Introduction to Burning and Plasma Tables

A Guide to Thermal Cutting

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Introduction to Burning and Plasma Tables

Thermal cutting is primarily used for the shape cutting of cold and hot rolled steel. Thermal or “burning” machines are probably one of the oldest forms of metal shape cutting short of the physical hammering/sawing/hacking methods. Utilizing either an Oxy-Fuel mix or a Plasma stream, either sway the process burns/melts materials up to and even over 6” thick. This machining method is a thermal method and thus the material being cut must be yield to high temperatures. The machine motion system is controlled via a computer controller or CNC, however, older machines utilized an optical tracer eye and some even used physical template tracer methods to follow profiles and cut contours. Machines can be configured with one or more of either Oxy/Fuel or Plasma torches and can even include a combination of both methods for the most flexibility in shape cutting.

The two types of thermal cutting are Oxy/Fuel and Plasma with one subcategory of “Hi-Definition” (or “Fine Plasma”). Both processes are described in detail below.

Oxy / Fuel

Torches, much like a welders oxy/acetylene torch, are used to mix gases for high-temperature cutting. These gases can be any flammable gas but is typically a mixture of propane to burn and oxygen to greatly intensify and amplify the heat. These gases are introduced at high pressures to not only create the ‘burn” but to also blow the molten or vaporized material away and out of the cut zone. This method of thermal cutting is typically the most efficient shape cutting method however it is much slower than plasma cutting and is typically of very little use on materials thinner than 1/2” - 3/8” due the high heat resulting in warpage of the material Oxy/ Fuel is best applied to steels 1/2” and thicker.

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Plasma

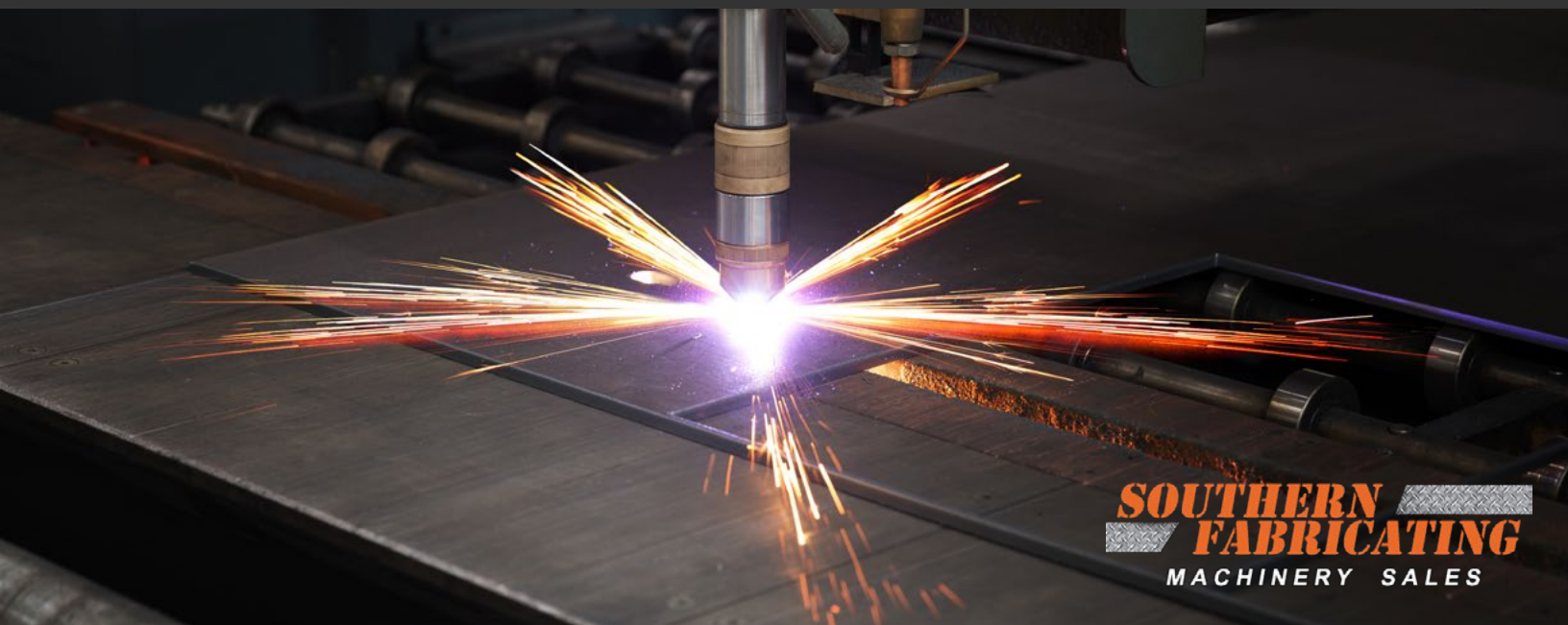
In the 1960's scientists discovered that by increasing the speed of gases coming out of a small hole, and then charging the housings with an electrical current they could force a very high and direct thermal process called 'Plasma'. This process allowed parts that could be thermally cut to now have almost "saw-like" finishes versus the older molten rough edges that Oxy-Fuel processes provided. Plasma torches requires large amounts of high pressure clean dry air to assist in 'blowing out' the molten and burned material from the cut zone as well as oxygen to help intensify the burn. Plasma can also use non-flammable 'shield gases' to prevent the material from having a brown or burnt edge by eliminating the Oxygen in the environment directly around the burn. Plasma cutters are available in both handheld and machine mounted power supply.

