
REM CHEMICALS, INC.

ISF® Reduces Dynamic Corrosion Fatigue

Problem:

Corrosion resistance is of prime importance for materials used in the aerospace industry, which often operate in corrosive environments. It is well known that a material subjected to a cyclic load far below the ultimate tensile stress can fail, a process called fatigue. If the metal is simultaneously exposed to a corrosive environment, the failure can take place at even lower loads and after shorter time.



Solution:

ISF® processed parts have an increased cycle life when subjected to dynamic corrosion fatigue of martensitic stainless steel by

1. reducing the surface area,
2. eliminating surface tensile stresses, and
3. enriching the chromium oxide content of the surface.

Test:

Martensitic stainless steel specimens, which were ISF® processed to an R_z <2.5 µm. were compared to reference specimens, which were hand polished in the longitudinal direction to an R_z of 4.0 µm. The specimens were tested to a runout of 5 x 10^7 cycles by reverse bending with a mean stress of 250 MPa and a bending frequency of 50 Hz.

Results:

Medium	*Stress (MPa) Hand Polished*	*Stress (MPa) ISF® Processed*	*Stress Percent Increase from ISF® Process*
Air	250 ± 385	250 ± 445	16
Water, 80 °C, Oxygen Saturated	250 ± 250	250 ± 370	48
22% NaCl, 80 °C pH 7 (sea water:3.5% NaCl)	250 ± 90	250 ± 195	117

Conclusions:

1. Metallographic examination prior to testing did not detect any intergranular corrosion of ISF® processed specimens.
2. The alternating stresses endured by the ISF® processed specimens are, depending on the medium, from 16% to nearly 117% higher than that for the hand polished specimens.
3. The higher levels of stress that could be sustained with the ISF® processed specimens are attributable to the reduction of surface stresses, and also to the increased corrosion resistance of the surface.