

LOWERING PLASMA CUTTING COSTS

When equipment is properly sized and used correctly, and depending on material type and thickness, PAC (plasma arc cutting) can offer cutting speeds that are many times faster than oxy/fuel or mechanical processes. Increased cutting speeds, which can reach 25 to 100 inches per minute in hand held cutting applications, are often limited by the operators ability to move smoothly down the cut path rather than the system's capability. This increase in cutting speed translates directly into lower cost per foot of cut. The increase in cutting speed coupled with lower consumable cost (air vs. oxygen and fuel), reduced distortion on thin material, suitability on a wide variety of materials, and immediate starts with no preheating make PAC a high productivity cutting option. To achieve the highest levels of cutting speeds and cut quality, it is critical to avoid a few operational and maintenance errors that are common in many shops. So let's look at some of these issues.

AIR VS. DUAL GAS

Compressed Air is the plasma gas used most commonly on the new generation of hand held plasma units and does an excellent job on sheet metal and thin stainless steel. The torches are light with only three or four consumable parts and part life is very good with proper use. For high volume cutting applications, using a dual gas system can offer improved cut quality and finish on aluminum and stainless steel by selecting the proper combination of plasma and assist gases. The development of hafnium electrodes which are compatible with oxygen has made PAC of steel up to 1/2" very cost competitive.

AIR QUALITY

The development of plasma systems that use compressed air has led to the rapid growth of PAC in a wide range of applications. At the same time, the air supply is the most common factor in the lack of performance of these systems. First the air supply unit must be able to supply the required pressure specified for the system, and equally important, the volume of airflow needed for the material being cut. While it is easy to check the pressure, flow should be tested at the torch with a calibrated flowmeter and is often ignored. The other major factor in the performance of air plasma systems is the quality of the air. If the air contains contaminants, particularly water and oil, cut quality and part life can be reduced to the point where PAC is no longer cost effective. Most of the newer plasma packages come with a basic filter but none are sufficient in supplying the quality air your plasma system needs by itself. A three-stage system consisting of a water/particle filter, an oil filter, and an oil vapor filter, is recommended by manufacturers such as Hypertherm for best results. While not many shops have this level of air filtration, it shows the importance that manufacturers place on a clean air supply. The filters should be located close to the plasma power supply and checked on a regular basis. It is common to cut corners in this area to save some initial expense, but it is far more costly in the long run in terms of part life and time spent cleaning up poor quality cuts. Compressed air in high pressure cylinders can be used but is too costly to be practical in any but special situations

ARC STARTING

When cutting metal, the plasma arc transfers from the plasma torch electrode to the workpiece. The heat of the arc melts the metal, which is blown away by the high-pressure gas flow. Depending on the system, the arc is started either by a pilot arc or touching the work with the torch. The pilot arc system uses high frequency to initiate the arc, which can effect electronic equipment nearby. The touch start method used to shorten part life, but new technology such as Lincoln's patented Vortech consumables, has offered considerable improvement. Not requiring high frequency allows consistent arc starting at distances two or three times what is practical with high freq starting. It is important to transfer the arc immediately to the work piece so the heat of the arc doesn't impinge on the nozzle for an extended period, which will quickly destroy the part, usually by making the nozzle orifice out of round. Once the nozzle orifice is out of round, cut quality and speed is reduced and the ability to cut thicker material is diminished. **To optimize torch and part life, it is critical to avoid firing the torch in the air away from the work.** The arc should always be started on the edge of the plate or over the plate where piercing is necessary.

WORK CABLE AND CONNECTIONS

Another common problem in all arc welding and cutting applications is poor electrical connection between the power source and work-piece. To establish a good connection, the cable and clamp must be in good condition with the connections properly attached. The clamp should be in direct contact with the metal surface and any paint or rust should be removed. Poor electrical contact will make igniting the arc more difficult and diminish machine capacity.

PIERCING THE WORKPIECE

It is always preferable to start cuts on the edge of the plate, but sometimes it is necessary to pierce through the plate to begin the cut. In hand-held cutting applications, a simple, effective technique can be used help prevent molten metal from splashing back on the torch parts and arcing out the torch head. When starting the pierce lay the torch on the workpiece at a shallow angle to the metal. After initiating the arc, roll the torch to a 90-degree angle and start moving along the line of travel. This will blow the molten metal created at the start before a hole is made away from the torch parts rather than back into the torch.

CONSUMABLE PARTS

Over the long term, the money spent on replacing consumable torch parts will represent the largest cost associated with PAC and should be treated as such. This is also an area jealously protected by manufacturers from an increasing number of companies that produce after-market parts. The fact is that with today's CNC machining capabilities and material analysis, there are many quality sources of replacement parts that are no longer protected by the original patent. Some plasma equipment manufacturers try to insinuate that using parts produced by someone else in itself cancels their warranty obligation, but after-market parts are a fact of life in every industry. The best strategy is to find a quality supplier that you feel provides the best value of cost and performance.

PAC can help increase the productivity of many cutting operations but like other welding and cutting processes you can only realize the full benefits if it is properly set up, correctly used, and well maintained.
