

ABSTRACT

This thesis describes an improvement of the testing capability of a hydraulically operated Avery Universal testing machine presently installed in the Materials Laboratory, Faculty of Engineering, Peradeniya. The auxilliary plotter of the machine is capable of recording a load - elongation (crosshead movement) curve for tensile and compressive testing. But it was found that the curve plotted is not an accurate one due to limitations. Considering these limitations auxilliary equipment was connected to the machine to obtain an accurate load - (gauge length) elongation curve during testing. This curve can be directly converted to the stress-strain curve. By this arrangement the mechanical properties of a material can be determined accurately.

The aim of this work was to study the effects of torsional prestrain (cold twisting) on the subsequent stress - strain curve of a circular bar. A mathematical model has been developed to predict the stress - strain curve of a torsionally prestrained circular bar. The results are compared with the experimental results. The circular bar was twisted to a predetermined degree of torsional prestrain. The twisted specimen was tensile tested immediately using the Avery universal testing machine and the load - elongation curve was recorded with the improved arrangement. From this curve the stress - strain curve (experimental) was determined for the torsionally prestrained circular bar.

Due to many reasons and the complexity of the situation the curves do not coincide each other. Nevertheless the simple model developed gives an engineering estimate that is useful.