

FATIGUE DATA OF TOOLOX[®]

The Toolox[®] steels made by Swedish Special Steel producer SSAB have proven to be an excellent choice for high performance machine parts as well as different type of tooling. Being delivered already heat treated large savings can be made in time and cost. Thanks to the state of the art metallurgy, the inclusion level in Toolox[®] is very low. Giving together with the high strength an excellent fatigue resistance.

Customers have for many years confirmed the great Toolox[®] performance under fatigue loading. To obtain fatigue data, testing was carried out at the department for construction materials at Linköpings University in Sweden. The fatigue tests were performed at room temperature according to ISO 1099 using a servo-hydraulic fatigue machine with an Instron load cell with 50 kN load capacity.

Samples were machined to cylindrical samples followed grinding and polishing with papers of decreasing grit size down to #4000. In addition some specimens were tested directly in the as machined condition. Final gauge section was 6.0 mm in diameter, 15 mm in parallel length and with a 30 mm transition radius.

Fully reversed ($R = -1$) stress-controlled fatigue tests were conducted with a frequency of 20 Hz and a run-out-criteria of 2 million cycles. For tests expected to have a maximum stress larger than 70% of the yield strength, the frequency was reduced to 2 Hz to avoid heating the sample due to internal friction. A failure criterion according to a through specimen crack (complete separation) was used.

Testing was done on Toolox[®] 33 and Toolox[®] 44 and also as reference on steel SS2541. SS2541 being the Swedish designation of 4340/34CrNiMo6 alloyed steel.

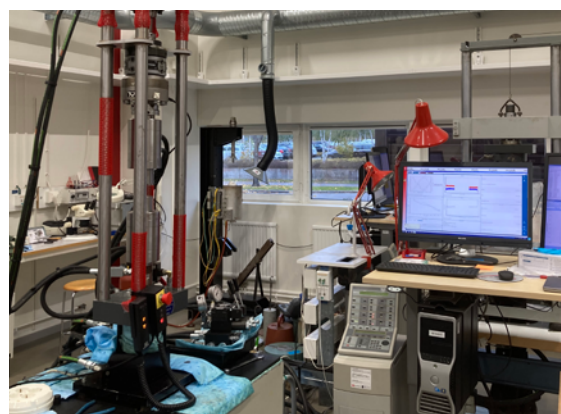
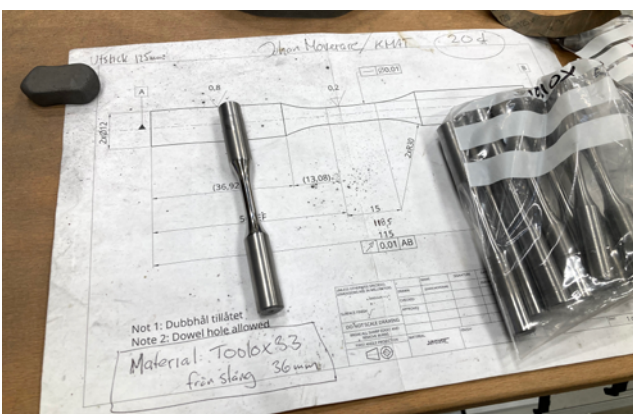
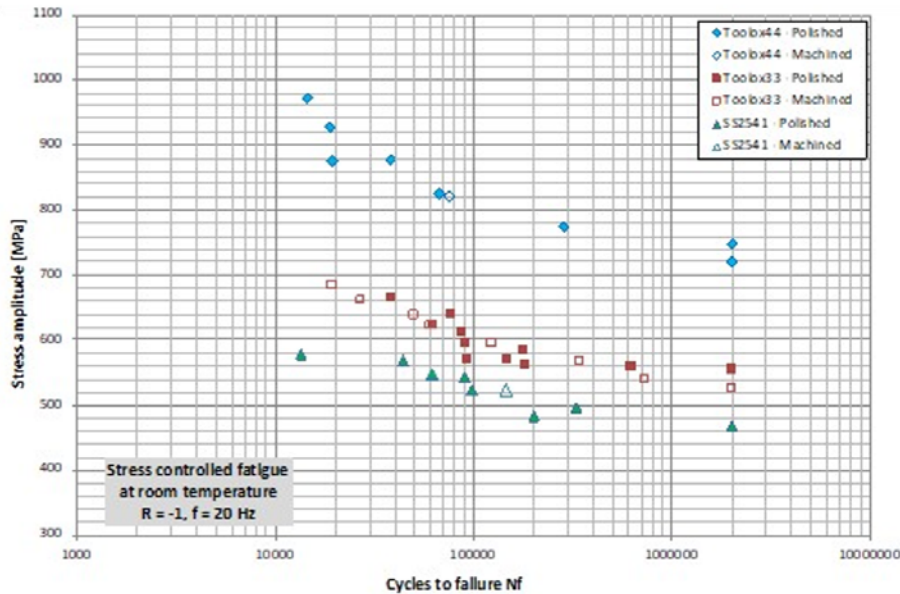


