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Void Detection in Friction Stir Welding Using the Spindle Motor Current BRANDON OSBORNE, ISAAC WILBUR, WILLIAM LONGHURST, BRYAN GAITHER, Austin Peay State University — Friction Stir Welding (FSW) is a solid-state process that uses downward forging pressure and frictional heat from a rotating tool to soften and join two metals. FSW's ability to join metals with low melting points and to reduce the probability of imperfections found historically in traditional fusion welding makes it a preferred method for a variety of materials. Despite its advantages, however, voids can still form under improper welding conditions. Because voids reduce the structural integrity of the weld, the ability to detect them in situ would provide insight into how to minimize their formation. Welding torque has been shown to be a useful parameter for detecting the presence of voids. To indirectly monitor welding torque, a clamp-on current sensor was attached to the mill spindle motor and the current signal was recorded. The signal was then Fourier transformed to determine its constituent frequencies. During normal welding conditions the frequency content showed a component around 14 Hz; however, when the tool encountered a void in the workpiece the 14 Hz component disappeared and the component in the 1-4 Hz range increased.

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