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RESISTANCE WELDING PROCESS MONITORING AND CONTROL

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Resistance spot welding (RSW) is a process for joining sheet metal components that involves clamping two or more parts together between two electrodes and passing a series of low voltage, high current pulses through the parts. The parts are squeezed together in an area between the electrodes and heated by the high current pulses. The material between the electrodes melts forming a molten area known as a nugget. RSW is a widely used method of joining sheet metals in mechanical engineering, coach and elevator production, other spheres of manufacturing and construction. Acceptance inspection methods used for defect identification in RWS welded structures can't fully satisfy requirements of modern industry, especially in the conditions of mass-production. Creation of method and apparatus for on-line weld quality monitoring and diagnosis will improve the reliability level and help reduce the cost of welded structures. The major difficulties in resistance spot welding quality evaluation are related to the complexity of the basic processes in welding and their complicated interactions. In addition, variations in materials such as composition and coating, and process conditions such as electrode wear, work-piece fit-up, water cooling rate, machine compliance, etc., also influence the RSW monitoring. The monitoring and control of a resistance welding process are very closely related to the quality definition of welds. The quality of a weld is usually expressed by its measurable features, such as the physical attributes and the various strengths indexes. The weld size, in terms of the nugget width or the weld button diameter, is the most frequently measured and most significant in determining the weld's strength.

The objectives of monitoring and control can be expressed as follows: Weld size estimation. An ideal monitoring system should provide an accurate online estimation of a button size based on the signals obtained from the process. The processed information is used for modifying welding parameters in real time to prevent splash and produce sound welds .The results of monitoring system can also be used for statistical process control of weld quality and process maintenance scheduling.