

# Simulation and Experimental Investigation of Electrochemical Trepanning of an Aero-Engine Diffuser with Different Flow Fields

Zhouzhi Gu<sup>1</sup>, Xiaohu Zheng<sup>1\*</sup>, Yongcheng Ge<sup>2</sup>

<sup>1</sup> Jiangsu Key Laboratory of Advanced Manufacturing Technology, Huaiyin Institute of Technology, Huai'an 223000, China

<sup>2</sup> College of Mechanical Engineering, Yangzhou University, Yangzhou 225127, China

\*E-mail: [hyzxxh@126.com](mailto:hyzxxh@126.com)

Received: 13 June 2021 / Accepted: 20 September 2021 / Published: 10 October 2021

---

The electrochemical-trepanning process is an economical approach for manufacturing diffuser structures. In the electrochemical-trepanning process, the flow field is an important factor that affects machining stability, machining efficiency, and surface quality. In this study, two different flow fields of the forward flow-field mode and the lateral flow-field mode were proposed, and their numerical models were also established and then simulated using FLUENT software. The results showed that the flow velocity of the forward flow-field mode was higher, and the flow velocity of the lateral flow-field mode was more uniform. Furthermore, a fixture was designed to realize this new flow mode, and then corresponding experiments were carried out. The experimental results illustrated that the forward flow-field mode could get a better feed speed of 2.5 mm/min, and the lateral flow-field mode could get a better surface quality of 1.581  $\mu\text{m}$ . In addition, since the lateral flow field was more uniform, the flow pattern on the machined surface disappeared, and the machining quality was greatly improved.

---

**Keywords:** electrochemical machining; flow field; experiment; diffuser

[FULL TEXT](#)

© 2021 The Authors. Published by ESG ([www.electrochemsci.org](http://www.electrochemsci.org)). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).