# Robotized Portal System for Plate Shape Control, Marking and Punching

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## ABSTRACT

As part of the transformation towards Industry 4.0, the steel manufacturing sector is undergoing rapid automation, integrating robotics, advanced vision systems, and digital control platforms. Polytec, an Italian company with over 30 years of experience in designing automation and robotic solutions for mission-critical industrial applications, has developed a comprehensive suite of systems for steel plate processing directly at the output stage of the rolling mill. These systems are engineered to improve quality, ensure full traceability, increase plant safety, and significantly enhance overall production efficiency.

Keywords: cooling bed, sample cutting, robotics, artificial vision, rolling mill, quality control

## INTRODUCTION

Polytec's automation system is designed to perform a complete set of operations on steel plates emerging from the rolling mill, including:

- Contour and flatness verification
- Defect detection and surface inspection
- Thickness measurement
- Ink and mechanical (punch) marking
- Real-time conformity assessment
- Plate tracking through SCADA and HMI interfaces

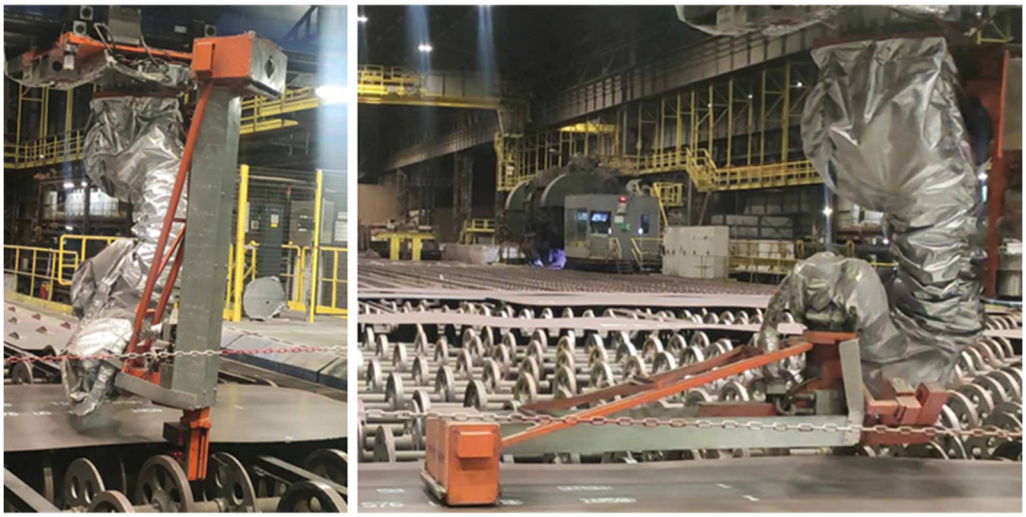

**Figure 1:** robotized portal system

 

The system integrates robotic manipulation, vision-based inspection, and data-driven decision-making, enabling dynamic responses to quality deviations and production requirements. Non-compliant plates may be automatically downgraded, rejected, or redirected for reprocessing, based on customer specifications and in-line inspection results. The system is typically installed in the cooling bed area, immediately downstream from the hot rolling line, where plates are evacuated. It supports plate thicknesses ranging from 4 mm to 40 mm and is structured into distinct zones:

- Waiting Zone
- Elevation and Alignment Check Area
- Safety Zone
- Temperature Measurement Station
- Measurement and Marking Station
- Maintenance Platform
- Electrical and Control Room

Each section is integrated into a seamless operational flow, controlled by Polytec's proprietary automation and tracking platforms.

**Step 1: Processability Verification System**

Infrared sensors and curvature measurement devices assess each plate's temperature and flatness. This determines whether a plate is suitable for downstream operations and ensures compliance with processing standards.

**Step 2: Plate Defect Detection**

A mobile inspection unit equipped with high-resolution vision cameras performs a full-surface scan of each plate. The vision system identifies surface defects and irregularities and pinpoints their location and extent. Plates with critical defects can be flagged for rejection or downgraded based on defined quality rules.

