

POSTER SUMMARY

**APPLICATION OF FATIGUE THEORY TO PREDICT
THE LIFE OF SUGAR MILL ROLL SHAFTS**

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Ongoing failures within the South African sugar industry prompted an investigation into the fatigue life of mill roll shafts. Ferrous material has an 'endurance limit' which is the alternating stress above which the shaft will fail by fatigue in a predictable number of cycles. Below this stress limit the material will have infinite life. For various carbon steels this has been determined empirically using the RR Moor Test Rig which subjects a specimen to pure bending only. When a material is subject to a constant stress (mean stress) the endurance limit is reduced. In a sugar mill roll, the drive torque subjects the material to a constant (mean stress), and the forces on the roll while it rotates results in an alternating stress. This poster shows the calculation to determine the reduction in endurance limit for a mill top roll subject to a mean and alternating load. Based on the assumptions made, the calculation shows that the particular mill roll selected does not have an infinite life but will fail by fatigue. Since fatigue always originates at a material defect or stress raiser this has important implications on the maintenance, handling and operation of mill rolls in general. The message of the poster is that, although mill rolls appear to be big and strong, they may be operating close to their fatigue capability and therefore should be treated with the utmost care. The poster builds on previous work in this field.

Keywords: mill roll failure, mill roll fatigue, mill roll shear force and bending moment diagrams, endurance limit, fatigue strength