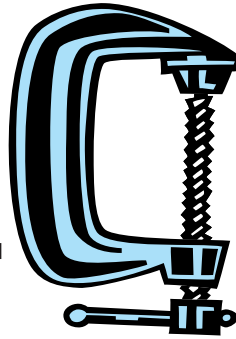


the fabricator.



Using a welding positioner-gripper in pipe fabrication



Increasing productivity through workstation technology

By John Panetti

Every time we take an aspirin, turn on a light, fill a gas tank, use a paper towel, or adjust the thermostat, we are using a product that involves,

either in production or delivery, welded process pipe and valves. Yet, for as many ways as welded products touch our lives, many fabricators, manufacturers, and contractors that weld pipe spools, valves, and the like are still struggling with productivity issues.

Rather than adding more operators—always a challenge with the chronic shortage of skilled welders—some companies have been able to increase production rates or meet tighter deadlines by equipping workstations with welding positioner-grippers.

A positioner-gripper clamps a pipe joint or valve and rotates it so that the operator is presented with a joint that can be welded continuously in the flat position (see **Figure 1**). This, depending on the application, allows an increase in typical welding



Figure 1

A positioner-gripper rotates a pipe joint or valve so it can present the joint to the operator for continuous welding in the flat position.

deposition rates and welding travel speeds, while reducing rejection rates.

Welding Flat With High Heat

Welding at the highest deposition rate possible requires welding with the highest voltage and amperage the electrode allows while

staying within customer specifications. However, achieving this demands welding in a position in which gravity assists the molten weld puddle. When welding out of position, such as vertical-up or overhead, operators must weld at lower heat levels to keep the weld puddle from sagging and rolling out of the joint.

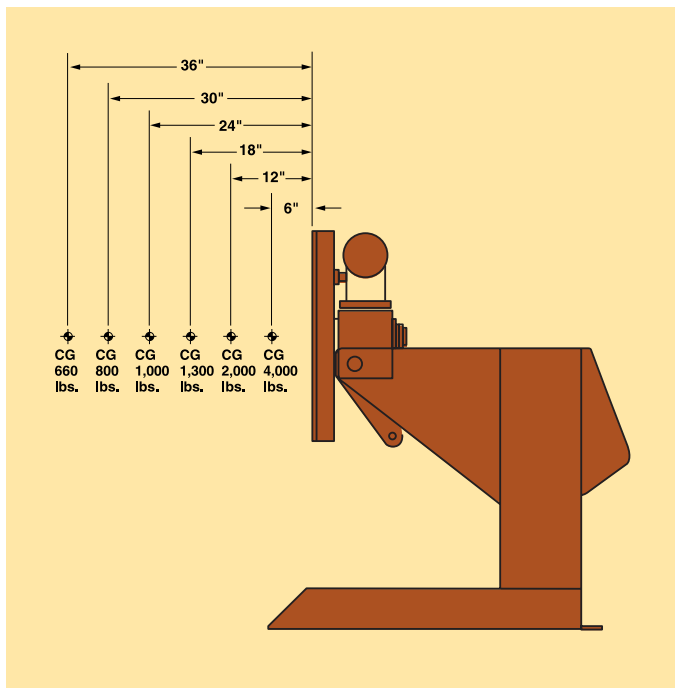


Figure 3

Load rating is measured as the weight of an overhung load at a specified distance from the face of the gripper table.

	Minimum Parameters	Maximum Parameters
Wire feed speed	175 IPM	525 IPM
Arc voltage	22-24 V	29-31 V
Current	130 amps	275 amps
Deposition rate	3.2 lbs./hr.	10.1 lbs./hr.

Figure 2

Operators can increase their deposition rates by more than 300 percent by welding at the maximum allowable heat level.

Figure 2 shows minimum and maximum parameters for a 0.045-inch-diameter E71T-1 flux-cored wire, a common electrode used for steel fabrication. The table shows operators can increase deposition rates by more than 300 percent by welding at the maximum allowable heat level.

Eliminating Manual Work

A welding positioner-gripper can help operators weld at faster travel speeds than they could in a purely manual or semiautomatic welding operation. Operators can concentrate on keeping the weld puddle in the joint rather than thinking about moving around while manipulating a torch or electrode holder.

By eliminating the manual part of welding, a positioner-gripper can help operators decrease fatigue, which can lead to fewer rejected welds and less rework.

On a similar note, companies switching from shielded metal arc welding (SMAW) to gas metal arc (GMAW) or flux cored arc welding (FCAW) can smooth the transition by adding a positioner-gripper. It gives new operators one less thing to think about, and it increases their ability to make a good weld

in the flat or downhill position.

Understanding Criteria

Fabricators contemplating their first purchase of a positioner-gripper understandably have many criteria to consider:

- Load rating.** Load rating is measured as the weight of an overhung load at a specified distance from the face of the gripper table (see **Figure 3**). For this rating, the load is unsupported (held only by the gripper jaws) and parallel to the floor. The positioner-grippers used most often for pipe fabrication have a 3,000- to 4,000-pound load rating at 6 in.