Fig 1. Fatigue test results



The results as can be seen in Fig 1 confirms the outstanding fatigue resistance of Toolox®. Toolox® 44 giving much longer fatigue life than the reference. But also Toolox® 33 being significantly better.

Cylindrical samples of Toolox® with machined, ground and polished surfaces.

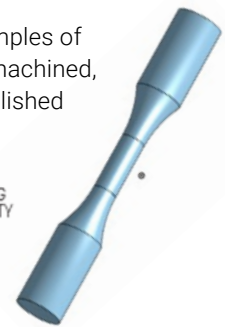
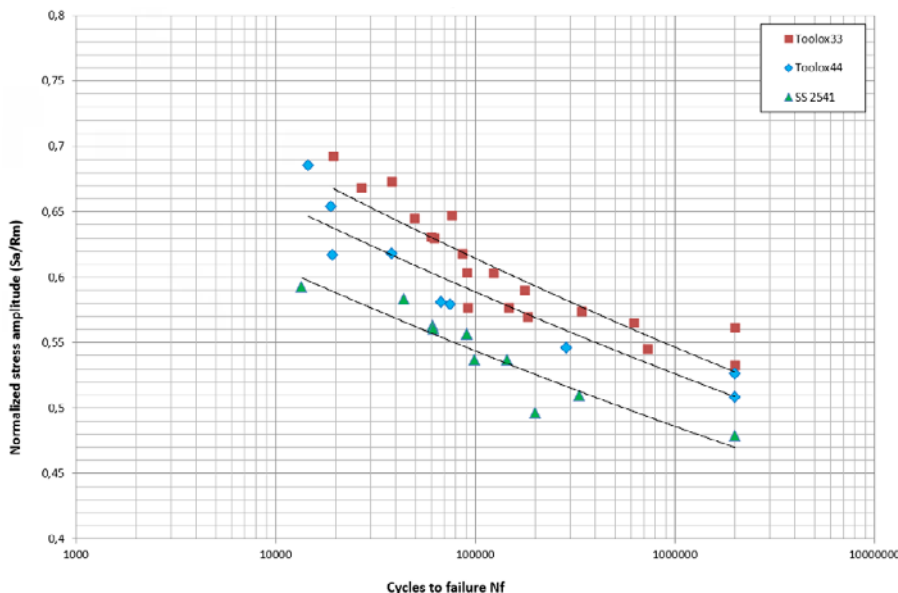


Fig 2. Normalised strength



The very good fatigue resistance of Toolox® 33 becomes even clearer when the stress amplitude is normalized with the tensile strength. As can be seen in Fig 2. Despite having a similar tensile strength to SS2541, the fatigue life is much better.

Availability

Plates and square blocks from 6–320 mm. Bars between 21 and 405 mm with lengths up to 5000 mm. Toolox® is available from the local SSAB stock. Cut pieces of Toolox® can be obtained through the well-established global network of Approved Toolox® Distributors. Both SSAB and the distributors can provide you with good application support as well as technical guidelines.

Contact and more information

Contact your local sales representative to learn more, visit www.toolox.com or consult Tech Support at: help@ssab.com.