AMADA

NUGGETS™

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TECHNICAL APPLICATION BRIEF

The Importance of Voltage Monitoring and Checking

Count Alessandro Volta (1754-1827), of Como Italy, published a paper in 1800 describing the first battery, which he called a "voltaic pile". The concept of voltage and voltage measurement has been improved on ever since and now, in the next millennium, this Nugget will focus on voltage as it is used in the resistance welding industry today.

NUGGETS

Nuggets is a periodic newsletter published by Amada Miyachi America, which defines and explains important technical topics and issues that relate to the resistance welding industry. We believe that through communication and education with Amada Miyachi America's customers and prospects we can provide an understanding of how, when and why these products are used.

This issue of Nuggets looks at the fundamental importance of Weld Checking, which includes both voltage monitoring and checking mechanisms to assist in maintaining consistency in the resistance welding process.

VOLTAGE IS A PRIMARY PROCESS CONTROL FACTOR IN RESISTANCE WELDING

Most users of resistance welding equipment are very familiar with the vital importance of controlling three key parameters:

· Current (energy)
· Force
· Time

Sophisticated control, monitoring and feedback are often used to ensure precision management of these parameters. However, not enough attention is given to the importance of monitoring and controlling voltage levels.

VOLTAGE MEASUREMENTS REVEAL ACTUAL CONDITIONS WITHIN THE WELD CIRCUIT

Although today's welding power supplies usually provide repeatable output, actual weld results may vary depending on other factors that significantly impact the weld circuit's resistance profile. Adding voltage checking to the process control system can provide a valuable real-time indicator of whether the process is being maintained within required parameters. Some of the key factors that voltage checking can help control are:

Checking for the presence or absence of the work pieces between the electrodes

When resistance welding, either manually or in an automatic machine, the parts to be welded may be absent, yet the electrodes can be closed and current passed through them without triggering a fault, resulting in poor quality or non-welds. Voltage measuring will eliminate this problem.

Improper part positioning

Current measurement alone cannot detect when the edges of two parts are misaligned and will allow the set amount of current to pass through the electrodes, resulting in arcing and spitting of metal. Result: poor quality weld. Voltage monitoring can detect part misalignment and sound an alarm alerting the operator to stop and reposition the parts before continuing. Voltage checking during production will improve process control and reduce scrap.

Identifying electrode wear

Voltage checking can identify improper electrode wear and alert the user with an output signal. This signal provides information that enables proactive electrode maintenance, reducing the likelihood of failure or poor quality should electrodes become either mushroomed or coated with material.

BASIC SETUP

In AC or DC circuits the welding voltage is typically isolated from the primary power supply by a dual-winding welding transformer. The primary voltage, either 220 VAC or 480 VAC, is stepped down through this welding transformer to approximately 2 - 30 volts. The welding voltage is measured on the secondary of the welding transformer as close to the electrodes as possible (figure 1). By measuring the voltage drop across the electrodes, the system is able to provide a snapshot of every weld that shows whether or not the welding circuit is maintaining consistent characteristics.

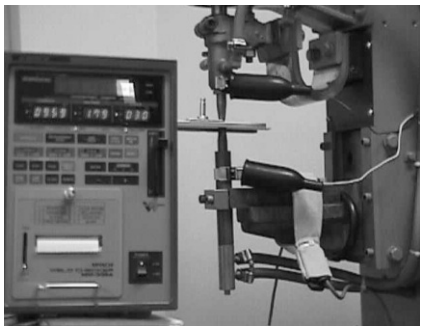

Figure 1- Typical voltage checking set up.

Notice the additional clearance for the wires near the upper and lower platens,

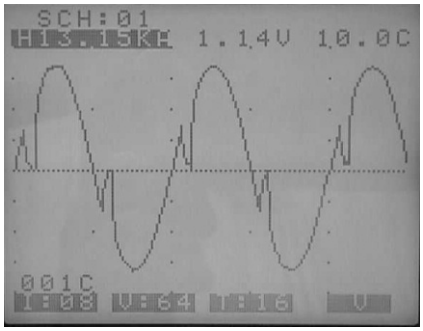

Figure 2 - Typical voltage monitoring data

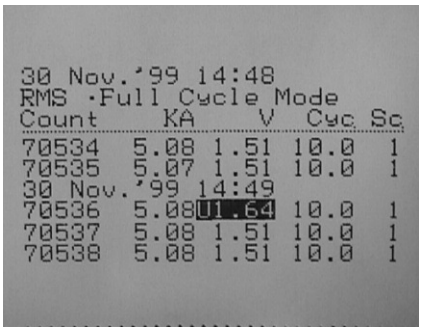

Figure 3 - Process related voltage checking data

allowing the operator to insert tooling or parts into the throat of the welder without interference with the voltage leads.

KEY DIFFERENCES BETWEEN VOLTAGE "CHECKING" AND VOLTAGE "MONITORING"

The terms "Voltage Monitor" and "Voltage Checker" are often used interchangeably, however, these two terms actually identify important distinctions between instrumentation capability and usage. Voltage Monitor refers to the viewing or collection of voltage data (figure 2). A Voltage Checker is much like a Voltage Monitor, however, it also has the added capability to send an output as a direct result of the data collected, based on preset limits (figure 3).

This feedback can be used to set up critical process control mechanisms to automatically alert the operator when key process parameters change. In addition, voltage checking may provide valuable information regarding the condition of the welding system itself, such as frayed wiring or loose connections between the power supply and the weld head.

DEPLOYING VOLTAGE CHECKING CAPABILITIES

Amada Miyachi America offers a complete line of Voltage Monitoring and Voltage Checking instruments, capable of analyzing AC, DC, Seam, 3-phase, Capacitive Discharge and DC Inverters. All of these table top and handheld Weld Checkers® are designed for quick and easy installation by attaching directly to the electrodes, making it possible to immediately begin using the voltage data to improve the welding process.

Depending on the requirements of the specific application, the voltage checking system could provide either a simple alert to the operator or an automatic shut down of the process. On-going data from the voltage checking system can also be automatically incorporated into overall SPC quality assurance systems and/or printed out at the workstation as a paper traveler with each production lot.

SUMMARY

Although voltage is an established basic concept of electrical circuits, the role of voltage checking is becoming better understood in controlling the resistance welding process. Detecting the presence or absence of the work piece, determining electrode wear and edge detection are all capabilities within the resistance welding voltage checking process. Furthermore, it is important to understand the differences between monitors and checkers. Monitors only provide information while checkers provide both the information and the means to send an output.

In the next quarterly publication of Nuggets we will take a more in-depth look at the various ways that voltage checking information can be put to use to identify and solve specific process challenges in resistance welding.

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