

Plasma Cutting on ferrous and non ferrous materials using water secondary – Water Mist Secondary (WMS™) Patent Pended Technology

Cutting ferrous and non ferrous materials, especially Stainless Steel and Aluminium, it's always been an interesting technologic challenge.

The most used technologies for cutting these materials, due to the cutting precision and production prices are plasma, waterjet and laser.

In Plasma Cutting field, the Stainless Steel middle-high thickness are normally cut using Nitrogen, eventually supported with mixtures of Argon and Hydrogen, and it guarantees good qualitative results but with high costs of cut. For small thickness Compressed Air, Nitrogen or mixtures of Nitrogen and Hydrogen are used, with alternate results.

The Water Mist Secondary technology, created on Thermal Dynamics research laboratories, allows the plasma cutting of non ferrous materials using Nitrogen and Water.

Using normal tap water notably reduces production prices, with the possibility of remarkable results on a very wide range of thickness.

WMS™ Technology

Water Mist Cutting process can be applied on every Plasma torch for automatic dual-gas cutting, using dedicated consumable parts.

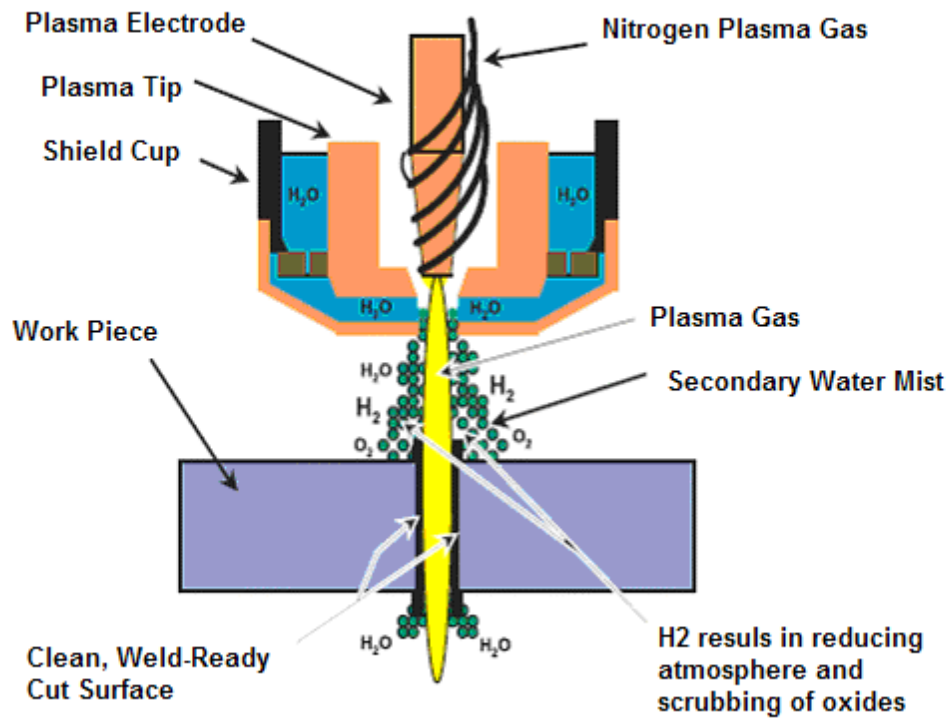
The same torch that is usually used for Oxygen/Air cut (ex. for Mild Steel cut) is used with Nitrogen/Water when cutting non ferrous materials.

The Nitrogen is used as primary gas (Plasma Gas) while water is used as secondary gas (Shield Gas). The water canalized in the torch is nebulized during the cut and divided in its principal components.

The Hydrogen so generated create a reductant atmosphere on cutting zone, isolating it from contaminating elements, and producing a clean, dross-free and oxide-free cut surface.

The main amount of the water used during the process (from 0,3 to 0,5 liters/min) is nebulized during the cutting process, not requiring therefore the installation of particular systems of harvest or disposal.

About the cut of small thickness with film, the small thermal increase allows the easy removal of the film after the operations of cut



Subtitle: Water Mist Technology use Nitrogen and Water for cutting Stainless Steel and non ferrous materials.

Comparison with other cutting technologies

We'll now analyze the advantages and the disadvantage of WMS technology in the cut of Stainless Steel, in comparison to the other technologies commonly used.

We'll take in account mostly the following parameters:

- Cutting Quality (square, dross free cut, precision)
- Cutting Speed
- Costs per hour, based only on real cutting costs (electricity, consumables, gas, abrasive, etc.)

