

## Effects of Canned Cycles and Cutting Parameters on Hole Quality in Cryogenic Drilling of Aluminum 6061-6T

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**Abstract :** The influence of canned cycles and cutting parameters on hole quality in cryogenic drilling has been investigated experimentally and analytically. A three-level, three-parameter experiment was conducted by using the design-of-experiment methodology. The three levels of independent input parameters were the following: for canned cycles—a chip-breaking canned cycle (G73), a spot drilling canned cycle (G81), and a deep hole canned cycle (G83); for feed rates—0.2, 0.3, and 0.4 mm/rev; and for cutting speeds—60, 75, and 100 m/min. The selected work and tool materials were aluminum 6061-6T and high-speed steel (HSS), respectively. For cryogenic cooling, liquid nitrogen (LN2) was used and was applied externally. The measured output parameters were the three widely used quality characteristics of drilled holes—diameter error, circularity, and surface roughness. Pareto ANOVA was applied for analyzing the results. The findings revealed that the canned cycle has a significant effect on diameter error (contribution ratio 44.09%) and small effects on circularity and surface finish (contribution ratio 7.25% and 6.60%, respectively). The best results for the dimensional accuracy and surface roughness were achieved by G81. G73 produced the best circularity results; however, for dimensional accuracy, it was the worst level.

**Keywords :** circularity, diameter error, drilling canned cycle, pareto ANOVA, surface roughness

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