基于 3D 打印航空发动机喷油管磁力研磨试验研究

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摘　要：目的 针对镍基合金 GH4169 航空发动机喷油管进行磁力研磨光整加工试验研究，分析内置辅助磁极磁力研磨对工件内表面及交叉孔相贯线去毛刺的效果。**方法** 利用磁粒研磨内置辅助磁极光整加工对工件内表面及内交叉孔相贯线处进行磁力研磨加工，通过研磨粒子与工件之间的划擦、磨削等运动，提高工件表面质量和去除内交叉孔相贯线处的毛刺。**结果** 磁轭转速为 1000 r/min，加工间隙为 6 mm，采用圆柱形辅助磁极及平均粒径为 250 μm 的磁性磨料时，其加工效果比传统的加工效果好，且效率更高，工件表面粗糙度从原始的 5.8 μm 降至 0.47 μm（Ra<0.5 μm），内交叉孔相贯线处的毛刺明显被去除，且由于磁性研磨粒子的研磨作用，可对其进行二次光整加工。**结论** 通过磁力研磨内置辅助磁极光整加工方法，原始工件内表面存在的褶皱、微裂纹明显得到改善，交叉孔相贯线处的毛刺也明显被去除。试验选用磁性研磨粒子粒径为 250 μm 时，研磨效果最佳。通过磁力研磨光整加工后，管件能够得到良好的表面效果，提高了管件的综合性能。

关键词：磁力研磨；3D 打印；镍基合金喷油管；内交叉孔相贯线；辅助磁极

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Magnetic Abrasive Finishing of Aero Engine Fuel Injection Tube Based on 3D Printing

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ABSTRACT: Experimental research on magnetic abrasive finishing for GH4169 alloy fuel injector of nickel based alloy was carried out and analyze the deburring effect of the built-in auxiliary pole magnetic abrasive finishing on the inner surface of the workpiece and the cross hole line. The Aurora built-in auxiliary magnetic abrasive machining was used to grind and process the inner surface of workpiece and internal cross hole line. The movements like scratch, grinding, etc. between the abrasive particles and the workpiece were adopted to improve the quality of the workpiece surface and remove the cross hole line burr. The magnetic abrasive with yoke speed of 1000 r/min, cylindrical auxiliary pole, machining gap of 6 mm and average grain size of 250 μm could provide better machining effects and higher efficiency than the traditional processing. The surface roughness of the detected workpiece could drop to 0.47 μm from the original 5.8 μm (Ra<0.5 μm). The burr at the internal cross hole line was obviously removed and the second finishing process could be conducted due to the abrasive action of magnetic particles. The

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