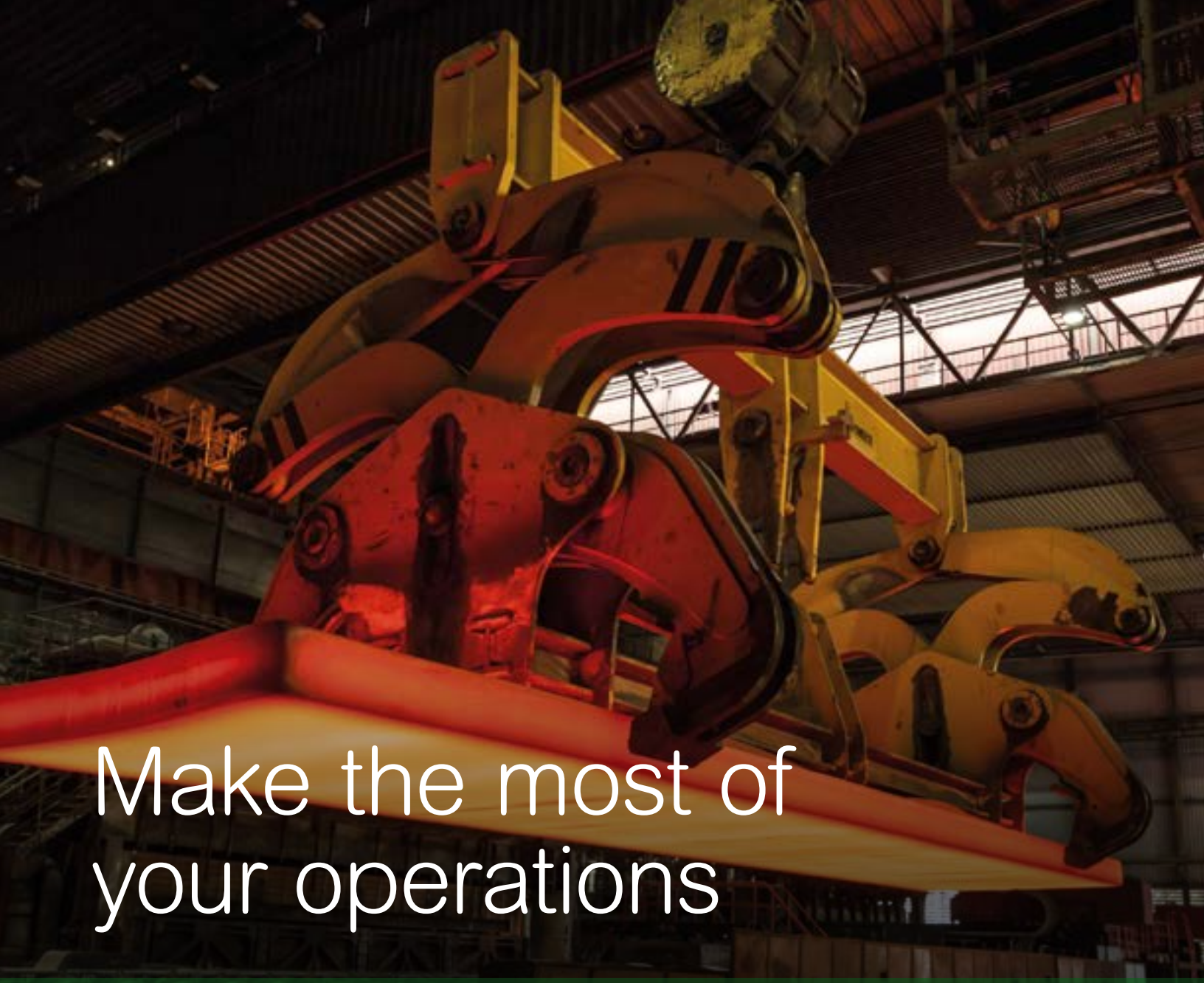


Make the most of your operations

Integrated Autonomous Crane System (IACS)

se.com/metals

Life Is On | Schneider Electric

The Integrated Autonomous Crane System (IACS) from Schneider Electric automates and integrates crane operations into the supply chain so steel producers can gain:

