

Successful GMA welds rely on a combination of good technique, properly functioning equipment, and the correct electrical parameters.

# Making Better Gas Metal Arc Welds

**W**hile it might at times seem like alchemy, in fact there is nothing mysterious or magical about making a good gas metal arc weld. A good weld is the result of properly functioning equipment, good technique, and the correct equipment settings for the application at hand. If any of these three elements is not in place, the result will almost certainly be a poor weld.

On the equipment side, the gas metal arc welding (GMAW) gun and consumables are often overlooked as critical elements in the process of producing high-quality welds. However, being the most handled pieces of equipment and the closest to the point of the arc, the gun and consumables are exposed to continual mechanical and heat stresses.

Two critical elements to ensure the gun and consumables do not interfere with your ability to produce high-quality GMA

welds are proper gun maintenance and correctly troubleshooting problems when they arise — Fig. 1.

## Maintaining Your Equipment

Thankfully, GMAW guns and consumables don't require a lot of time-consuming maintenance and upkeep. Nevertheless, failing to spend enough time main-

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## *Good gas metal arc welds begin with well-maintained equipment*

**BY ANDY MONK AND  
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damage that could interfere with weld quality and also cause a safety hazard.

Avoid problems such as porosity, an erratic arc, and damage to the copper cable stranding by keeping the cable from bending at too sharp of an angle.

**Liner.** Accessing the liner can be very time consuming, so you should limit routine maintenance activity to periods when the liner is easily reached, such as during wire changeovers or when the gun is disconnected from the feeder. You can clear out any built-up debris, including metal filings from the welding wire, by using compressed air during these changeover times.

**Handle and Trigger.** Daily visual inspection should be conducted to ensure there are no missing screws or other damage to the handle and that the trigger is not malfunctioning. These items should be replaced as necessary if they are found to be damaged.

**Neck.** The neck connections, and the insulators that separate electrically live components from neutral components, should be checked on a regular basis as both a safety and weld quality measure.

Loose neck connections should be tightened or, if damaged, replaced. You should also check that the insulators are in place at either end of the neck and that they are undamaged.

**Consumables.** Consisting of the diffuser, nozzle, and contact tip, the consumables require regular replacement simply by virtue of their role in the welding process and proximity to the arc. Extending the life of the consumables is relatively easy, however, and you can save a significant amount of downtime and equipment costs through some simple maintenance steps — Fig. 2.

Multiple times daily, use a pair of welding pliers or a reamer to clear out any spatter or other debris that could clog the nozzle and diffuser, being careful not to damage these parts in the process.

Also, you should check the O-rings on

maintaining your equipment could result in spending a significant amount of time reworking bad welds.

The majority of gun and consumables maintenance simply involves checking the visible components of the equipment for problems. This includes looking for loose fittings, damaged cables, clogged diffuser ports, and the like.

Below is a component-by-component guide to minimizing downtime for reworking bad welds.

**Feeder Connection.** The feeder connection, which carries the electrical current and gas from the wire feeder to the

gun, should be tight fitting and free of excessive dirt and debris. The O-rings that ensure the shielding gas flows into the gun cable and nowhere else should be in good working order, i.e., not dry, cracked, or otherwise damaged.

If the feeder connection is loose and cannot be properly tightened, it will likely need to be replaced. The same goes for damaged O-rings. A dirty direct plug usually can be cleaned with an electrical contact cleaner.

**Cable.** Cable maintenance involves little more than inspecting it on a daily basis to ensure there are no cuts, kinks, or other





*Fig. 1 — Proper GMAW gun maintenance and troubleshooting are essential to maintaining productivity and avoiding downtime.*

the diffuser; the connections between the diffuser, neck, and contact tip; the nozzle insulator; and the contact tip on a daily basis. Loose connections can usually be tightened, but you should replace these components if any other types of damage appear.

## Troubleshooting

Of course, no amount of preventive maintenance will be able to stop every

problem from occurring. So, when a problem does arise, it's important to be able to identify and correct its cause.

