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Prediction of the Friction Coefficient of 13Cr5Ni2Mo Steel Using Experiments Plans-Study of Wear Behavior

Soumaya MEDDAH, Mounira Bourebia, Amel Oulabbas, Chams eddine Ramoul, Samira TLILI, Ahlem Taleb, Sihem ACHOURI

Abstract: Metal materials used in industrial applications deteriorate under the effect mechanical and chemical phenomena occurring under operating conditions, such as pipes carrying gas or fluid that are subject to internal wall wear. From where an experimental study was conducted through friction tests on supermartensitic stainless steel Cr13Ni5Mo2, in order to estimate the effect of test parameters on friction coefficient and wear behavior of this steel by adopting the factorial plans 22 methodology at two factors (Load "P" and linear sliding "V"), each at two levels (-1, +1). The results have been demonstrated using a mathematical model predicting the coefficient of friction "f" in every point of the study field. The factorial plans make it possible to establish a modeling of the studied phenomenon with a maximum of efficiency and a minimum of experiences. The experimental results showed that the friction coefficient "f" reaches a max value for an applied load P=10N combined with a linear speed V=5cm/s. In addition, the wear morphology of surfaces after the friction test indicates that for 2N and at all speeds, friction is dominated by an abrasive wear mechanism. However, for 10N, it is observed the predominance of adhesive wear with a higher wear rate.

Keywords : friction, factorial design, Mathematical model, wear mechanism