Overcoming Barriers that Prevent Using Wire for Field Welding

When choosing the appropriate welding process for your jobsite, there's a lot to consider. Application, weld position, material, procedures and contract requirements are all factors that affect your decision. Wire welding processes are common in the shop, but did you know they offer significant benefits for field welding as well?

Common benefits of wire processes include high weld quality and increased productivity thanks to travel speeds up to four times those of TIG or stick. And because most of the costs associated with welding in the field are related to labor—approximately 80 percent—productivity gains mean a higher return on investment.

Traditionally, many companies have used TIG and stick welding in the field, often due to familiarity. Others, however, choose these processes due to past challenges they've encountered using MIG or flux-cored welding in the field. These challenges include:

  - Burnback
  - Birdnesting (a tangle of wire in the drive rolls)
- Premature consumable failure

But the good news is that these issues can be easily remedied with a little equipment and technique know-how. Are you ready to use wire processes in the field? With the right information, you can reap the productivity, efficiency and quality benefits the processes offer. Follow the guidelines for appropriate usage and implement the solutions discussed in this article to ensure success.

Selecting the right consumables and equipment

The formula for success when using wire processes in the field starts with choosing the right equipment and consumables. These include the appropriate style and size of wire, drive roll, gun and cable liner.

Drive rolls:

Knowing what kind of drive roll to select and how to set proper tension can help prevent many problems associated with wire feeding. Design enhancements from some manufacturers, such as improved drive roll systems, are also helping address common drive roll issues.

When you're selecting the size and type of drive roll, consider the size and type of wire you plan to use. Since flux-cored wire is softer (due to the flux inside and the tubular design), it requires a knurled drive roll, which has teeth to grab the wire and help push it through. However, don't use a knurled drive roll with solid wire. The teeth will cause shavings to break off the wire. Those shavings can clog the liner and wear out the front-end consumables faster. Use a smooth, V-

groove drive roll with solid wire to avoid this problem.

Setting proper drive roll tension is essential. Drive rolls are designed to feed the wire smoothly from the wire spool into the gun cable. Setting the drive roll tension too tight can deform the wire, which can result in arc instability or burnback. Too little tension also can be problematic and cause wire slippage. To set the proper tension, begin by releasing the tension on the drive rolls. The welder can increase the tension while feeding the wire into a block of wood, continuing to increase the tension one half-turn past wire slippage.

Most feeders now come installed with an inlet guide, which helps guide the wire into the drive roll properly. Inlet guides are designed to work with a range of wire sizes, so make sure your inlet guide is the right size for the wire, as well.

Gun liners:

To prevent arc and wire feeding problems, make sure you have the proper gun liner, and keep it well maintained. Arc instability and burnback can result from liners that are kinked, worn, the wrong size or partially plugged. Welders can blow compressed air through the liners to remove dirt and debris and improve feeding performance. Keeping the welding wire clean and changing out the liners as necessary is also important to avoiding clogs.

Common causes of birdnesting include blockages of the liner, improperly trimmed liners and using the wrong liner. Promptly replace the liner if you find a blockage during routine inspection of the welding gun and cables, and always trim the liner according to the manufacturer's recommendation. Keep the liner free of burrs or sharp edges, and always use the correct size to match the wire diameter.

Wire selection:

Since good welds require a constant wire feed supply, wire feeding issues also can affect performance. Be sure to select the correct wire type for the welding procedure and that the wire is feeding properly. One way to test wire feeding is to feed the wire against a block of wood and watch for the wire to continuously coil up smoothly. This implies there is no obstruction to the wire feed. If the wire doesn't coil smoothly, there is a problem somewhere in the wire feed process that needs to be addressed.

Gun selection:

Choose your welding gun based on the amperage needed for the job. Welders perform many of the welds in field applications out of position, such as vertical or overhead. To prevent the weld pool from becoming too large and too fluid to control, use lower amperages and wire feed speeds. Typically, a 300-amp gun will be enough to handle many jobs using MIG and gas-shielded flux-cored welding in the field.

It's important, however, to select a gun with enough amperage for the job. Running a gun beyond its amperage range will quickly damage it from overheating. Conversely, lack of fusion, cold lap or defective welds can be problems when welding with too little heat (such as when using a gun with too-low amperage).

Contact tip selection:

Contact tip issues can cause arc instability, wire stubbing and burnback. To help avoid these problems, match the contact tip size with your wire size, and replace the contact tip when the exit hole becomes worn or oblong with use. Worn contact tips result in irregular feeding and difficulty keeping the wire positioned in the weld pool.

