

Experimental Study on Jet Electrochemical Machining of Intersecting Single Grooves

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Abstract

Due to unique advantages of Jet Electrochemical Machining (Jet-ECM) such as the absence of mechanical and thermal effects, there is an increasing demand for the implementation of the technology in industrial sectors. However, meeting the stringent quality requirements of the current technological level is a challenge in Jet-ECM especially for complicated microstructures. Hence, the implementation of an adequate metrology system is necessary to minimise deviations and to enhance the process towards zero-defect-manufacturing. The metrology system should be capable of measuring the workpiece before machining in order to enable the machine to adjust the process parameters and to reach the desired micro-structure. Post-machining measurements to compare the machined part with the desired shape should be possible as well. This will enhance the machine to make corrections on the workpiece before delivery to the next section in a process chain. However, in order to reach the desired microstructures, the characteristics of workpiece like material properties and previously machined structures on the size and shape of the machined microstructure should be taken into consideration. This is done through the implementation of results of the fingerprint study into the process control. In this study the effects of previously machined single grooves which intersect the secondly machined groove on the size, shape and surface roughness are investigated. The previously machined groove was generated by milling or Jet-ECM. Since at the intersections the gap size changes and this lead to changes in current and current density, it is expected to observe changes in size and surface roughness. This investigation will show how grooves change at the intersections and whether the mentioned changes are significant. Besides, some suggestions will be provided in order to minimise the effects in Jet-ECM of intersecting single grooves.