

Surface Quality Improvement of Abrasive Waterjet Cutting for Spacecraft Structure

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Abstract : Abrasive waterjet (AWJ) machining is considered as one of the most powerful cutting processes. It can be used for cutting heat sensitive, hard and reflective materials. Aluminum 2024 is a high-strength alloy which is widely used in aerospace and aviation industries. This paper aims to improve aluminum alloy and to investigate the effect of AWJ control parameters on surface geometry quality. Design of experiments (DoE) is used for establishing an experimental matrix. Statistical modeling is used to present a relation between the cutting parameters (pressure, speed, and distance between the nozzle and cut surface) and responses (taper angle and surface roughness). The results revealed a tangible improvement in productivity by using AWJ processing. The taper kerf angle can be improved by decreasing standoff distance and speed and increasing water pressure. While decreasing (cutting speed, pressure and distance between the nozzle and cut surface) improve the surface roughness in the operating window of cutting parameters.

Keywords : abrasive waterjet machining, machining of aluminum alloy, non-traditional cutting, statistical modeling

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