

Simple but Powerful – Specialised Plasma Robotic Cutting System

By Hughen, Plasma Technologies PVT Ltd, India

Introduction

In the rush and tumble of today's technology race, the world's leading countries are pouring astronomical sums of money into research and development for every conceivable nature. However, it should be remembered that the greatest inventions of the modern day can sometimes be the simplest.

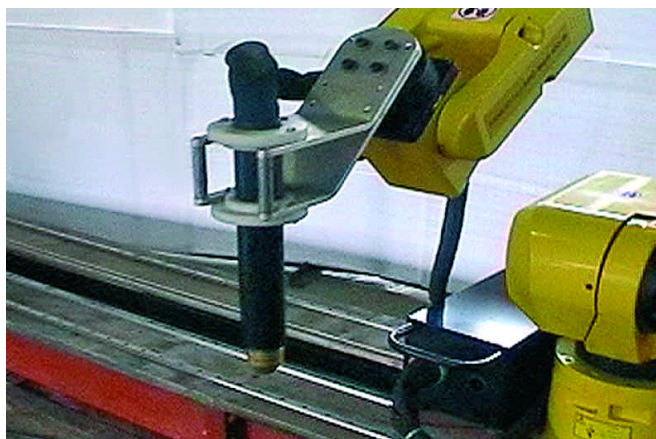
This article illustrates one such simple and powerful example, the 'robotic system', and in particular the 'Plasma robotic solution'. Where there is a need for efficient and precise cutting at highly affordable costs, Plasma robotic systems provide the capability to service a range of requirements.

Delivering the Required Cutting Solution

The Plasma robotic system is a system to fulfill the demanding cutting criteria, with rugged and simplistic solutions with high performance. The Plasma robotic system components have to be finely matched to deliver the required solution to every tube and pipe cutting application.

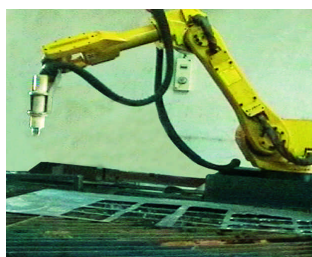
The two basic systems are:

- XY robot for 2D cutting
- Plasma robotic system (2D and 3D)



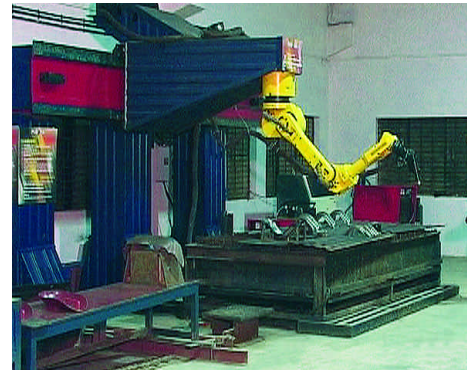
➊ Moving floor based Plasma robotic system

Components of the Plasma Robotic System



➋ Afixed base Plasma robotic system

- **Plasma torch:** Internationally patented and CE marked torch, which is capable of rugged duty cycle cutting with high precision.
- **Power source:** An advanced magnetically controlled power source, which gives an extremely low ripple, thereby a very fine cut/weld job joint.



➌ Moving cantilever Plasma robotic system

- **Robot:** From a fixed base mounted robot, the Plasma robotic solution is upscalable to a moving base or moving cantilever configuration depending on the need of the user, allowing greater flexibility of operation.
- **7th axis cantilever gantry:** It enables a working area of minimum 2.5m width and breadth, with 30m or more in length.
- **Integrated Plasma software:** This flexible programming software (developed in-house), enables data input from all levels of an organisation.
- **Digital work cell:** A detailed work cell is created that simulates the entire solution layout, material handling cycle time, job movement etc. This is a visual providing a virtual work shop environment.

Benefits of the Plasma Robotic System

Throughput

The Plasma robotic solution enables various processes to be carried out on one machine in a single set up. These processes have traditionally been carried out at different locations in a given workshop or plant. The combination of multiple processes with this solution eliminates repeated material handling and multiple machine setups, which usually leads to an increase of the entire planned throughput.

Weld Edge Preparation

This is a classic example of a pipe cut on a standard machine and then manually ground to achieve the weld edge. A heavy pipe is thus taken to a minimum of two or three locations where teams of workers prepare the pipe. With a Plasma robotic solution the pipe/tube is loaded once and the robot undertakes all weld edge preparation in a single set up.

Advanced operations such as:

- Contour beveling
- Double V beveling with root
- Bolt holes
- Cutting of small slots

These are cut faster and cheaper and hence the job is carried out with optimum efficiency by the robot.

Reduced Material Consumption

A minimum of 15 per cent to 30 per cent material yield over conventional processes is possible. This is achieved by nesting with common cut edges. High cutting speeds and reduced material handling results in cycle times which are comparable to blanking. Low cutting costs and extremely low burning losses combined with the above, results in an overall savings per part.

Flexibility of Multiple Jobs

2D and 3D cutting capabilities enable a huge variety of jobs to be processed with one system. This unique flexibility enables the user to increase the scope to fulfill multiple customer requirements.



