

Characterization of tool wear in friction drilling

ABSTRACT

Friction drilling is a non-traditional hole-making process, where the rotating conical tool between the thin workpiece produces a heat due to penetration to soften the workpiece and form a hole. It creates a bushing without generates the chip. Tool wear in friction drilling is crucial because it affects the tolerances that are achievable. In this study, the tool wear characteristics of friction drilling on low carbon steel were experimentally investigated using tungsten carbide tool. Tool wear characteristics were quantified by measuring the changes in tool shape and weight reduction. The energy dispersive spectrometry was utilized to analyze the element containing on the tool surface, and the observation of wear was made using optical microscope and scanning electron microscope. The results indicated that the conical tungsten carbide tool is durable and can be used up to 1000 holes. The changes of tool shape and weight reduction were concentrated at the tool center and conical regions. It confirmed that the abrasive wear revealed at the same regions with circular grooves. The adhesive wear was observed at the tool center and conical regions, and oxidation wear was identified with a dark burned appearance at the tool surface.

Keyword: Friction drilling; Tool wear; Chipless hole-making; Tungsten carbide