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Effect of roller burnishing parameters on roughnesssurface and hardness of steel S355J0 specimens byusing response surface methodology

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Abstract : Burnishing is a cold working process with superficialplastic deformation, which is to exert an external pressurethrough a very hard and smooth roller or ball on a surface tooccurs a uniform and work-hardened surface, makes it possibleto reduce roughness, to increase the hardness and to produceresidual stresses of compression The steel S 355 J0 specimenswere machined on a conventional lathe to the proper dimensions,these machined specimens were then burnished by a simplelocally designed and fabricated roller-burnishing tool. The mainobjective in this work is to determine a mathematical modelsstatistically based on experimental design (response surfacemethodology) using central composite second-order rotatabledesign which allows to give the relationship between the two outparameters surface roughness and hardness representative of thesuperficial layer surface caused by the four internal rollerburnishingparametersnamely:burnishingspeed,force,feedandnumberof passes of the tool. The experimental results indicatethat feed, burnishing force and speed are the most important andsignificant parameters to improve roughness surface and feed,speed, burnishing force and number of passes are the mostimportant and significant parameters to improve superficialhardness of steel S 355 J0 specimens. The surface roughness andhardness were improved to 0.15µm from about 2.5µm and to 226Hv from 176 Hv respectively.

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