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# Effect of roller burnishing parameters on roughness surface and hardness of steel S355J0 specimens by using response surface methodology

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**Abstract :** Burnishing is a cold working process with superficial plastic deformation, which is to exert an external pressure through a very hard and smooth roller or ball on a surface to occur a uniform and work-hardened surface, makes it possible to reduce roughness, to increase the hardness and to produce residual stresses of compression. The steel S 355 J0 specimens were machined on a conventional lathe to the proper dimensions, these machined specimens were then burnished by a simple locally designed and fabricated roller-burnishing tool. The main objective in this work is to determine a mathematical model statistically based on experimental design (response surface methodology) using central composite second-order rotatable design which allows to give the relationship between the two output parameters surface roughness and hardness representative of the superficial layer surface caused by the four internal roller burnishing parameters namely: burnishing speed, force, feed and number of passes of the tool. The experimental results indicate that feed, burnishing force and speed are the most important and significant parameters to improve roughness surface and feed, speed, burnishing force and number of passes are the most important and significant parameters to improve superficial hardness of steel S 355 J0 specimens. The surface roughness and hardness were improved to  $0.15\mu\text{m}$  from about  $2.5\mu\text{m}$  and to 226 Hv from 176 Hv respectively.

**Keywords :** roller-burnishing, steel S355J0, surface roughness, superficial hardness, response surface methodology