Often, the same problem, such as erratic wire feeding, can have more than one cause. In these cases, it's usually a good idea to conduct the troubleshooting effort by working from the easiest component to check to the most difficult.

For example, both the liner and the contact tip can be the source of erratic wire feeding. The liner takes approxi-



*Fig. 2 — As seen here, GMAW gun consumables are exposed to a lot of abuse during the normal course of welding. Regularly maintaining these products can extend their life and increase a company's productivity.*

mately 20 times longer than the contact tip to check, so it makes sense to begin with the contact tip and only check the liner if necessary.

Below are a few of the most common problems that occur as a result of gun and consumables malfunction.

**Wire Does Not Feed.** If your wire is not feeding at all, it is most likely being caused by a faulty feeder relay, control lead, adapter connection, liner, or trigger switch.

If the drive rolls are not turning when the gun trigger is pulled, it is either because an electrical continuity failure is occurring at the gun connection or the trigger is not functioning properly. Repair or replace any of these items discovered to be the cause of the problem.

If the drive rolls turn, but the wire is not feeding, there may be inadequate drive roll pressure or a blockage in the contact tip or liner. As mentioned earlier, check the contact tip and drive rolls before proceeding to the liner.

Consult the manufacturer of your wire feeder if the feeder relay turns out to be the cause of the problem.

**Contact Tip Meltback.** Contact tip meltback — when the wire fuses with the contact tip — occurs occasionally as a normal part of welding. If you are noticing an increase in meltback frequency, it could be a result of using the wrong contact tip recess, holding the gun too close to the workpiece, or a faulty work lead.

If you have not changed your welding parameters, shielding gas, and base metal, then it's unlikely the contact tip recess is the cause of the problem. Additionally, if those variables are the same and you are



confident you are not welding any closer to the material than normal, it may be time to consider the work lead as the cause of the meltback. Repair or replace a faulty work lead as necessary.

A final cause of increased meltback, erratic wire feeding, is discussed as follows.

**Erratic Wire Feeding.** If the wire is not feeding from the gun at a consistent rate, it is most likely being caused by the liner, drive rolls, or contact tip.

Begin troubleshooting an erratically feeding wire by ensuring the contact tip is the correct size for the wire being used, and that it is not damaged from excessive wear by the wire or from heat exposure from the arc.

If the contact tip is worn out from excessive wear, it could be a result of the drive rolls causing small deformities in the wire. After replacing the contact tip, be sure to check for burrs or other abnormalities along the length of the wire and adjust or replace the drive rolls as necessary. Drive rolls that are improperly tensioned, either too tight or too loose, can also lead to erratic wire feeding.

**Erratic Arc.** Interruptions in electrical conductivity are often the primary cause of an erratic arc. These are commonly caused by the wire maintaining only intermittent contact with a worn out contact tip instead of the constant contact required for a consistent arc. Simply replace the worn out contact tip with a correctly sized new one if this proves to be the case.

Other possible causes of an erratic arc, all of which relate to inconsistent electrical conductivity, are a neck that is too straight, a worn or kinked liner, debris buildup inside the liner, an improperly trimmed liner, and a faulty work lead connection.

**Porosity.** Holes in the weld bead, called porosity, are almost always caused by problems with the shielding gas coverage. This can be caused by excessive wind blowing the shielding gas away, worn out or damaged diffusers, insulators, O-rings and fittings, a ruptured gas hose, too much or too little gas flow, or a faulty solenoid.

If porosity occurs without any changes to your work environment and equipment setup, troubleshoot the problem by checking all of the previously mentioned components and replacing as necessary.

Good gas metal arc welds are not a product of luck, and poor welds can usually be attributed to operator technique, equipment malfunction, or incorrect electrical parameters. Following these maintenance and troubleshooting tips won't ensure excellent GMA welds, but will guarantee that your gun and consumables are not the cause of any problems that arise. ♦

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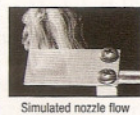
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