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Plasma Cutting Systems Combine Versatility with Efficiency

BY REESE MADDEN

Their ability to quickly perform a variety of applications on different metals in various locations makes plasma arc cutting systems versatile productivity tools

Many people know that a plasma system can cut, but far fewer know that it can gouge, or that plasma can cut any type of electrically conductive metal, that it can be used on a track system, or that it can be used to efficiently cut metal up to 1½ in. thick. But, in fact, plasma can do all this and more, and this versatility helps make plasma a truly valuable productivity tool.

When you use a tool more you better leverage your investment, making the tool a greater value. And when that tool helps you avoid having to switch back and forth among various tools, or rely on others to execute certain tasks, versatility translates into greater productivity.

American Fire Training Systems is an example of one company enjoying the versatility of plasma. The company makes some of the largest steel fire training structures in the United States. Its projects, which can range in size from a single story 3200-sq-ft unit to a six-story complex, are used to train firefighters around the country. American Fire Training Systems switched from oxyfuel to plasma five years ago and hasn't looked back.

Reed Steffek, the company's production manager, said oxyfuel is used for certain things, but plasma arc cutting machines "are definitely the tool of choice around here. There's really no beating the productivity we get from plasma. Plasma definitely cuts quicker, cleaner, and allows us to do more."

The Measures of Versatility

Plasma versatility can be measured in many ways.

Processes

Plasma is best known as a cutting tool, but even within cutting, plasma is more versatile than many people realize. With specialized consumables, plasma systems can be used for drag cutting, cutting with a standoff (particularly useful when cutting odd-shaped pieces or when trying to access a tight location), or even for getting high-quality, very narrow cuts on thin materials.

In addition to cutting, many owners are now starting to leverage plasma's gouging capabilities. Specialized gouging consumables are now available for many brands of plasma systems. Plasma gouging can be used in place of carbon arc gouging and is an effective method of removing metal for weld preparation or for gouging out worn or cracked parts for repair or replacement.

Plasma is also an effective piercing tool, whether by hand or on a cutting table. Compared to oxyfuel, which requires pre-heating before cutting or piercing, plasma is particularly productive because it requires no preheating of the workpiece.

Material Types

One of plasma's biggest advantages over other thermal cutting processes is that it can be used on any electrically conductive metal, including mild steel, stainless steel, aluminum, galvanized steel, copper, cast iron, and others. This capability is especially attractive to users who may encounter many different types



A construction worker uses plasma cutting at a job site.



A shipyard employee in North Kingstown, R.I., uses plasma cutting on a track system.

of metals, including farmers, scrapyards, metal fabricators/job shops, facility maintenance professionals, and others. Plasma's effectiveness on painted, rusted, or dirty metals is also attractive to these and other users.

The ability to cut multiple metal types is a frequently cited reason why plasma owners make their initial plasma purchase. Whether owning a plasma system enables them to avoid wasting time and money subcontracting out certain parts of a project, or whether it simply enables them to avoid wasting time switching from one tool to another, plasma's material type versatility is a clear productivity enhancer.

Material Forms and Thicknesses

In addition to cutting any type of electrically conductive metal, plasma can also efficiently cut many material forms: plate, rod, pipe, beam, and even grating — with no preheating required.

Air plasma is an effective tool for cutting thicknesses from gauge to 1½ in. Judging a plasma system's true capacity is not always easy given the lack of consistency among various manufacturers in how they rate their systems. There is, however, a common relationship between cut speed, cut quality, and cut capacity: there is an optimal speed for achieving the desired cut quality on a

given metal thickness. In many cases, the speed advantage of plasma over other cutting methods, such as oxyfuel cutting, is dramatic. Oxyfuel cutting is, however, generally regarded as the superior method for cutting materials more than 1½ in. thick.

The versatility of plasma also makes the job easier for American Fire Training Systems because workers can use the same plasma cutting machine for just about anything they're cutting.

"We use our Powermax1000's to cut through different types of steel and aluminum whether painted, unpainted, or rusted," Steffek said. "And we're able to cut through a wide range of sizes — from

What Is Plasma Cutting?

Plasma cutting is a high-speed thermal process that utilizes an accurately controlled electric arc to cut most common metals. The plasma process uses a small nozzle orifice and high-velocity gas flow to generate a very high-temperature, high-energy-density arc. Plasma cutting and gouging requires a process gas, such as air or nitrogen, a DC power source, and consumables, including an electrode and nozzle. Plasma arc cutting systems provide the following:

- Fast cutting speeds
- Application versatility
- High productivity
- Cost-effective operation

½-in.-thick tube, to ⅜-in.-thick quarter-ton steel to thin 14-gauge sheets.”