Plasma Cutting

As previously mentioned, the plasma cut of Stainless Steel middle-high thickness (from 5-6 mm) it's usually performed with Nitrogen as primary gas and with mixtures of Argon and Hydrogen as secondary gas.

Generally the results of cutting are excellent, both in qualitative terms and of speed, but the huge consumption of Argon/ Hydrogen influences the hourly cost that results middle-high.

For thickness less than 5 mm the cost of cut become extremely reduced by the use of economic gas (compressed Air or Nitrogen, eventually mixed to Hydrogen).

Generally the cutting speed is very high, but the quality is compromised from an excessive inclination of the cut (with Nitrogen and varied mixtures) or by excessive oxidation (in the cut with compressed Air).

The WMS™ technology allows keeping speeds similar to those of Plasma cutting with gas, with good quality (vertical cut, without dross and not oxidized) on a range of thickness that goes from gauge up to 20 mm.

Moreover, the Nitrogen/Water process reduces the costs of cut to a very low level because, besides the elimination of the costs related to the secondary gas, we obtain a longer life on the consumables parts.

Other advantages of the technology WMS™ are the extreme facility of setup the process (wide window of parameters) and the low thermal increase on the material, which reduce the thermal distorsion and facilitates the removal of the protective film in the cut of thin materials.

Laser Cutting

Obviously premising that the precision and the level quality obtainable with the laser cutting normally are not reproducible with the plasma cutting, we go further to examine the advantages of the technology WMS™ in comparison to the laser cut.

The laser cut uses great powers of the bundle and high pressure of nitrogen for the stainless steel cutting, with increase of the costs of cut, that will surely results high.

Moreover, while cutting speeds are higher on small thickness, usually they results lower when the thickness of the material raise over 10-12 mm.

Cutting with WMS™ technology allow replacing laser cutting when customer doesn't need very high quality of cutting, with increase of productivity and a remarkable reduction of time costs.

WaterJet Cutting

As for Laser Cutting, also for WaterJet Cutting we must remember the very high quality and precision that we obtain with this cutting process, and that we can't obtain in most cases with Plasma Cutting. Moreover, an appreciated advantage of WaterJet cutting is that, since it's not a thermal cutting, the chemical structure of the material in the cutting zone will be not modified. Anyway, cutting with water have very small speeds and quite high costs, due to the consumption of abrasive materials to put in the cutting flow.

Plasma Cutting with Water Mist Technology allows obtaining a cutting quality very close to WaterJet cutting, with speeds much higher and cutting costs extremely low.

The great productivity of this cutting system makes it a valid alternative to the WaterJet cutting, particularly in the range of middle-low thickness (less than 20 mm).

Conclusions

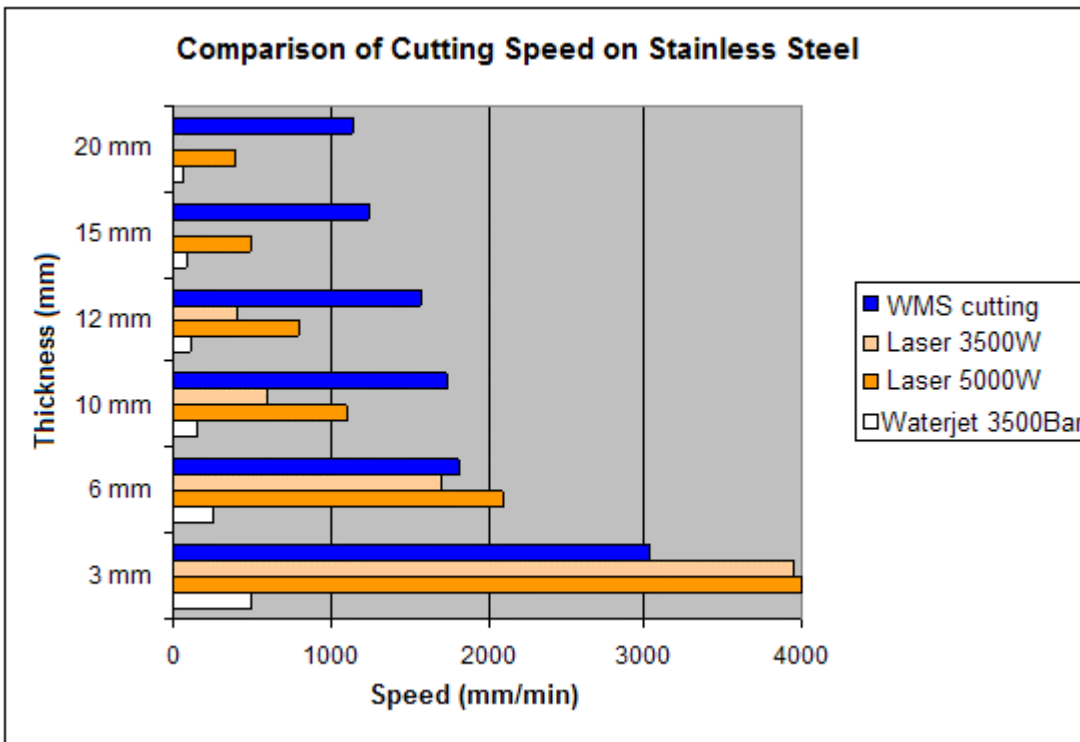
Water Mist Secondary (WMS™) technology allow to keep low cutting costs and to improve performances of Plasma cutting systems, increasing the flexibility and widening the field of application.

