

Correlation between dynamic resistance measurements and real time ultrasonic B-scan inspection for automotive resistance spot weld

Danilo Stocco¹, Andriy Chertov¹, Roman Maev², Sang Hyun Yoo³, Sung Hoon Jung⁴

¹Engineering, Tessonics, Canada, ¹Board, Tessonics, Canada, ¹Engineering, Obara, Republic of Korea,
¹Engineering, Obara , Republic of Korea

This paper aims to present a correlation study between the dynamic resistance curve of the Resistance Spot Welding (RSW) process versus the real-time ultrasonic measurements of the weld internal structure. The samples used are steel plates, with varying thickness, and the ultrasonic data were collected during the welding process. Dynamic resistance curves of each joint were acquired using the Obara Hawkeye adaptive welding controller mounted on a 90 KVA, medium frequency and direct current (MFDC) machine. Ultrasonic images were collected using a Tessonics' ultrasonic system with single-element 10 Mhz transducer, in pulse-echo mode, installed inside an X-type welding forceps, with cooling water as the coupling medium. A-scans were collected with an interval of 1 millisecond, in order to construct a B-scan image representing all stages of the spot weld formation. The B-scan image was synchronized with the respective dynamic resistance curve for each of the collected samples, aiming to identify the relationship between the two approaches, and correlate the characteristics of the B-scans, such as the amount of heat developed directly between the electrodes, liquid metal thickness and its penetration into the plates against the alterations and sudden changes noticed in the dynamic resistance curve as found in the experiments. The results collected and presented will be used for the development of specialized instrumentation for improvement of the existing resistance curve-based welding adaptive systems.