



International Journal on Recent Researches In Science, Engineering & Technology

(Division of Mechanical Engineering)

A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy.

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Research Paper

Available online at: www.jraset.com

ISSN (Print) : 2347-6729

ISSN (Online) : 2348-3105

Volume 5, Issue 2,
February 2017

JIR IF : 2.54

DIIF IF : 1.46

SJIF IF : 1.329

Mechanical properties of S45C medium carbon steel specimens under lathe machining and quenching conditions

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Abstract

The authors have studied the mechanical properties of S45C medium carbon steel specimens under lathe machining and quenching conditions. In their experimental work they considered two sets of medium carbon steels of 0.45% carbon. The specimens were subjected to mechanical loading using a conventional tensile testing machine. The microstructure was also considered. The results of their work suggested that the microstructure did not significantly affect the tensile strength. However the temperature selected for quenching process had a significant effect on the elevated levels of tensile strength and strain. They have very clearly explained their experimental setup. In the experiment a study into the factors affecting the tensile material strength of specimens fabricated under specific lathe machining conditions was successfully undertaken and completed. The results indicate that a change in machining speed (430 to 860 RPM) does not influence the mechanical properties of medium carbon steel in any way since no significant incremental changes were noticed in any of the data recorded. However, noticeable fluctuation in stress, strain and percentage elongation of the material specimen were apparent over the 200-600⁰c temperature range in both water and isorapid oil that were selected as the mediums of quenching after the heat treatment process. However, a more substantial change in these measured mechanical properties was recorded for the sample material quenched in water as compared to isorapid oil. That leads to the conclusion that heat treatment and quenching in water can be more effective in material hardening and thus significantly affecting its mechanical properties for future analysis and application.