Improved Material Removal with Thermal - Assisted Abrasive Flow Machining (Th-AFM) Process

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Abstract

A precise finishing technique called abrasive flow machining is mostly used to polish intricate interior and external surfaces of metallic components. Because of the low rate of material removal, this procedure is likewise slow, just like the majority of finishing operations. This method began in the aerospace industry, but it is currently used in the die-making, automotive, and biomedical implant industries, among others. Recently, there has been research into hybridizing the abrasive flow machining (AFM) process with other non-conventional machining (NCM) techniques in an effort to overcome the primary drawback of the AFM process—namely, the low material removal—and meet the demanding functional and finish requirements. The current study focuses on the creation of a thermal setup and abrasive flow machining (AFM) technique for internal hole or prismatic recess fine finishing. The novel technique is known as thermally assisted abrasive flow machining, or Th-AFM, and it was found to cause greater material abrasion because of the combined effects of AFM and Temperature. Using the standard L27 orthogonal array (OA) for the experimentation plan, the various process parameters have been further optimized for the response characteristic of material removal in the current investigation, based on the Taguchi method and found to be 9.9 mg. All things considered, the Th-AFM process has a very bright future in the industries because of its ability to complete quickly, even when dealing with thin, delicate, and hard alloy components.

Keywords

Abrasive aluminiun oxide, abrasive flow machining, Types of media, Thermal AFM.