

Report: ATO19002

Fatigue Testing of Bare and TDZ Specimens

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December 6, 2019

Disclaimer: The results of this report are based on the evidence that has been received and reviewed. G2MT has the right to modify results if further evidence comes forth.

Summary of Conclusions

The fatigue resistance of bolts with and without a thermally diffused zinc (TDZ) surface treatment applied was performed on two standard ½" bolts. The testing was performed in accordance with ASTM E2207, a well-respected industry standard for quantitative assessment of fatigue resistance. The testing was performed on a Baldwin Lima torsion fatigue tester with ½" amplitude and operated at 1,800 RPM as shown in Figure 1. Each test was stopped by the automatic triggering mechanism after a substantial crack had grown in the part. Both parts cracked in the reduced gauge length section as expected. Following the test, both specimens were fully fractured to observe the crack growth as shown in Figure 2. A small central area was still unbroken on both specimens, which appears as a darker spot on the fracture surface.

The results of the fatigue testing analysis indicate:

- Both specimens broke after 23,000 cycles of fatigue testing (the measurement system tracks by thousands of cycles).
- The fracture surfaces of both specimens are identical.
- Based on these initial results, it does not appear that there is a substantial effect of TDZ coating on fatigue strength.

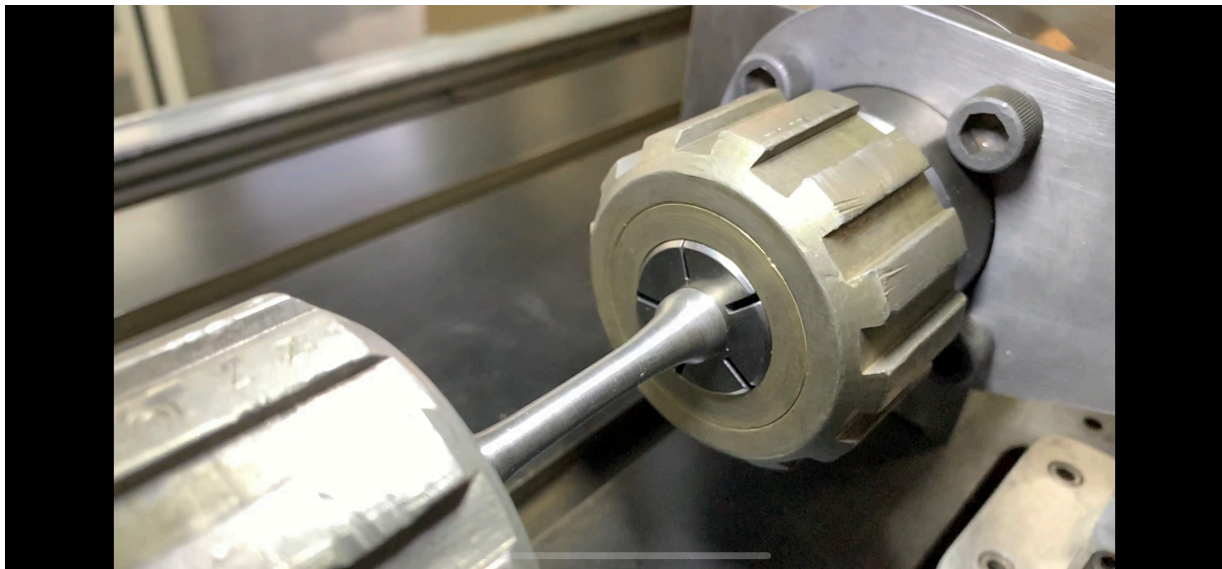


Figure 1: Photograph of the torsion fatigue testing system with a specimen under test.



Figure 2: Photograph of the (left) TDZ and (right) bare bolt fatigue testing specimen after fracturing to observe the crack propagation. The dark gray area is the final fracture surface that occurred during the crack opening process.