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Optimization of Surface Roughness in Turning Process Utilizing Live Tooling via Taguchi Methodology

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Abstract : The objective of this research is to optimize the process of cutting cylindrical workpieces utilizing live tooling on a HAAS ST-20 lathe. Surface roughness (Ra) has been investigated as the indicator of quality characteristics for machining process. Aluminum alloy was used to conduct experiments due to its wide range usages in engineering structures and components where light weight or corrosion resistance is required. In this study, Taguchi methodology is utilized to determine the effects that each of the parameters has on surface roughness (Ra). A total of 18 experiments of each process were designed according to Taguchi’s L9 orthogonal array (OA) with four control factors at three levels of each and signal-to-noise ratios (S/N) were computed with Smaller the better equation for minimizing the system. The optimal parameters identified for the surface roughness of the turning operation utilizing live tooling were a feed rate of 3 inches/min(A3); a spindle speed of 1300 rpm(B3); a 2-flute titanium nitrite coated 3/8” endmill (C1); and a depth of cut of 0.025 inches (D2). The mean surface roughness of the confirmation runs in turning operation was 8.22 micro inches. The final results demonstrate that Taguchi methodology is a sufficient way of process improvement in turning process on surface roughness.

Keywords : CNC milling operation, CNC turning operation, surface roughness, Taguchi parameter design
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