Ranges: Typically plasma power sources are rated at ½ their amperage for the overall cutting capacity in steels. As an example; a 100 AMP power supply is typically rated to both pierce and cut 1/2" thick of steel and can cut from an existing hole or part edge up to 5/8" – 3/4". Whereas a 200amp Plasma Power Source is rated to both pierce and cut up to 1" thick of steel continuously and can be used from a start hole at thicknesses up to 1-7/8".

“Hi-Definition (Fine Plasma)”

In the 1990’s further development of electronics and the plasma process resulted in very finely tuned power sources and newer precise cutting torches. Surface finishes on cut material went from ‘saw-like’ finishes to ‘laser-like with little effort. These better finishes on a faster cutting process became very popular and Hi-Definition was the preferred cutting method by 2005.

These ‘Hi-Definition’ systems are only found on computer controlled (CNC) machinery and are not available for handheld applications as in order to achieve the best results, the standoff distance and traverse speed must be accurately and smoothly controlled. These power sources can provide the best surface finishes, part accuracies, and detail (in fact many compare them to laser finishes) but must be used in conjunction with an accurate machine design and motion system to produce an accurate part.



Any kind of thermal processing requires a table to support the material that can withstand the heat and absorb or ventilate the smoke and fumes from the cutting process. In most cases, the table is not part of the initial system quoted and must be calculated for. There are several popular options for tables and they are described as follows:

Material Supports

This can be anything that is non flammable that supports the weight of the workpiece. Metal Saw Horses, Pillars, etc. can all be used.

Dry Table

This is a table manufactured for the explicit use of thermal cutting and is typically fashioned high enough off of the floor to allow for the cleaning of slag and other molten material from underneath the table. This table provides no fume or smoke control method and is best suited for outdoor applications.

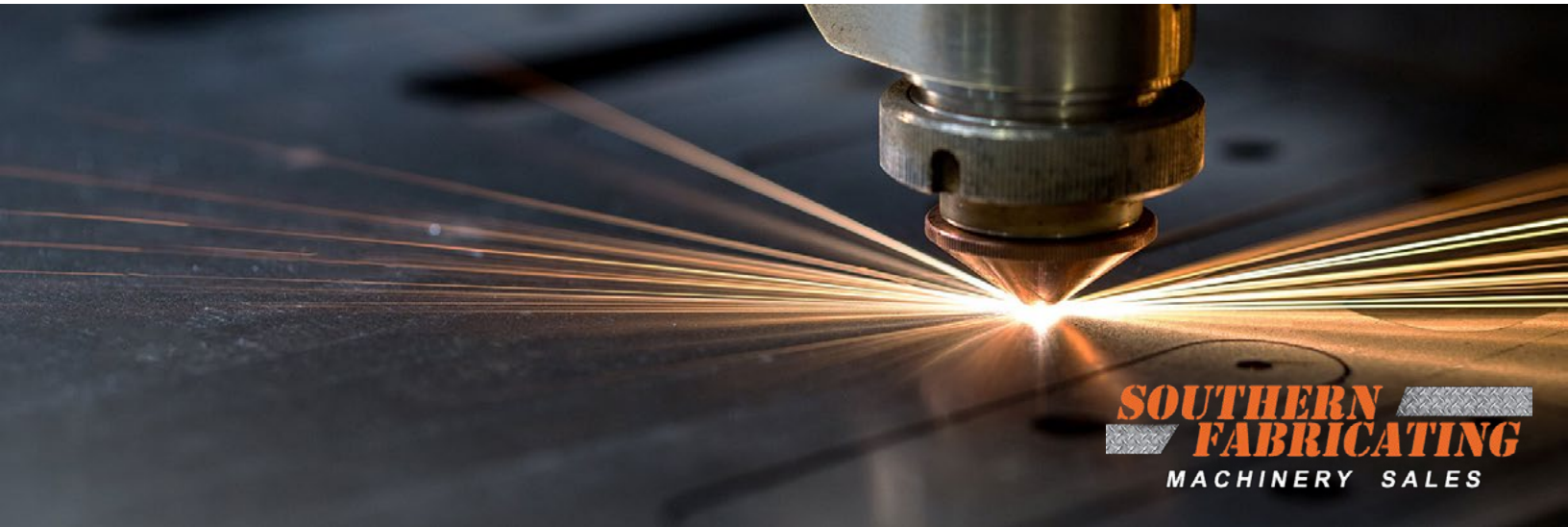
Downdraft Table

This table is similar to the water table described above however instead of being filled with water the table or tank is exhausted by high capacity fans to pull the smoke and fumes from the cutting process down into the tank and ducted to either outside of the machining area or through a dust collector. This type of table can have ducted “zones” in the table which are controlled by the location of the cutting torch which improves the efficiency of the table greatly.

Water Table

Applicable only to plasma cutting, this is best described as a water tank. This table is typically made of replaceable slats of steel supported on each edge of a tank filled with water. The material surface is typically below the water line which somewhat controls the smoke, dust, and fumes associated with plasma cutting. The water does cause some problems with the molten slag quickly cooling and re-adhering to the material as well as rust and cleanup problems but overall can be a very efficient method to controlling the byproducts of plasma cutting.

Whichever process you choose should be based on the requirements of both your part AND budget. Southern Fabricating Machinery Sales represent manufacturers and machinery from each and every process, make and model to ensure we can offer you the right solution for your application. Contact us today for more information about Oxy/Fuel & Plasma cutting systems.



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