RWMA
RESISTANCE WELDER MANUFACTURERS' ASSOCIATION

Buying the 'Right' Spot Welding Machine

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Buying the right resistance spot welding (RSW) machine can be a confusing experience for the average metal fabricator or welding engineer because the price differences for the various machines are hard to understand and justify.

Purchasing the wrong spot welding machine can be an expensive mistake. Many recalls have been traced to improperly made spot welds, and sad to say, the RSW process sometimes got the blame. A properly made spot weld will not shear or break in the fused zone; instead, the base metal will tear around the weld. In addition to strength, spot welding offers speed and cost effectiveness that no other metal-joining method can match.

You can determine the right welding machine for your job and get the most for your money by following the recommendations prescribed by the Resistance Welder Manufacturers' Association (RWMA). First, consult the charts published by RWMA or AWS to determine the optimum welding current and electrode force for your application. Some charts have multiple sets of specifications for Classes A, B and C spot welds. It's best to use the Class A specs whenever possible. Note that these charts do not specify a "kVA" rating for welding each metal thickness, although the kVA rating is often used to compare RSW machines.

RSW machines have always been rated in kVA (a thermal rating), which can be stated in different ways depending on the percent duty cycle specified. The kVA rating of RWMA standard machines is based on a 50% duty cycle, but not all RW machine manufacturers hold to these standards. As an example, a machine rated at 100 kVA at 50% duty cycle may also be rated 141 kVA at 25% duty cycle or 224 kVA at 10% duty cycle. Thus, the kVA rating can be inflated by citing a shorter duty cycle in the fine print, or omitting the duty cycle reference completely.

Another performance measure is the available short-circuit current of the machine. RWMA standards specify the short-circuit current based on the machine size, kVA rating and throat dimensions, along with the allowable duty cycle when operated under short-circuited conditions. To comply with this standard, a RW machine must have adequate copper sections in the secondary loop, well-designed water cooling, and the kVA rating of the welding transformer based on a 50% duty cycle. Note that the short-circuit current can be inflated by listing "peak" instead of "RMS" (root-mean-square) current. It is the RMS or effective current on which weld schedules are based to produce acceptable welds.

Some lower-priced machines specify the kVA rating at a 10% duty cycle. This is adequate for job shops with low-speed, light-gauge applications, but do not expect them to perform to RWMA specifications. When replacing a RW machine, verify all specifications match the original machine's or reliable welds may not result.

Weld force is the other part of the RW equation that must be considered by the welding engineer. Basically, the spot welding machine is a sophisticated device used to heat and forge metal together. The force applied to the weld area is critical to the weld's strength. A point to consider is that all machines of equal kVA rating may not offer equal weld force.

Most modern production RW machines are operated with air cylinders of various diameters that apply the weld force either directly (vertical-action press-type machine) or through a lever mechanism (rocker arm types). The force produced by a press-type machine is easily computed from the diameter of its air cylinder and the air pressure applied. Rocker arm machines are entirely different. Extending the arm length (throat depth) of a rocker arm has a dramatic effect on the maximum welding force available since the welding force decreases in the same ratio as the throat depth increases. Therefore, a deep-throat rocker arm not specifically designed to have arms of that length can reduce the force and adversely affect weld strength. This is particularly true if part fit-up is less than ideal, and a portion of the weld force is consumed just overcoming the spring back of the metal to force the parts into intimate contact.

RWMA specifications specify the maximum force expected from each spot welding machine frame size for both rocker arm and press types. The nonconforming, light-duty models on the market cannot compete with heavier duty models. Mother Nature cannot be fooled. It still takes the proper welding force and welding current to do a specific welding job. Be aware, also, that manufacturers of lower-quality models sometimes cite Class B or Class C specifications to make their machines appear to give higher performance. Be guided by the Class A specifications.

For example, RWMA specifies for welding 18-gauge (0.048-in.) mild steel, Class A weld settings of 10,300 secondary amps, 650 lb of force, and a weld time of 12 cycles. Since one cycle equals 1/60 s, 12 cycles equals 1/5 s. This results in an attractive, low-marking spot weld with an average tensile shear strength of 1820 lb. Class C welds can be accomplished on the same metal by using only 6100 weld amps, 205 lb of force, and a whopping weld time of 42 cycles, which is almost 3/4 s. The Class C weld is much less attractive due to the increased heat-affected zone caused by the long weld time, and the average tensile shear strength drops 12% to 1600 lb.

Buying a resistance spot welding machine is the same as buying most things — you pay your money and you take your choice. But, it pays to make your choice in an informed manner.

The Resistance Welder Manufacturers' Association has been dedicated to setting and improving industry standards and to education for over 50 years. It currently represents about 40 manufacturers of resistance welding machinery, electrodes and component supplies, including transformers and controls. Membership is open to other members of the industry in addition to manufacturers. The RWMA conducts an annual welding school which is open to the public and publishes educational bulletins and the *Resistance Welding Manual*, 4th edition. For more information on the Association, contact Kristina Goldfield, executive director, 1900 Arch St., Philadelphia, PA 19103; (215) 564-3483; FAX (215) 564-2175.