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Automatic Diagnostic of Resistance Spot Welds Using Adaptive Ultrasonic Phased Array Method

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This paper presents the results of a collaborative research program related to an efficient inspection procedure dedicated to characterizing and sizing resistance spot welds. This method allows to perform a real-time diagnostic of the resistance spot weld according to the following categories: good/stick/small/excessive indentation. The method is based on the combination of a highly resolved ultrasonic cross-section image thanks to real-time Adaptive phased array Total Focusing Method, with a dedicated decision making process. A specific phased array-probes with a flexible membrane with water coupling is placed over the spot weld, and the ATFM technique automatically measures the exact, uneven shape of the part and provides an accurate TFM image of the cross-section of the weld (see Figure 1). This image is automatically processed and analyzed. These algorithms have been implemented in portable phased-array ultrasonic system (Gekko, by M2M), and experimental tests over a large series of good and bad samples have been carried out (by Renault), to evaluate the performances of this method. The principle and implementation of the method, as well as examples of images and diagnostics associated to various samples will be discussed in this paper.



Figure 1. Ultrasonic probe over a resistance spot weld part (left) and display of the cross-section ATFM image (right) within a portable phased array system.