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Optimization of sustainable cutting conditions in turning carbon steel by CNC turning machine

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The current study aims to find the optimum cutting parameters in turning process without using cutting fluids (dry cutting condition) towards sustainable manufacturing, where the power consumption and environmental pollution increases due to increase of the machining operations in manufacturing field. So, in order to save energy and environment and reduce cost, it is important to adopt sustainability in machining processes. The experimental work in this study involves the preparation of experiments on AISI 1045 carbon steel to collect the necessary data for implementing optimization process. The experiments were conducted by changing levels of cutting parameters (spindle speed, feed rate and cutting depth) in CNC turning machine. Surface roughness of the work piece has been depended as a quality indicator. Also the temperature of cutting tool has been recorded during machining the work pieces in order to control the temperature of cutting process. Theoretically, empirical equations for temperature of cutting tool and surface roughness of the work piece have been discovered. By using genetic algorithm technique, these equations have been used to find the optimum of cutting parameters spindle speed, feed rate and depth of cut. The optimum values obtained by genetic algorithm achieved sustainable cutting; spindle speed 588.96 rpm, depth of cut 0.50 mm and feed rate 64.55 mm/min in order to have the optimum of surface roughness in low cutting temperature.

Biography

Haider M Mohammad completed his PhD in Mechanical Engineering (Applied Mechanics and Failure of Materials) in Mechanical Engineering department at University of Basrah, College of Engineering. His research interests include "Failure of boilers, corrosion, fatigue, creep rupture, surface roughness, heat treatment, welding, optimization, sustainability, cold working and machining".

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