

CASE STUDY:

JINDAL STAINLESS LIMITED, JAJPUR ROBOPLAZMA HOT PLATE CUTTING SYSTEM

JINDAL STAINLESS LTD.

A part of the O P Jindal group, JSL Stainless Ltd. (formerly JSL LIMITED) incorporated in 1980, is India's largest and the only fully integrated Stainless Steel producer with a capacity of 1.8 Million Tons per annum. JSL has grown from an indigenous single-unit Stainless Steel plant in Hisar, Haryana, to the present multi-location and multi-product conglomerate.

JSL is India's largest producer of stainless steel in 200, 300, 400 and duplex grades. The company is a globally recognized producer of stainless steel flat products in Austenitic, Ferritic, Martensitic and Duplex grades. The product range includes Ferro Alloys, Stainless Steel Slabs and Blooms, Hot Rolled Coils, Plates, Cold Rolled Coils and specialty products such as razor blade steel, precision strips and coin blanks.

THE PROBLEM

The technology & process followed for cutting red hot stainless steel plates at JSL's Jajpur facility which is producing 250,000 tons per annum of Ferro Alloy's and 1 million tons per annum of stainless steel.

Process Flow :

Red hot Stainless steel slabs are produced from furnace

- Steel slabs are rolled to the desired thickness and carried through a conveyor

- Rolled hot plates are rough cut in-line using powder cutting

- Plates are then transported to cooling bed and kept for cooling

- After cooling, plates are transported within the yard for final cut by plasma cutting method at required size and further processing.



Major concerns with Current Process



As a result, JSL was struggling with inefficiency, inaccuracy, wastage & production delays with this cutting technology & method added up with the additional cost of material handling, inventory & labour. That is the context in which Jindal Stainless began considering using robotic plasma cutting process to red hot plates.

THE SOLUTION

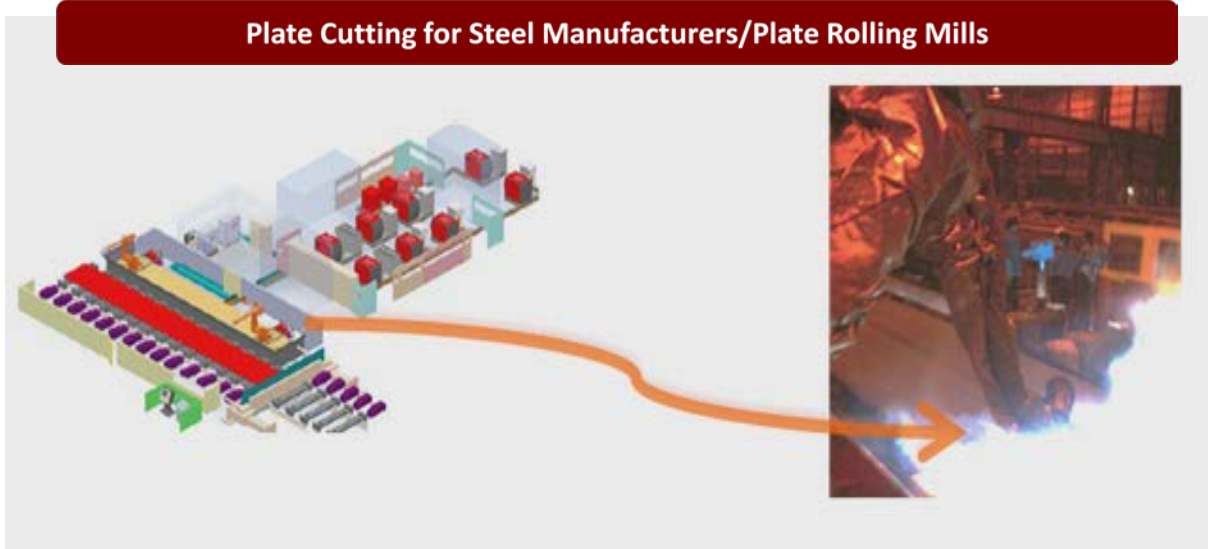
JSL approached Plasma Technologies to find a solution considering the 14 years of proven track record of trolley plasma cutters.

JSL's interest in robotization was to cover three goals : improve efficiency & accuracy of cutting process, reduce production time and simultaneously increase the productivity .

