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Use the **FORCE**

Cost-efficient projection welding gives fabricators repeatability, consistency, speed and quality for products that use welded-on fasteners

Employment in the U.S. clean energy industry leaped to nearly 3.3 million people—outstripping fossil fuel jobs by three to one—according to a March report issued by the national nonpartisan business group E2 (Environmental Entrepreneurs). The organization anticipates a 6 percent growth rate for clean energy jobs in 2019.

Skilled welders will be instrumental in the creation of green infrastructure along with environmentally friendly technology like projection welding.

“One of the trends we’re seeing is a migration from laser and fusion processes to projection welding,” says T. J. Snow Co. Inc. Senior Applications Engineer Jeff Morgan. “Laser welding equipment is expensive to maintain, requires a skilled operator and you need a special license to operate the machine. Fit-up and part location have to be perfect to produce a good joint. Projection welding is the fastest, most economical method and the



easiest with which to control quality. It fulfills the three criteria people look for: fast, cheap and strong.”

Fast, cheap and strong

When compared to spot welding, the projection process offers greater repeatability

Projection welds performed simultaneously with the capacitor discharge welding process joined two components to make this strut mount.



Far left: The use of multiple projections on this curved part allowed the welds to be performed simultaneously. **Left:** T. J. Snow Welding Engineer Jeff Morgan shows an example of ring projection performed on a part processed on a 20 kJ capacitor discharge welding machine.

“ Projection welding is a science that is controllable, consistent and predictable if done properly. ”

Tom Snow,
T. J. Snow Co. Inc.

with lower consumable costs. “The twenty-thousandth projection weld will be identical to the first whereas, in spot welding, the tips would have required many dressings to produce 20,000 spot welds,” says Morgan.

“If you aren’t using projection welding now, it is something that merits investigation,” he adds. “I recommend it for fabricators making products that require any type of welded-on fasteners, such as a nut to attach a bolted-on part.

Despite its advantages, CEO Tom Snow says there remains a lack of understanding about the process even among those who use it every day.

“Projection welding is a science that is controllable, consistent and predictable if done properly,” he says.

Snow and Morgan offer a short primer that unpacks the technology starting with its nomenclature. Resistance welding joins metal by applying force and passing current through the material to be fused. The metal’s electrical resistance produces heat.

Its primary advantage is that it doesn’t require any other materials to create a bond, which makes it very cost efficient.

There are five types of resistance welding: projection, spot, seam, flash and upset welding. The types and shapes of the weld electrodes used to apply force and conduct current constitutes the primary difference between them.

Projection welding uses a protrusion, embossment, tab or button at the weld location to direct focus and force current along a predetermined path. Large flat copper electrodes or dies are used to apply external force, rather than the tips used in spot welding.

Since copper dies require dressing and restoration less frequently than individual tips, consumable life is extended. Weld size is more consistent since the dies that perform the projections don’t change in diameter or shape. Spot welding tips wear unevenly and need to be redressed regularly.

“You can achieve enhanced weld qual-

ity and improved throughput because you can perform multiple welds in one hit,” says Morgan. “Because you get more out of each set of electrodes, you use less copper and gain greater consistency.”

Maintenance

T. J. Snow has seen an uptick in the use of ring projections. “Let’s say you have a water heater part with a threaded connector projection welded onto a heavy piece,” says Snow.

“A ring projection will completely seal the joint, making the component watertight, gas tight and airtight. Fittings on exhaust systems are another example where the projection process has replaced TIG and MIG welding.”

Stamping dies that are used to produce projections must be properly maintained, cautions Morgan. “If die wear occurs and causes projections to lose their proper shape, weld quality will be affected.”

Electrodes have a tendency to wear over time because high heat and force is being

Welding

applied between the electrodes. Variables like material and cooling water dictate the number of welds that can be performed between maintenance intervals.

The amount of water pumped through electrodes to cool them and the delivery method used can also affect weld quality and performance. Cooling water is trans-

mitted through a small tube in the electrode.

"I prefer the water to be room temperature, about 70 degrees Fahrenheit," says Snow. "Let's say the electrodes reach a temperature of 1,600 degrees. When the water hits those electrodes, it turns to steam and requires a means of escape.

"We allow for that by making a 45-degree cut on the end of the water tube. If fabricators use electrodes that don't have a cooling tube, or the tube is bent or damaged from use, these conditions can contribute to premature electrode deterioration, contributing to substandard welds," he explains.

Hardware

New developments in projection welding equipment controls have added the ability to monitor weld quality and provide feedback in real time.

"As coatings become more exotic and steel strengths increase, projection welding has become more difficult," notes Morgan. "As a result, the machine used to perform the process is extremely critical. It must have an adequate follow-up function. Heat buildup will result in the projection collapsing before fusion takes place.

"As the projection collapses, the electrode must 'follow up' to maintain force during the weld. If force is not maintained, severe expulsion [ejection] of molten metal from the weld can occur."

T. J. Snow's SlimLine Pedestal-type and Heavy Duty Resistance Welder with platens have been engineered to support projection welding applications.

As a metal joining method, the process is a practical choice. Making the transition is relatively easy, too, since hundreds of parts already have flanges available to add projections, eliminating the need to redesign them.

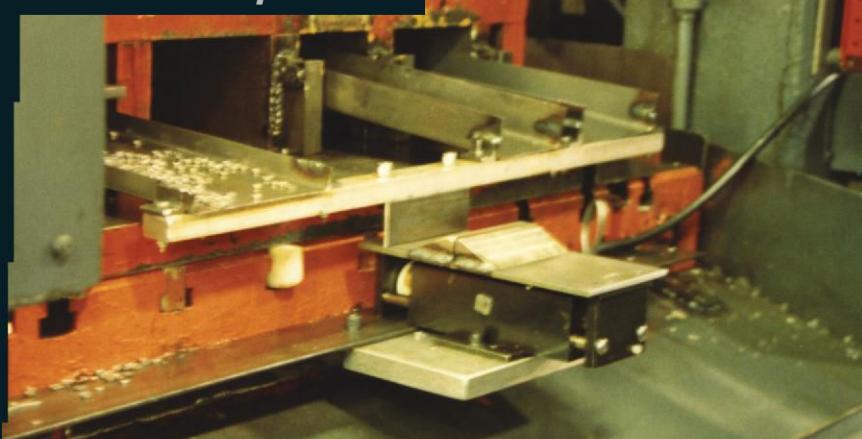
Closely spaced welds can be accommodated simultaneously, something that is impossible to do with individual spot welding tips. Dissimilar metals and thicknesses can be projection welded as well as shapes with inaccessible weld locations.

"Fabricators are looking to improve quality but they also want to boost throughput while saving time and cost," says Morgan. "Projection welding is a versatile choice, especially in an industry where tribal knowledge is being lost. We're able to close that gap with hands-on training, seminars and the right technology."

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