Computer Control Raises Welding from Art to Science

Benefits

- Reduces energy use for resistance welding by precise control of electric current
- Reduces the number of rejected welds and eliminates the need for destructive weld testing, saving money, materials, and energy
- Allows more effective use of resistance welding, which is less expensive, faster, more reliable, and less energy intensive than other joining methods
- Measures both frequency and voltage of available electrical current, then precisely regulates voltage to make resistance welding an exact, high-quality process
- Performs real-time diagnostics during each weld, takes corrective action, and documents weld integrity

"Our WeldComputer™ systems were sold primarily to the aerospace and defense industries. Now, with help from the I&I program, we have expanded our product line so that half of our sales are to general commercial industries."

—- *Dennis Hull, Chief Operating Officer of WeldComputer Corporation*

Sophisticated welding control system that saves energy and improves quality is now affordable for general industrial use

Welding is one of the most common manufacturing operations, and resistance welding is one of the oldest and most common ways of welding. Until recently, however, resistance welding—a function of physical electrode force, material thickness and resistance, and time, frequency, and voltage of the electric current—was more of an art than a science. Because the standard way to test a weld is to stress it until it breaks, manufacturers, such as automakers, often overwelded to avoid testing the weld. And, with the thinner steels now used for cars and other products, spot welding was becoming more difficult.

The WeldComputer™ Resistance Welder Adaptive Control offers a way to meet these challenges by providing precise, effective welds, and documenting weld integrity. This control system had previously proven effective for quality improvement and energy savings in the aerospace and defense contract industries, but was considered too expensive for more general commercial operations. There is tremendous potential, however, for its use in the automotive, appliance, and other industries.

Computer-Controlled Resistance Welding

With reduced effective cost, the WeldComputer™ Resistance Welder Adaptive Control can now save energy and avoid rejects for welding operations for general commercial products such as automobiles and appliances, as well as meet the precise welding standards of the aerospace industry.

Solution

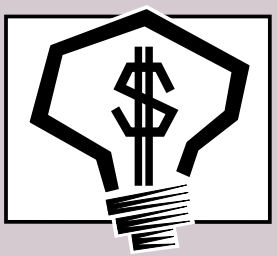
With assistance from a grant funded by the Inventions and Innovation Program, WeldComputer's system designers have produced a more affordable Resistance Welder Adaptive Control. They succeeded in making significant gains toward all of the following specific project goals:

- Modest cost reductions were achieved by reducing component costs.
- Multi-channel versions of the Adaptive Control were developed. Total cost increased only slightly, so effective cost per weld was greatly decreased.
- As an outgrowth of efforts concentrating on critical functions, WeldComputer Corporation developed a new product line of L-Series Controls that sell for less than one-fifth the cost of the original Adaptive Control. Although the L-Series Controls do not have the Adaptive Control capabilities for identifying and taking corrective action for variations such as force, thickness, and thermal nugget displacement, they are still able to compensate for plant voltage variation. They can, therefore, still provide high-quality, energy-efficient welds by precision heat control and line compensation. The L-Series Controls are selling well to all market segments.
- An unanticipated benefit of the project was improving the ability of WeldComputer to service industries with significant power line frequency variation—a situation common in many developing and some developed countries.

Results

Resistance welding can be used wherever relatively thin metal sheets need to be joined. The sophisticated adaptive controls the WeldComputer were already ideal for stringent quality control situations, like those found in the aerospace and defense contract industries. Capital investment cost was the primary deterrent to general commercial use of the adaptive control for products such as automobiles (5,000 to 10,000 spot welds per car) and appliances. With the reductions in the effective cost of the system achieved with this project, WeldComputer Corporation now sells approximately half of its adaptive control systems to general commercial industries. The L-Series Controls are quite cost competitive, and the cost of the Adaptive Control has been so reduced, it is attractive for automotive manufacturing and other general commercial use.

WeldComputer Corporation manufactures a wide range of controls and monitors for the resistance welding industry. Using proven technology developed over the past two decades, the company's products afford welders the opportunity to monitor welding processes, take corrective action to reduce the effects of process variations as the welds are being made, and archive the results. The WeldComputer™ Resistance Welder Adaptive Control is now saving energy and reducing losses due to substandard welds for automotive, appliance, and other manufacturers, as well as in the aerospace industry.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

FOR ADDITIONAL INFORMATION, CONTACT:

Dennis Hull
WeldComputer Corporation
105 Jordan Road
Troy, NY 12180
Phone: (800) 553-9353
Fax: (518) 283-2907
info@weldcomputer.com
www.weldcomputer.com

FOR PROGRAM INFORMATION, CONTACT:

Sandy Glatt
Program Manager
Inventions & Innovation Program
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
Phone: (202) 586-2079
Fax: (202) 586-7114
sandy.glatt@ee.doe.gov

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www.oit.doe.gov

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, DC 20585

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