Advanced Data Analysis for Resistance Weld Monitoring

Weld monitoring instrument supports process development, production monitoring, and data requirements for medical device development.

Miyachi Unitek, Monrovia, CA

Medical device manufacturers are experiencing an ever-increasing emphasis on process accountability. ADAM (Advanced Data Analysis Monitor) is a technology developed for resistance welding that gives manufacturers the information they need to support process development and production monitoring. It also supplies the data necessary to document quality requirements contained in ISO (International Organization for Standardization), good manufacturing practice (GMP), and total quality management (TQM) programs. The instrument monitors not only what happens after the trigger point of a typical weld monitor, but also before the trigger point, giving a 360-degree view of the process.

For process development, the tool can be used for welding evaluation and research, process optimization, and process validation. For production monitoring, with real time limits and machine Input/Output, the instrument monitors user-set process limits, data logging, process trend analysis, triggering messages for activities such as electrode changes or equipment maintenance, process troubleshooting, set-up verification, remote welder performance interrogation, and statistical process control. Weld quality analysis includes traceability, process certification and analysis, calibration confirmation, and statistical process control.

The development of the instrument began with consultations and product demonstrations with medical device industry experts to define and refine its requirements, functions, capabilities, and performance. As a result, the instrument has a variety of features that make it particularly suited for medical device applications.

It can monitor a manufacturing process to determine part pass/fail or to identify process drift before defect limits are reached. It may also be used to determine such process parameters as weld force, pulse profile, and energy level during the initial setup. The monitor’s data reporting features can be used to meet industry traceability standards. Finally, the independent process monitor operates completely separate of the weld power supply, providing an accurate, independent measurement of the process.

Sophisticated statistical process control capabilities, such as the integrated database and Minitab® statistical software, enable users to collect and analyze data. Other key features include current, voltage, power, resistance, displacement, force and cover gas flow monitoring; high resolution inputs; pre- and post-trigger viewing; envelope limits; and Ethernet communications capability.

The instrument integrates open architecture technology including Microsoft SQL. Server with proprietary electronics and software to provide a comprehensive weld monitoring instrument that is easy to use, informative, and configurable to each process application. The open architecture ODBC database can be accessed via Ethernet connection.

The ADAM continually polls its instrument inputs, so it can actually capture information before the weld trigger point. This information can then be used by process engineers to identify issues associated with the stabilization of force before the weld.
pulse is fired, as well as contact resistance problems highlighted by voltage and current at the very beginning of the pulse.

In addition, the instrument features large screens tailored to production monitoring, process development, and retrieval of historical process information. Very flexible formatting capabilities allow users to customize the particular weld data displayed for quick viewing and emphasis of key parameters. Screens contain extensive information in easy-to-read alphanumeric and graphical formats.

The monitor screen provides graphical viewing of seven key resistance welding variables: current, voltage, power, resistance, displacement, force, and cover gas flow. Weld time measurement windows show graphical and numerical results with upper and lower reject limits. A programmable weld counter shows the ratio of in/out of limits welds.

An expandable graphic data window allows the user to overlap multiple waveforms from one weld to analyze the dynamic relationships between the variables. Waveform cursors with advanced measurement tools enable precise interrogation of the welding sequence. Overlays display weld waveforms from multiple welds on one screen to identify process variations.

The programmable limits screen can be used for setting upper and lower numeric limits on peak and RMS data. Envelopes can be placed around waveforms to establish upper and lower bounds on a waveform. Initial part thickness, final part thickness, and thickness change can also be monitored to measure the mechanical aspects of the welding process.

Other screens include a logger screen, with time and date stamps of monitored results updated in real time. Data, stored on a large internal hard disk, is integrated to a Minitab Statistical software package for process analysis and quality improvement. Events and errors are captured with time and date stamps for record keeping and process analysis. Users can also log events such as a change of electrodes, so these actions are readily available when analyzing data. Multiple levels of security protect against unauthorized program changes.

The instrument is extremely configurable so the user can tailor product performance to specific process needs. It can be used as a comprehensive product monitor in a manufacturing environment and can also be used as an informative process development tool. Both the weld data and part monitoring setup schedules are traceable.

This technology was done by Miyachi Unitek, Monrovia, CA. For more information, visit http://info.hotims.com/34450-141.