- Up to 30% improvement in productivity
- Crane availability >99%
- Dynamic resource allocation
- Up to 25% maintenance cost reduction

Integrated Autonomous Crane System

The steel industry dilemma

The steel industry is at a crossroads caused by extreme competitive pressure that requires both financial restraint on CAPEX projects and a need to invest in innovation, digitalization and modernization – elements that could deliver significantly greater efficiency and profitability as well as a much-needed competitive advantage.

Autonomous cranes

The Integrated Autonomous Crane System from Schneider Electric is the answer to that dilemma. It can improve your operations from furnace to yard and from warehouse to shipping by digitizing and automating your crane operations and integrating them into your supply chain and ERP.

Benefits

- Safer workplace
- Improved productivity
- Protect asset investment and improve overall reliability
- Increased material movements efficiency
- Resources reallocation
- Real-time strategic decision making
- Improved tracking and inventory management
- Reduced product damage from mishandling for higher yields – Fast ROI
- Reduced mechanical wear and lower maintenance/ repair costs

Integrated

Crane operations are connected to the existing ERP System and fully integrated in the supply chain. Thanks to the Warehouse Management System (WMS) software, real-time tracking is carried out for every product throughout the entire process. Product orientation, priority management between yards, coordination of all yard operations and storage optimization contributes to increasing overall efficiency.

Autonomous

Our unmanned, autonomous crane solution complies with the latest Directives and Regulations of safety (such as EN IEC 62061). Meeting the highest levels of requirements, a detailed risk analysis is undertaken before design and commissioning to work in full automatic mode, helping to prevent human intervention, identify risk and potential hazards.

Crane system

Schneider's years of expertise in smart crane solutions have been embedded in our technology to deliver the highest levels of performance on the market. Our system combines algorithms such as powerful anti-sway, auto positioning with 3D form recognition and dynamic optimized trajectories for the most advanced and efficient solution available.

Smarter crane operations driven by EcoStruxure

EcoStruxure is Schneider Electric's open IoT architecture that improves business efficiency by bringing visibility across all types of manufacturing environments.

EcoStruxure Hoisting Expert, the dedicated application for hoisting, is the answer to crane automation and yard management. From a multitude of smart devices to controls and advanced algorithms, the system collects all relevant data and converges the information received by the Level 3 and the Warehouse Management System for intelligent decision making.

Connected Products

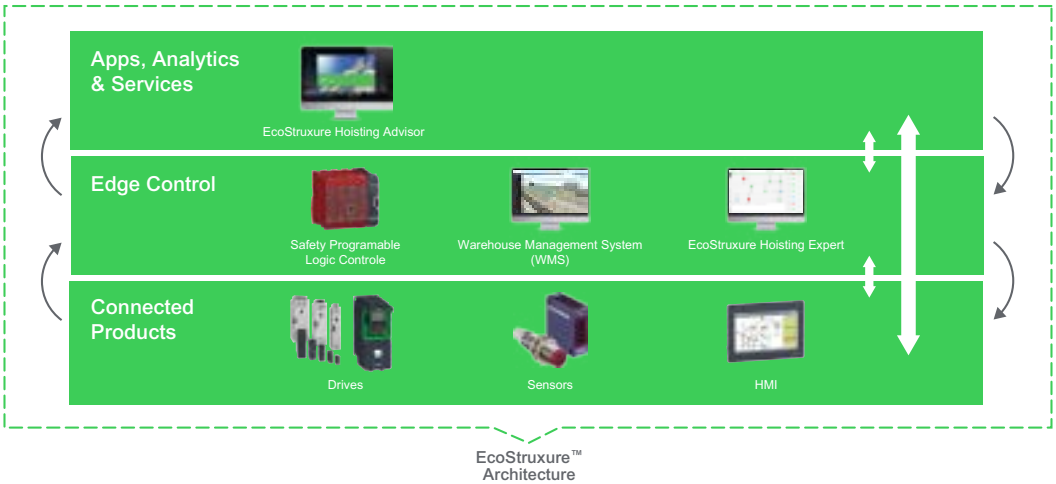
Field devices with embedded intelligence such as sensors, circuit breakers, meters, variable speed drives and scanners provide to real-time data that is essential to a higher-level of control.

