

# Effect of ball burnishing process on mechanical properties and impact behavior of S355JR steel

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**Abstract:** Often, surface mechanical treatment (SMT) or heat (quenching, tempering) is used to improve the surface condition and mechanical characteristics such as impact resistance and tensile strength. Hence the objective of this experimental work, where ball burnishing (BB) as well as quenching and tempering were applied on S355 JR steel specimens, is to evaluate the surface hardness  $H_v$ , the rupture strength  $R_m$ , the energy absorbed  $W$  during the impact test, and the work-hardened thickness  $e$  after the burnishing operation. Factorial designs were used for the test organization and mathematical models were established for the prediction of  $H_v$ ,  $R_m$ ,  $W$ , and “ $e$ ” in function on treatment parameters considered: number of tool passes ( $i$ ) and the pressure force ( $P_y$ ). The results show that the surface hardness increases by 30.46%. The high levels of  $P_y$  and  $i$  were allowed to improve  $R_m$  by 30.8% as well as an increase in tenacity of only 3.6%. Increasing the force to 20kgf promotes mixed rupture under the effect of impact to shock. The quenching and tempering improve the Rupture strength  $R_m$  by 183% and 119%, respectively, while the effect of burnishing was limited to a rate of increase of this property of 28% compared to machining.

**Keywords :** Tensile resistance . Burnishing . Heat treatment . Superficial hardness . Absorbed energy . Penetration depth . Rupture facies