WMS™ Cutting Features

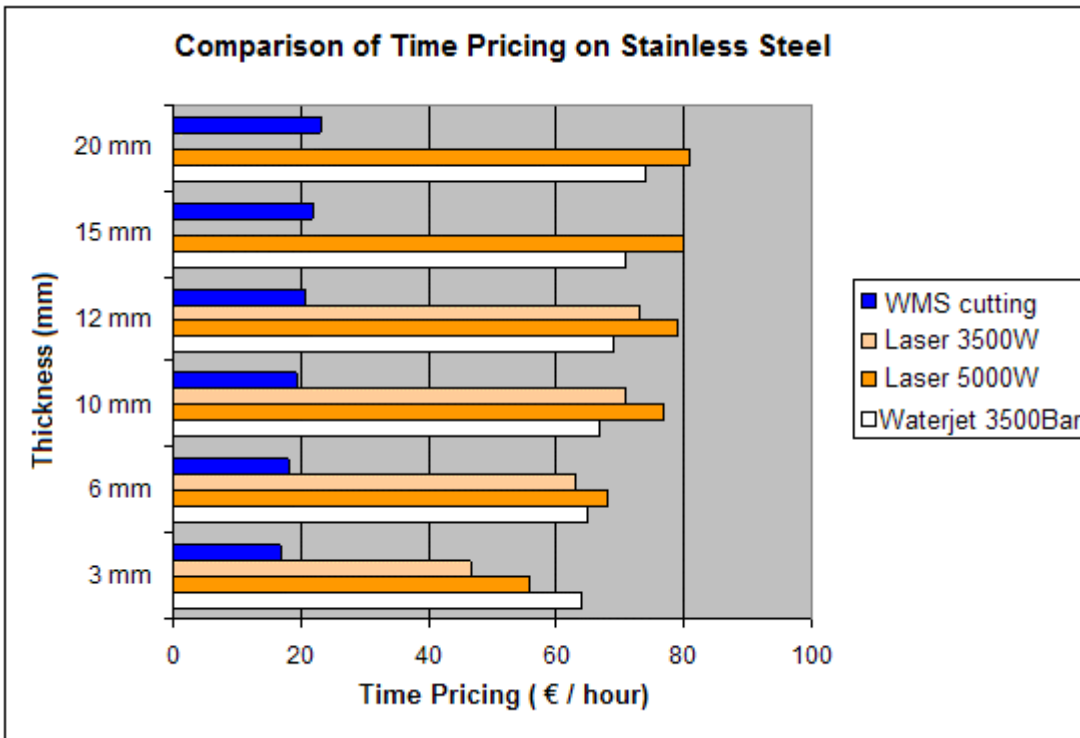
- Materials: Stainless Steel, Aluminium and other non ferrous materials
- Thickness Range: from 0,5 to 20 mm
- Quality: Vertical cut, dross free and without oxide, very low thermal distorsion on small thickness
- Productivity: High cutting speed
- Cutting Costs: very low
- Serviceability: Wide parameter window for process setup

WMS™ Technology is available on all Thermal Dynamics AutoCut and UltraCut power supplies from 100 to 300 Ampere, for both High Precision and Conventional cutting.

Graphics



Subtitle: Cutting speeds with WMS process is higher on middle-high thickness, compared with waterjet and laser with high power



Subtitle: Comparison of prices per hour, including machine costs and consumables.



Subtitle: 20 mm Aluminium cutting sample using WMS™ process. We can notify the reduced rugosity on the cutted surface compared with normal Plasma cutting.



Subtitle: 12 mm Stainless Steel cutting sample WMS™ process. Vertical cut, oxide free and dress free.