Edge Control

Metal processes are mission-critical, so control of devices at the edge of the IoT architecture is a must. This essential capability provides real-time solutions which enables local control at the edge, increasing the Safety Integrity Level.

Applications, analytics, and services

Sophisticated problem solving and analysis capability at the enterprise level optimizes business operations and maximizes results.



Modernization

Crane modernization

Modernization is the first step in taking care of your initial investment and extending the lifecycle of your cranes. Aging cranes require more maintenance and productivity is often impacted by frequent disruption and major breakdowns. It's also a requirement to respect the latest regulations and safety standards to help prevent any incidents. Whether you are looking to improve comfort, help ensure your personnel protection, or simply increase reliability by implementing new technologies, the result will be a reduction in accrued operational and maintenance costs.

Benefits

- Increased safe operations for people and equipment (following Directives & Harmonized Norms based on compliant architecture and detailed safety risk analysis)
- Up to 30% maintenance cost reduction (reduced mechanical stress provides significant savings on ropes replacement, drums, reducers, wheels, spare parts etc…)
- Increased availability through advanced diagnostic tools
- Increased productivity by means of driver assistance and optimal crane operation
- IACS Ready (for autonomous yard)

Remote control

Real-time remote crane operation

Compared to traditional cabin-controlled cranes, remote operations can be performed 24 hours a day, without any interruption. Remote control improves visibility and enables automated movements and the use of advanced functionalities. By means of installing the latest technologies, the remote operator supervises maneuvers from a comfortable and safe central location. Processes can be controlled with high flexibility and performance. Cameras are distributed in strategic positions within the yard to allow for real-time monitoring and improved operational management.

Benefits

- Safe location and more comfortable environment for crane operators by implementing driving assistance and automated movements
- Resource allocation optimization
- Increased productivity by multi-crane control
- Healthier workplace environment
- Uninterrupted work

Semi-automatic

Advanced automated operations

Schneider Electric offers a comprehensive set of automated functionalities across all areas of steel warehouse management. From coil to slab, scrap to ladle, crane movements can be partially or fully automated by implementing advanced hoisting algorithms and technologies which effectively reduce manual and repetitive tasks. Processes are achieved according to pre-defined sequences of movements. At all times, manual mode is possible, and cranes remain operational without loss of flexibility and availability.

Benefits

- Higher throughput and efficiency
- Reduction of mechanical wear and longer equipment life
- Storage optimization through high accuracy and intelligent movements
- Reduction of damage caused by manual operations
- Crane operations accessible to less experienced personnel

