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Non-Destructive Evaluation of Thermal Spray Coating Interface Quality by Eddy Current Method

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Abstract

Thermal spray coating is usually applied through directing molten or softened particles at very high velocities onto a substrate. An eddy current non-destructive inspection technique is presented here for thermal spray coating interface quality characterization. Several high-velocity-oxy-fuel (HVOF) coated steel plates were produced with different surface preparation conditions before applying the coating, e.g., grit-blasted surface, wire-brush cleaned surface, and a dirty surface. A quad-frequency eddy current probe was used to manually scan over the coating surface to evaluate the bonding quality. Experimental results show that the three surface preparation conditions can be successfully differentiated by looking into the impedance difference observed from the eddy current probe. The measurement is fairly robust and consistent. More specimens are also prepared with variations of process parameters, such as spray angle, stand-off distance, and application of corrosion protective sealant, etc. They are blindly tested to evaluate the reliability of the eddy current system. Quantitative relations between the coating bond strength and the eddy current response are also established with the support of destructive testing. This non-contact, non-destructive, easy to use technique has the potential for evaluating the coating quality immediately after its application so that any defects can be corrected immediately.