❶ A 3-dimensional pipe saddle, cut on the system

For example:

- 3 dimensional profiling of pipe
- 3 dimensional profiling of structurals like I-beam, channels, tubes etc

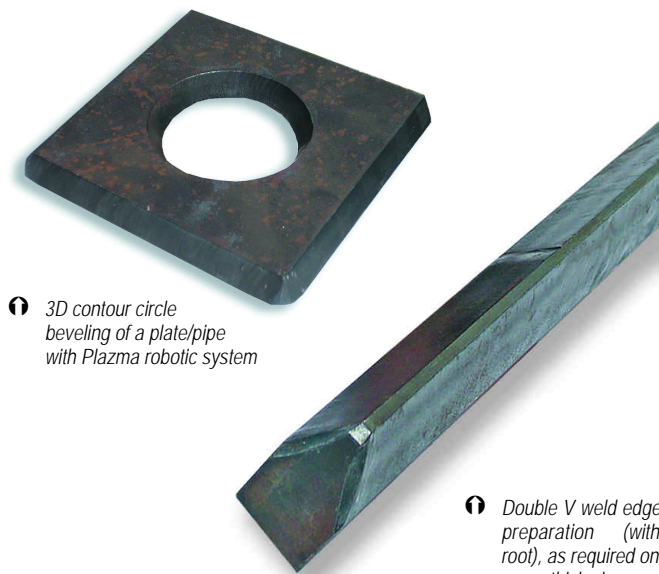
Batch Manufacturing

This solution also provides flexibility for the batch manufacturing of jobs to supersede mass manufacturing. It is possible for smaller companies to beat larger competitors, by providing just in time batches of assemblies instead of large scheduled supplies.



❶ Structural I beam with bolt holes cut on a Plazma robotic system

For example, with this Plazma robotic solution a user can cut an axle blank, bevel the formed axle half and cut the axle ring on the welded axle. This enables the user to thrive and grow when faced with stiff competition from larger companies.



❶ 3D contour circle beveling of a plate/pipe with Plazma robotic system

❶ Double V weld edge preparation (with root), as required on many thick pipes

Mobile Cutting Solutions

The unique vibration dampened, cantilever mounted Robotic system design enables precision cutting in a mobile set-up. This solution can be transported to various sites if and when required. This capability is used for process plant up-gradation with on-site cutting of complicated 3D geometrical profiles.



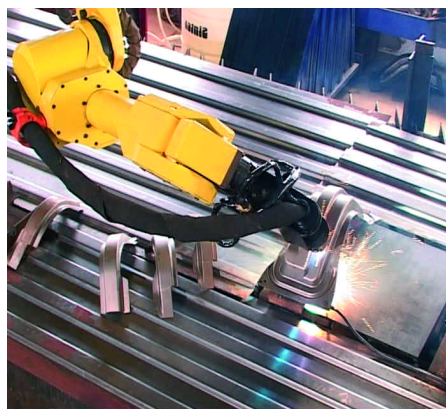
❶ Circular outward contour beveling as required in 3D pipe as a weld edge preparation

High Speed Cutting of SAW Pipes

With the newly developed Coherent Plazma cutting system, it is now possible to cut SAW pipes in a pipe rolling mill on a continuous in line cutting basis.

Increasing Capabilities: Coherent Plazma

In the case of sheet metals, any excess heat input immediately increases the slag and drastically alters the microstructure. Using a laser/water-jet cutting systems solves this problem, because the high density of the laser and cold cutting action of a water-jet minimises the energy absorbed by the sheet, thus ensuring excellence of cutting quality. But a plasma beam can never achieve the physics of these processes.



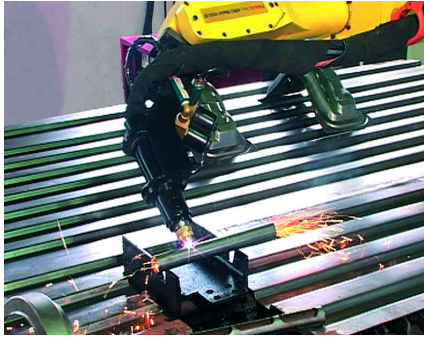
❶ Actual cutting of 3D sheet metal automobile components cut on Coherent Plazma

However, because it is combined with a robotic movement, the Coherent Plazma cutting system provides the solution to overcome this problem. It is a revolutionary technology that delivers a precise quantum of cutting energy for a high quality cut. This Coherent Plazma beam is focused with overall kW energy

much lower than the conventional Plasmas. This means that laser-like cutting is now possible at affordable rates.

Coherent Plazma is now used in a range of cutting applications including:

- **Flexibility for rapid prototyping and in production model changes:** The robotic Plazma system reads a CAD input and cuts the formed sheet metal component with a Coherent Plazma. This combination eliminates the long lead time required to manufacture trimming dies, thus reducing the span of launching any new product onto the market. Therefore, with a Plazma Robotic cutting work cell, design changes are just a question of re-programming, which avoids expensive re-tooling. The cutting time required by Coherent Plazma is exactly 22 seconds. The capital and operating cost per job comes to about Euro 0.60.



↻
Circular outward contour
beveling as required in 3D
pipe as a weld edge
preparation

- **Cutting sheet metal pipes without mechanical and thermal damage:** Conventional processes like punch deforming a sheet metal pipe is also possible. Coherent Plasma cuts almost any profile on a pipe without any thermal or mechanical damage.



ⓘ 3D sheet metal automobile
components cut on Coherent
Plazma



ⓘ
Sheet metal
tube cut with a
Coherent Plazma
(instead of laser cutting)

This drastically improves the pipe fit up, thereby enabling automated welding of the joint.

- Component trimming of formed sheet metals
- Sheet metal pipe profiling with Coherent Plazma

Additional Applications of the Plazma Robotic Solution:

Welding

The Plazma robotic system can be configured to act as a cutting and welding solution. Standard applications such as MIG welding can be integrated with cutting, together with quick tool changeover.

Plazma Technologies PVT Ltd

EL-55, MIDC Bhosari, Pune 411026, India

Ph. : +91 202 712 1617 , 2 712 8928

Fax: +91 202 712 3062

E-mail: plazmaoverseas@vsnl.com

Website: www.plazmasolutions.com