- Tilt torque.** Tilt torque relates to the fact that positioners can raise or lower the weldment, typically within a range of 110 degrees. If a load weighs 500 lbs. and extends 2 feet beyond the gripper face, the positioner must have a tilt torque rating of at least 1,000 ft.-lbs. (500 lbs. by 2 ft.) if it will be required to tilt the load.

- Eccentricity rating.** Eccentricity ratings deal with rotational torque for a load with a center of gravity that is not on the center of rotation, such as a large elbow joint (see **Figure 4**). If the 500-lb.



Figure 4

Eccentricity ratings deal with rotational torque for a load with a center of gravity that is not on the center of rotation, such as a large elbow joint.

weldment has a center of gravity that extends 1 ft. beyond the center of the rotation, that weldment requires a positioner with at least 500 ft.-lbs. of turning torque.

Meeting Various Speed Requirements

Fabricators, manufacturers, and contractors who weld strictly with one process or repeat a limited number of jobs have a relatively easy time selecting a positioner-gripper with the

right speed. Conversely, pipe welding requires more speed flexibility than any other operation. For example, in the power piping industry, a gas tungsten arc welding (GTAW) root, FCAW hot pass, and submerged arc welding (SAW) fill and cap is a relatively common combination.

The fabricator's dilemma comes because some weldments require low revolutions per minute (RPM) speed (GTAW and SAW),

others require extremely low RPM and high torque (SAW on heavy-wall pipe), while others demand very high RPM (GMAW or FCAW on small-diameter pipe).

Except for automated SAW, the actual RPMs required by a manual (SMAW, GTAW) or semiautomatic (GMAW, FCAW) process depends mostly on operator skill. Using the same equipment, a skilled operator can weld at speeds two or three times faster than a novice.

To handle this variety of speeds and torques, some positioners offer speeds from about 0.4 to 3.5 RPM. For especially slow speeds, from 0.070 to 0.4 RPM, some positioners also offer optional gear multipliers that lower the speed of standard products.

Some positioners also offer infinitely adjustable RPMs. Typically, this is provided by an AC motor and an AC variable-speed drive. A simple potentiometer for speed adjustment and a digital speed readout with a 1-to-10 speed scale make selecting speeds easy.

Today's AC drives can be factory-programmed to meet end-user requirements. The most common speed-adjustment request relates to the time the positioner takes to ramp from zero to set speed. A typical ramp time of three or four seconds gives the welding operator time to establish the weld puddle at the start of the weld and crater out at the end to prevent crater cracking.

Complete Workstation Concept

Today positioners are available for performing the basic positioning function, or more advanced positioners can be used as a platform from which to create an entire welding workstation that reduces clutter and improves productivity.

Some positioners feature 115-V power to drive the positioner and also offer several outlets for tools. Pneumatic-hydraulic positioners may extend the air used for the cylinder to provide several headers for air tools and air carbon arc goug-



Figure 5

Pneumatic-hydraulic positioners may extend the air used for the cylinder to provide several headers for air tools and air carbon arc gouging.



Figure 6

Most grippers used for pipe fabrication feature three-jaw mechanical chucks that operate like those on a lathe.



Figure 7

An elbow box is an optional accessory for holding elbow fittings.

ing (see **Figure 5**). Some also offer a tool rack and a built-in industrial fan that mounts out of harm's way.

Tilt Power

Tilting the weldment to maintain a welding position or for operator comfort requires either a pneumatic-hydraulic cylinder or mechanical power through a motor and gear. While many positioners use gears, such units require guarding as an added safety precaution because the gear presents a pinch point. Pneumatic-hydraulic tilt methods do not have a pinch point, require no special guards, and do not require much space.

Gripper Options

Most grippers used for pipe fabrication feature three-jaw mechanical chucks that operate like those on a lathe (see **Figure 6**). A mechanical toggle closes all jaws simultaneously for self-centering performance, and various-size gripper faces are available to accommodate a variety of weldment diameters.

Several options are available for gripping the pipe. They include:

- Elbow boxes to hold elbow fittings (see **Figure 7**).

- Hardened jaws for increased wear resistance in high-volume applications.

- Carbide inserts, which screw into the base of the jaw (sometimes called a dog). Knurled embossments on their faces increase gripping power. Smooth-faced dogs grip only as much as friction allows before the weldment will slip. Carbide inserts bite into the weldment for a mechanical lock.

- Cladded jaws for gripping stainless steel or aluminum pipe without contamination. The dog surfaces can be clad in a variety of nonferrous metals.

- Small-bore jigs to improve gripping of small-diameter pipe (2 in. or less) when making socket and butt weld fittings.

- Rotary grounds to prevent electrical current from passing through the bearing, thereby eliminating the possibility of bearing damage.

Safe Operation

Any load off the ground demands respect, awareness, and precaution.

First, a positioner must be bolted to the floor to prevent tipping. Second, overhung loads need support from pipe stands, a crane, or other means. Third, only loads within the positioner-gripper's

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capacity should be lifted.

The main thing to remember, though, is to use common sense. One operator attempted to hold an excessive load in place by tack welding the workpiece to the gripper jaws. When he unhooked the load from the crane, the load snapped the gearbox shaft. Thankfully, no one was hurt.

When combined with a little caution, a positioner-

gripper selection that matches the welding operation can go a long way toward increasing productivity, with a 25 percent increase being typical. ■

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