

Abstract

Electrochemical – turning (ECT) is an important nontraditional or advanced manufacturing process that provides a better alternative in machining components. Complex geometrical shapes can be machined repeatedly and accurately surface can be obtained without surface treatment.

The present work investigates the effect of applied feed rate, rotational speed workpiece, applied voltage and electrode size or machining area on metal removal rate, hardness and surface roughness in electrochemical turning of mild steel. The objective of this on-going investigation is to develop a better understanding of (ECT) performance. It was found that

1- Material removal (MRR) increases with increasing the applied feed rate of the electrode or velocity of tool electrode displacement. Moreover, material removal rate increases with increasing the applied voltage, as the voltage increases the current density increases and material removal rate increases. Moreover, material removal rate increases with increasing the applied rotational speed of workpiece.

2- Hardness of workpiece decreases with increases the applied feed rate, also hardness of workpiece decreases with increases the applied rotational speed of workpiece and decreases the tool electrode dimension.

3- Surface roughness decreases with decreasing applied voltage, increasing feed rate and increasing tool electrode area. By increasing the feed rate, stray machining will be less because of small time interval. This will, therefore, result in better surface finish, further, an increase in feed rate causes an increase in the electrolyte flow rate, surface roughness decreases as the rotational speed of workpiece increases. High rotational speed of the workpiece produces better surface finish, since the rotational energy provides better discharge mobility by inducing more turbulent flow of electrolyte.

4- Making an experimental design using response surface methodology of matlab software to produce a mathematical predicted model related between material removal rate, surface roughness and working parameter of (feed rate, applied voltage and rotational workpiece speed).