**REDUCTION OF RETAINED AUSTENITE, DISTORTION AND PROCESS TIME IN CASE HARDENING OF 20MnCr5 MATERIAL FOR INNER DIAMETER OF BROACHED COMPONENTS**

**A PROJECT REPORT**

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**BONAFIDE CERTIFICATE**

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**IV**

**ABSTRACT**

The aim of this work is to investigate micro structural , geometrical and mechanical behavior of 20MnCr5 low carbon steel. when subjected to a different heat treatment and shaping process including forging, normalizing , carburizing, quenching ,subzero treatment and tempering. After heat treatment samples were subjected to metallographic, geometric and mechanical analysis and properties obtain from different process were analyzed. The heat treatment process had certain effects on the resultant properties and microstructures obtain for 20MnCr5 case hardening steel, which is described in detail. Quenching produced a martensite structure characterized by significant increase in hardness of material and same time decreased in impact energy. Normalized samples produced fine pearlitic structure was identified with moderate increase in hardness and it reduced in impact energy and rearrangement of grain boundary .subzero samples produced a free form retaine austenite in case area of material and getting fine tempered martensitic structure was identified with increase traverse hardness during case depth measurement tempering had a significant effect of quenched samples, with substitutional rise in material ductility ,avoid quenching cracks and reduction of hardness with increase the tempering process temperature.

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