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Improvement the surface hardness of XC38 steel by heat treatment - Approach by factorial plans

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Abstract : The surface hardness plays an important role in the service life of a mechanicals parts subjected to friction and wear. It can be improved by mechanical treatments or heat treatments. The latter occupy an important place in steel metallurgy, they aim to improve the performance of mechanicals properties of materials such as resilience and hardness and consequently they contribute in a visible way to the good resistance to fatigue and wear treated pieces. This work aims to predict the surface hardness Hv as a function of heat treatment parameters in this case the treatment temperature and holding time. therefore thermals treatments have been envisaged following the methodology of factorial plans 22 where two parameters have been considered, the temperature "T" and the holding time "t" where each parameter at two levels (min, max). These treatments were applied on forged XC38 steel samples, the obtained results have resulted in a mathematical model evaluating the surface hardness "Hv" as a function of treatment temperature and holding time. The experimental results indicate for this steel that holding time minimum and temperature minimum (t = 2h, T = 850 ° c) have an apparent significant effect where "Hv" achieved the value of 750 (Hvi = 179).

Keywords : heat treatment, superficial hardness, factorial designs, Mathematical model