

Q: What's the current status of electric servo-actuated resistance welding machines?

Forging force, commonly called "weld pressure," is one of the three main variables in the resistance welding process. This variable controls the electrical resistance between the parts being welded. The other two are weld current (amperage) and weld time (the duration of current flow).

A training video available through the Resistance Welding Manufacturing Alliance (RWMA) refers to these three variables as PCT, which stands for pressure, current, and time. To ensure consistently good welds, all these variables must be properly applied and controlled throughout the process.

Since modern digital controls offer absolute accuracy in welding current control and weld duration timing, concern about those two variables has largely been eliminated. In addition, many of the newer welding machine controls have a feature called constant current, which can automatically compensate for changing conditions in the process.

Until recently, however, proper application and control of weld pressure was harder to achieve.

Pneumatic air cylinders, the most common way of applying weld force for the past 50-60 years, were a big improvement over the early days of resistance welding, when force was often applied with a foot- or hand-operated mechanical lever or a motorized cam.

Air cylinders, however, are prone to problems of their own. Moist, dirty plant air supplies often lead to varnishing and corrosion of internal cylinder walls, resulting in weld force being applied inconsistently and welds that are not always properly forged.

Other potential problems with air-operated resistance welding machines include sticky solenoid-operated air valves and worn out cylinder walls and packings, plus plant air supplies that are prone to variations and even starvation when other air-operated machines come on line.

Enter the modern electrically operated servo-actuated force delivery systems that are just now starting to become more common in the world of resistance welding.

Auto manufacturers have used servo-actuated spot welding guns manipulated by robots for several years. However, until recently, most of the standard press-type pedestal welding machines commonly used for resistance spot and projection welding have remained air operated.

Since servos prices have dropped, they are now more affordable for many resistance welding applications, especially those requiring the highest level of quality.

Another key development is that software and touch-screen human-machine interface panels available for use with servos have improved to the point that almost anyone can learn to program and set-up a servo-actuated welding machine in a matter of minutes.

Advantages of servo-actuated resistance welding machines include the following:

- High-thrust-force (up to 5000 lb) servo-controlled actuator with quick travel and slow approach
- Slow approach feature improves weld appearance and minimizes electrode wear
- Faster operation than air-operated resistance welding machines
- Weld force is generated instantly (no need to wait while air pressure builds during squeeze time)
- Lower operating cost (expensive compressed air is not needed)
- Weld force repeatability is improved, which produces more consistent welds
- Monitors can be built into the servo control system to verify part stack-up and to monitor electrode wear
- A set-down monitor with programmable limits is ideal for projection welding, especially nuts and studs
- Part stack-up monitor can detect missing or upside down weld nuts
- Retractable stroke, if needed, is available without additional hardware
- Built-in data logging. Welding force and other variables can be viewed and graphed on a color touch screen and transmitted over a plant's network and exported to Microsoft® Office Excel.
- Easy part changeover process.

Since resistance welding is still the strongest and least expensive way to join sheet metal and attach nuts and studs, the value of improvements to the process now being offered by servo-actuated force delivery systems is rapidly being recognized.

Although more expensive than pneu-



Servo-actuated weld force delivery systems are now being adapted to conventional resistance welding machines, including the press-type projection welding machine on the left and the pedestal-type spot welding machine on the right. Advantages include increased welding speeds and improved process quality monitoring.



The addition of a touch screen makes a servo-actuated resistance welding machine much more user-friendly.

matically operated resistance welding machines, servo-actuated machines are being well received by users focused on improving quality and increasing operating speed. ♦

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