**Step 3: Thickness Measurement and Ink Marking**

This subsystem uses non-contact measurement techniques to determine plate thickness with high precision. Upon validation, plates are marked with ink to maintain traceability throughout the process. The markings include key identifiers, enabling tracking in subsequent production and quality control stages.

**Step 4: Plate Punching and Quality Check**

For permanent identification, each plate is mechanically punched with a unique code. A vision system inspects the punching result for completeness and readability. DataMatrix codes and alphanumeric identifiers are validated and stored within the SCADA-based tracking infrastructure.

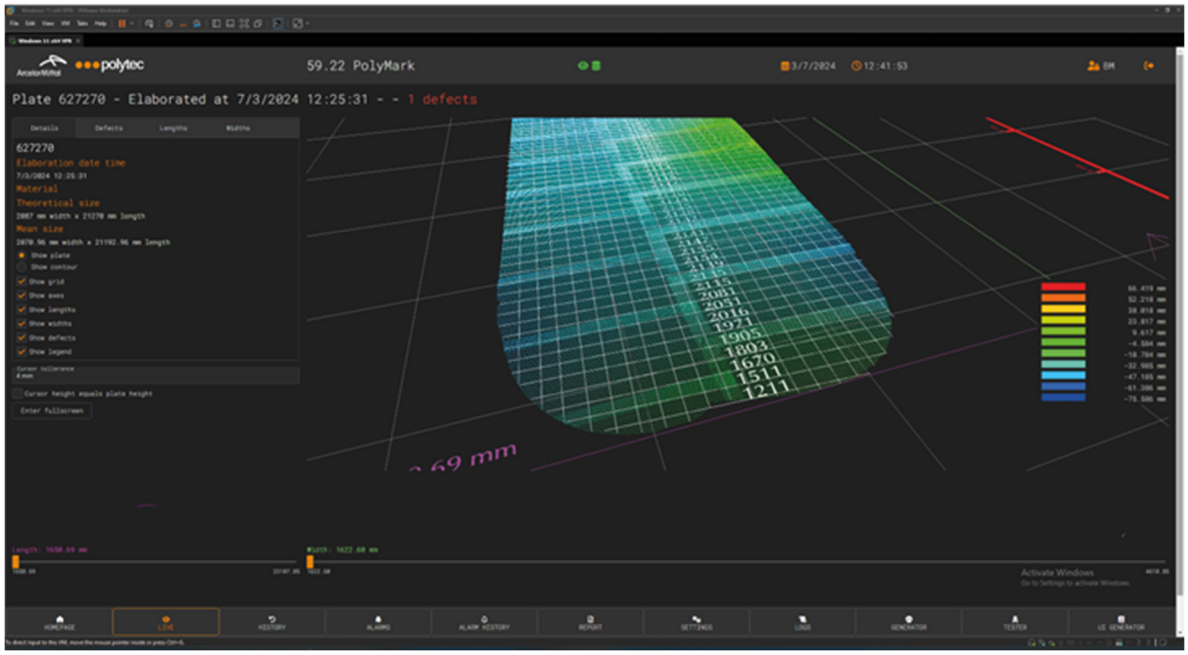


**Figure 2:** advanced vision system for contour measurement

 

The advanced vision system embedded within the platform supports simultaneous analysis of up to two plates and provides:

- Contour and dimension analysis
- Flatness and elevation deviation detection
- Plate rotation and orientation measurement
- Defect localization

It also verifies whether the plate is fully positioned within the robot's working area or requires pre-alignment.

## CONCLUSION

Polytec’s Plate Tracking Platform monitors plate position and status throughout the cooling bed and final handling stages. The system is SCADA-integrated and utilizes a network of sensors, vision units, and cranes equipped with Ignition-based HMI interfaces. This continuous tracking capability ensures full traceability from rolling to shipment, with centralized data access for quality, logistics, and customer service departments.

 