

NDE Characterization on the High-frequency Heat Treatment in Piston Rods for a Use of Shock Absorbers Using an Automatic Ultrasonic System

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In general, piston rods are playing an key component, which absorb shock and vibration energy. A high-frequency heat treatment process were treated in order to guarantee the surface hardening durability of piston rods. Here, Rockwell hardness test is performed to evaluate the degree of surface heat treatment of the piston rods. This test is limited for guaranteeing due to one-point measurement. So a proper non-destructive method was developed for inspecting the whole surface. Heat-treated surface of piston rods was evaluated by using Rayleigh ultrasonic waves. As a result, the peak-to-peak amplitudes of heat-treated piston rods were lower than that of untreated piston rods. We implemented a contact-type jig to measure the hardness and developed a simple automatic system for operation and processing data signals based on Labview. In the system, the obtained data were classified by channels after one rotation of the motor, loaded into the memory and displayed for the inspection data during a motor automatically operating. To assess the ultrasonic characteristics, fabricated defects were made in piston rods in order to obtain defect signals on the surface and back of the samples by performing a basic ultrasonic test based on the pulse-echo method with ultrasonic transducers. Finally, the ultrasonic behavior and the optimal test conditions have been characterized through FEM 3D simulation for producing Rayleigh ultrasonic waves with optimal parameters.