MIL-SPEC Resistance Welding
With Adaptive Controls

These are some of the provisions in the latest January 2013 publication of the AWS D17.2/D17.2M:2013 Specification for Resistance Welding for Aerospace Applications that manufacturers using adaptive controls can take advantage of to assure weld quality and reduce costs:

5.2.3 Alternate Testing Requirements. As an alternate to the testing requirements of 5.2.2(1) real time nondestructive system may be used when approved by the Engineering Authority. As a minimum the system shall address: part fitup, precleaning, electrode monitoring, and in-process monitoring of critical process parameters. This system of controls shall include but is not limited to, real time adaptive controls or in-process NDT methods. Destructive testing must still be used to establish and verify that the capability of this system will identify welds complying with strength or size requirements with 99.5% reliability.

5.1.5.2 Any control adjustment made beyond the constraints set forth in 5.1.5 taken to minimize part damage during the occurrence of a welding fault shall be excluded as a condition that would require the establishment of a new certified welding procedure.

5.1.5.1 Control adjustments shall apply from start to finish of the weld nugget formation.

5.1.4.2 Use of in-process weld control monitoring capable of detecting when a micro-ohms shift outside of the specification range occurs may be substituted for the surface resistance checks as deemed appropriate by the Engineering Authority.

4.3.4 Maintenance of Equipment. For machine characteristics wherein the behavior of the machine can be monitored, and criteria exists for those monitored parameters that would trigger maintenance when required, such monitoring techniques may be employed in place of periodical machine inspection.

4.3.3 Jigs and Fixtures. Where shunting cannot be avoided due to part design, the effects of shunting shall be factored into the production weld schedule and necessary adjustments made to ensure acceptable welds are produced.

4.2.2.1 Preconditioning steps to compensate for fitup variations that involve the controlled application of heat and/or force may be employed.

Listed below are some of the ways that manufacturers deploying WeldComputer® Inverter Wave Synthesis Adaptive Controls into their operations achieve exceptionally fast payback.

Reduce annual costs by eliminating destructive testing. Destructive testing has high material and labor costs and provided no information about any specific weld that is not destroyed. Therefore, monitoring every weld is the only way to prevent random problem welds from passing through production undetected. Pursuant to Paragraph 5.2.3, allows the adaptive control to monitor every weld produced and instantly alert the operator when a problem weld is detected.

Reduce annual operating costs by reducing the number of machine PM's that are performed. Pursuant to Paragraph 4.3.4, instead of scheduling periodical machine PM's, allow the adaptive control to alert the operation when a PM should be performed. While at the same time reducing PM requirements, the adaptive control achieves superior weld consistency by preventing current variations from occurring as the machine secondary circuit resistance degrades between machine PM cycles.

Pursuant to section 5.1.5, allow the adaptive control to minimize part damage and electrode degradation when expulsion occurs by instantly cutting off the weld heat within one millisecond of the detection of the event, and then immediately and automatically performing a repair weld operation to mediate the condition.

Reduce the manufacturer's reliance on manual surface resistance checks which can be unreliable and reduce productivity. Pursuant to Paragraph 5.1.4.2, allow the adaptive control to automatically monitor the resistance of each weld as it is produced, and instantly alert the operator about a problem with the resistance of the parts being welded.

Pursuant to Paragraph 4.3.3, allow the adaptive control to improve weld consistency by adjusting the current to compensate for shunting conditions.

Pursuant to Paragraph 4.2.2.1, allow the adaptive control to automatically correct a fitup problem as the weld is taking place.

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