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Thrust and torque response for drilling titanium and carbon composite sandwich materials

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Experiments were conducted based upon previous research conducted by El-Gizawy and Khasawneh [1] to determine the time response of thrust force and torque correlated to a simple drilling procedure through carbon fiber reinforced epoxy (IM7/997-3) composite material over 6Al-4V titanium alloy (AB1) sheets. The experiments measured the time response with a thrust and torque sensor, data acquisition system and CNC drilling machine. The research was used to locate points of interest among the previous statistical setup. Three-dimensional surfaces were analyzed to determine the drilling parameters that cause the highest force and torque in the CNC spindle (and, therefore, the drill bit) and the lowest force and torque, within the range available with the CNC used in the experimental setup. The experimental holes were also analyzed via surface profilometer and coordinate measurement probe to obtain surface roughness and dimensional accuracy measurements. The data indicates that the parameters that cause lower force and torque are preferable for dimensional accuracy in the titanium as well as for surface roughness, and tool life.