Shielding gas and nozzle selection:

The shielding gas protects the molten weld pool from contamination by the surrounding atmosphere. Using the wrong type of shielding gas for the application can cause problems. The proper gas for the job is based on the filler metal being used, the material being welded and sometimes the welding process. When welding steel, a 75 percent argon/25 percent carbon dioxide mixture is typically recommended to minimize spatter and provide good penetration. Reference the weld procedure materials for guidelines on choosing the proper gas.

Nozzle design and cleanliness are very important. Using a quality gas diffuser and a larger diameter nozzle helps ensure adequate shielding gas coverage of the weld. Choosing a smaller-diameter gas nozzle will help you maintain proper wire stickout when reaching into deep groove welds. Also, make sure to keep nozzles clean. If they become filled with spatter, it can lead to lack of shielding gas coverage.

Feeder options

Welders may question whether the equipment needed for wire processes is durable enough for the field environment. In fact, manufacturers offer suitcase feeders constructed from impact-resistant and flame-resistant plastics, designed to withstand the abuse typically encountered in field applications.

Two types of feeders are available, depending on the diameter of the wire spool you're using. Highly portable suitcase feeders designed for 8-inch wire spools are lighter and can be a good fit when space or access are limited. A larger version of the suitcase feeder holds 12-inch spools, which is beneficial when arc-on time is high because the welder won't have to change the spool as often. Typical suitcase feeders weigh about 25 pounds, with the total weight dependent on the filler metal and wire spool packaging.

The next decision about wire feeders is to choose between a voltage sensing model and a feeder with remote voltage control. Voltage sensing feeders often are used for field construction because they require only a weld cable, minimizing the need to transport additional cables to the jobsite, while also reducing clutter and maintenance.

However, this type of feeder necessitates going to the power source each time you want to adjust the voltage. Conversely, wire feeders equipped with remote voltage control traditionally required a control cable from the feeder to the power source. This adds to the task of cable stringing and cost and maintenance of the cable but reduces trips to the power source. ArcReach® technology from Miller makes it possible to have the benefits of both types of feeders, since it communicates over the weld cable and gives welders complete remote control of weld parameters at the wire feeder.

As technology migrates from the traditional bench-style feeders used in fabrication shops to the portable suitcase feeders used in the field, feeder quality improves in field applications.

Solving the problem of porosity

Weld porosity is a common concern when using wire processes in the field—and gas/wire combination or gas delivery issues are the most common causes. Porosity can result from using the wrong gas, having too much or too little gas flow, or the presence of dirt or rust on the base material.

If you experience porosity in the weld bead, check for gas flow problems in the MIG gun, such as a tear or hole in the gas hose, and that the gun's O-rings are in good condition.

Also, be sure you've turned on the gas valve, that the cylinder has gas and that the you've set the appropriate flow rate. It's important to have a consistent flow rate of about 30 to 35 cubic feet per minute. If the gas flow is too high it can create turbulence in the weld pool. Use a flow gauge to easily monitor the gas flow rate.

Dealing with wind

Wind is an issue that can come into play when using gas-shielded wire processes outdoors. Similar to TIG welding (which is commonly used for root pass welds in the field), all wire processes except for self-shielded flux-cored welding require shelter to protect the shielding gas from being disrupted or blown away.

Many welders construct huts to block the wind and protect the weld. Portable fabrication facilities are built on some jobsites to provide a controlled environment for welding, which helps improve quality and productivity.

Other troubleshooting tips to remember

Proper filler metal storage and careful MIG gun usage are also essential to gain good welding performance. For the best results, store filler metals in a clean, dry area to prevent exposure to moisture in the air or environment, which can lead to hydrogen pickup in the filler metal and cause weld cracking. Follow the manufacturer's storage recommendations for the wire classification.

Also, avoid coiling the gun while welding, which can cause wire-feeding restrictions. Lay the cables flat on the ground whenever possible.

Lastly, if the application dictates the use of anti-spatter, use it sparingly. Overuse of these substances can lead to weld quality issues.

Take proactive measures to ensure success with wire

Just as the proper equipment and consumables are key to successfully using wire processes in the field, providing training and resources for welders is another important step.

For welders trained only on stick and TIG, some training is necessary with MIG and flux-cored processes, as well as on identifying and fixing potential problems with wire welding. It's also important to have a wire welding expert on the jobsite who can troubleshoot problems and answer questions. Once they're trained in wire processes, welders often produce welds that are easier to complete than those made through other processes. Using advanced wire processes such as

pulsed MIG and modified short circuit transfer can further shorten training time due to ease of use.

Using wire processes in the field can result in greater output in the long run and following best practices can help companies get there sooner. Not every welding application on a jobsite can be transitioned to wire, but noticeable productivity and quality gains can result by making the switch in many cases. It's an additional tool that can improve quality, efficiency and output.

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