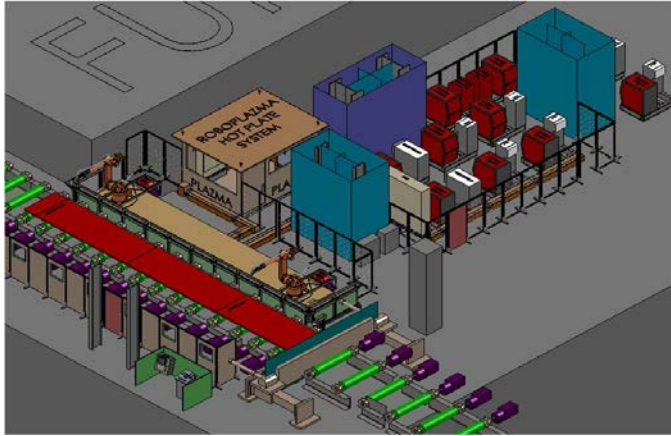
Having assessed the feasibility of such Robotic Plasma cutting system, Plazma Technologies started working on the design on making the product conception to guarantee the on-line cutting of rolled stainless steel plates in red hot condition at 1100 °C temperature, parts positioning, precondition of the robotized system.

At the same time, the cutting strategy was also analysed to overcome following challenges :

-  Achieving Right Angle Cut of misaligned plate
-  Severely Bent Plate.
-  Plate Spring Back
-  Operator Involvement Causing the Delay of Cutting Cycle Start
-  High Radiation Heat from Hot Plate
-  Plant throughput Complete Automated Cycle.



Benchmarking was initiated and plazma technologies came up with the world's first robotic unmanned self-intelligent red-hot steel cutting plasma system :



- The fully automated S.V.A.I. plant takes 7 minutes to roll a 75-meter hot strip. Roboplazma cuts the plate directly on the conveyor just once. Roboplazma Clears 48 Meter Hot strip in 7 minutes. It allows next slab come out of furnace & go to rolling.

unmanned system interfaced with the main SVAI control room. It has self-checking & self-analyzing software that cross checks the system for every cut. Critical Online Intelligence compensates for the unpredictable behavior of hot steel like spring back and plate waviness.

- Made of standardized configurable robotic modules with unique proprietary software and patented high performance plasma torch



- Embedded with a plasma torch design that performs precise metal cutting at red-hot temperatures.

- Governed by proprietary self-calibrating software that governs the operation, diagnostics and troubleshooting eliminating the complexities of controlling a cutting system.



- Engineered with a systems interface compatible with current steel production systems that facilitates the line integrations process and minimizes production disruption

BENEFITS :

With RoboPlazma solution for Hot Plate Mill and its Innovative product design & intelligent software, the efficiency enhanced, accuracy increased, productivity increased and costs saved.

More Efficient

- On line Hot Plate cutting.
- Intelligent Touch sensing for alignment checking and auto- calibration of the Plazma torch
- Real-time Monitoring the system's health and performance, with self-diagnosis features that report faults, reduce the downtime for service
- Interface compatibility with steel mill online systems reduces system integration time.
- Fast cutting action done completely online removes the bottle neck

More Accurate

- The system has built-in intelligence to compensate for plates' shape fluctuations, eliminating inaccuracies in cutting.
- The system software can command the robot to perform multiple subsequent uninterrupted cuts in material of different dimensions.
- System measures and calibrates its cutting scheme, no need for manual measurement.

High Productivity:

- 5000 tons Hot plate cut continuously.
- Controlled thru Profibus Plazma Technologies also initiated a comprehensive Production with Operation and Maintenance Training Program

Cost Saving

- A unique protective cloak allows the robot to perform flawlessly without damaging its inner mechanisms.
- Proprietary torch nozzle system allows precise cuts minimizing material yield loss.
- Automation eliminates the need for direct operator interaction, no safety risks associated with the processing of red hot metal.

	Safety Factor	Flexibility to cut thick gauge steel	Process can compensate for plate asymmetry	Automated real-time self-diagnosis and reporting system	Fast Cutting
Shear Cutting	Medium - discrete operator interaction	Low - usually used for 1.5" or less. Large and costly system would be required for thicker gauge.	No	No	Fast
Gantry Cutting	Medium - discrete operator interaction	Medium	No	No	Medium
Trolley	Medium - discrete operator interaction	Medium	No	No	Medium
Manual Cutting	High - operator interaction required	Low - difficulty and time consuming to cut thick gauge by hand	Yes	--	Slow
RoboPlazma	Low - eliminated direct operator interaction	High - can easily manage up to 80mm	Yes	Yes	Fast