Title: A Model For Tracking Temperature Variation In Cold And Hot Metal Working Conditions During Machining Operations.

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Outlet: Journal of Industrial Engineering International Vol. 6, No. 10, 1-15

Date: 2010

Abstract: This paper presents a mathematical model that could assist in measuring, monitoring and controlling temperature variation in cold and ‘red-hot’ metal working conditions of machining. A numerical analysis technique of the temperature distribution, based on the theory of complex applied potential, was carried out using the principles of relationship analysis between the paths of heat supply in Cartesian plane when the path of heat supplied to the material is orthogonal. The high level of temperature involved may effectively be predicted if a mathematical relationship that predicts the pattern of temperature distribution in a material is available. A case study example in a machining workshop is given. Simulation experiments are then carried out using Monte Carlo to increase the confidence in decision-making and provide data for significance testing. This was used as an input for testing for significance. Sensitivity analyses were also carried out in order to observe the degree of responsiveness of model parameters to changes in value. In all, five pairs of comparison were carried among different work piece materials. There are significant differences between work piece materials made of steel and copper, copper and zinc, copper and aluminium. However, no significant differences exist in the model behaviour of steel and aluminium, steel and zinc. It was observed there parameters are highly sensitivity to changes in value. The framework could possibly be applied to milling and surfacing activities in the engineering workshop. This contribution may be helpful to small-scale enterprises that could not afford sophisticated and very expensive facilities.