

# **Ultrasonic and Thermographic Inspection of Friction Welding Joint in Automobile Engine Valve**

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The automobile engine valves are made from two different steel types in order to endure extreme stresses such as high temperatures and chemical corrosion in the valve train system. The valve head is made from highly alloyed and high-temperature resistant steel, while the shaft is made from a different alloy steel that can be hardened. The shaft of the valve is connected to the valve head by friction welding. This paper describes an induction infrared thermo-graphic(IIRT) system developed to inspect the friction welding joint of automobile engine valve shaft made of two different steels. The IIRT equipment using electromagnetic wave as an excitation source was synchronized with infrared camera for a lock-in or pulsed mode to investigate the welding joint of dissimilar materials. Two kinds of engine valve shaft, one with imperfect welds and another with perfect welds were heated up by induction in pulsed excitation and imaged by IIRT system for comparison. Thermal images of the valve shaft with and without defects were obtained and compared with ultrasonic test results to verify the performance of induction thermography equipment. Experimental results showed that the thermal image of the interface of friction welding joint was not flat but wavy, but that of the perfectly welded joint was relatively flat because it was heated and deformed uniformly during friction welding process.