Location

At a macro level, plasma can be used in any number of locations, indoors and out, from a garage to a shop, and from a factory to a job site. A plasma cutting and gouging system can be used almost anywhere that a process gas (compressed air or sometimes nitrogen) and energy source are available. When hooked to a portable motor-generator and a portable compressor or gas cylinder, a plasma system is truly mobile, making it appropriate for use in the field, on a construction site, and in many other locations. Unlike oxyfuel cutting, which requires a flammable process gas such as acetylene, propylene, or propane, plasma systems may even be used in some more highly regulated environments where flammable gases aren't permitted.

American Fire Training Systems cited this ability to easily move from location to location as another reason why it depends on plasma.

“Some of our structures are huge and there is no way we can completely cut and assemble them in one spot,” Steffek said. “We do as much as we can at our plant, but a lot of time the final cutting and assembly has to take place at a job site. Our work would definitely be a lot harder without plasma.”

Certain plasma systems, especially those utilizing inverter technology, are even more portable, and can be easily carried up a ladder, taken on board a ship, or used in other tight quarters, and can

easily be moved from point to point, whether in a facility or in the field. Recent engineering developments also contribute to the versatility of plasma.

“The incorporation of Auto-Voltage™ and Boost Conditioner™ technologies into our Powermax brand of plasma systems really gives users much greater flexibility,” said Dennis Borowy, a principal engineer at Hypertherm. The first-mentioned technology allows people to use a wide variety of input voltages with no manual linking of any kind, while the second technology makes it possible for the system to extract the maximum amount of power from any given line.

With Auto-Voltage™, operators can start a job in their shop, plugged into their regular power source, and finish it in the field, hooked up to a completely different power source. Up until about seven years ago, this wasn't possible. People moving from site to site had to either make sure the same voltage levels were available at all of their locations, or go through the time-consuming process of manually rewiring their system to match the available voltage.

Boost Conditioner™ technology enables better, more consistent performance regardless of fluctuations in input voltage. This is especially beneficial for operators in areas with unreliable or low line power. The technology also compensates for weak or varying voltage on motor-generators, providing improved performance for users in the field.

Since this technology is fairly new, not all systems have it. Therefore, if your particular situation requires lots of moving around, you may want to check with your

distributor to find a plasma cutting machine with these features.

Applications

With a simple change of the torch and/or consumables, a plasma system can switch between manual and automated cutting or gouging. With a straight machine torch, a plasma system can easily be connected to an X-Y cutting table. Plasma systems can also be used on robotic arms or, more commonly, with a track system for effective long, straight cuts. Many plasma systems are used in conjunction with pipe bevellers or with hole-cutting tools. Plasma systems can also be used with metal templates or guides for efficient replication of cuts.

Conclusion

Plasma systems are highly versatile, highly productive cutting and gouging tools. The plasma process's ability to perform various processes and applications, to operate in various locations, and to work on various metal types, forms, and thicknesses gives it distinct advantages over competitive cutting technologies. If you already own a plasma system, chances are you can derive greater value out of your investment simply by expanding your usage occasions. And if you do not yet own a plasma system, you may find that you can get more done, in less time, at lower cost by investing in this powerfully versatile tool. ♦

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Any job. Any metal. In the shop or in the field.

System	Powermax 190c	Powermax30	Powermax600	Powermax1000	Powermax1250	Powermax1650
Output Current	12A	30A	40A	60A	80A	100A
Rec. Capacity	1/8" (3mm)	1/4" (6mm)	1/2" (12mm)	3/4" (19mm)	7/8" (22mm)	1 1/4" (32mm)
Max. Capacity	3/16" (5mm)	3/8" (10mm)	5/8" (16mm)	1" (25mm)	1 1/8" (29mm)	1 1/2" (38mm)
Duty Cycle	35%	30-50% Voltage Dependent	50%	40-50% Voltage Dependent	40-60% Voltage Dependent	60-80% Voltage Dependent
Weight	43 lbs. (20kg)	20 lbs. (9kg)	47 lbs. (21kg)	83 lbs. (37 kg)	96 lbs. (44 kg)	128 lbs. (58 kg)

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