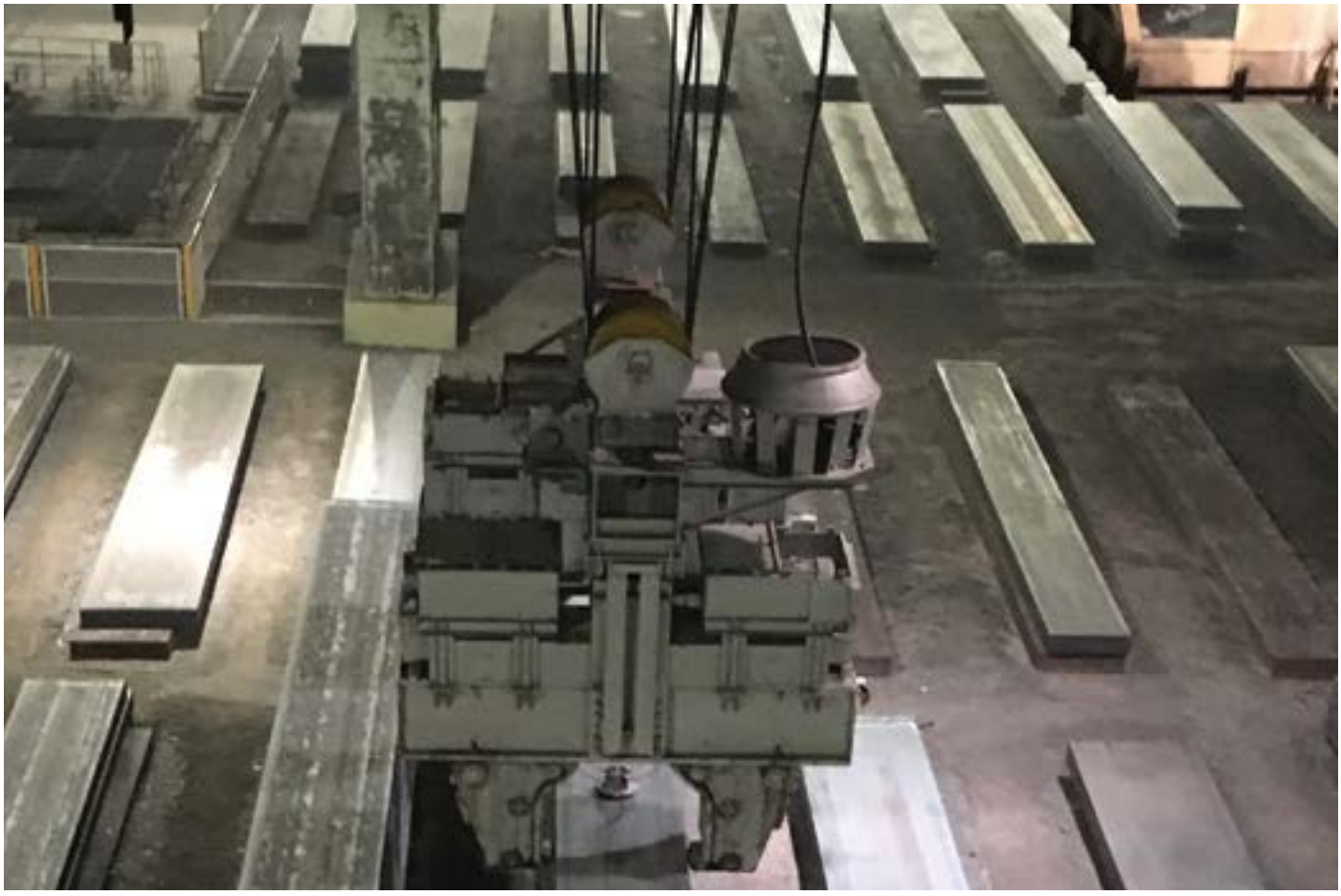
Integrated Autonomous Crane System (IACS)

Autonomous yard

IACS provides steel manufacturers the integration of their cranes into their overall processes. Yard management and product flow are based on easily configurable rules and movements priorities. All automated movement and product handling instructions are carried out with respect to restricted areas. These areas may be modified according to specific demands, new activities or production arrangements. In addition, achievable movements can be revised for optimal crane cycles (reallocation of work orders).

Benefits

- Resources reallocation
- Increased safety for personnel
- Storage optimization
- Improved material tracking and inventory management
- Maximized operational efficiency
- Minimized product damage from mishandling
- Reduced mechanical wear and higher equipment life
- Adaptable to existing yard layouts



Key technologies and expertise

Risk assessment

As safety is our priority, a detailed risk assessment is performed for every project Schneider Electric executes, including Performance Level or SIL qualification for existing safety functions.

This assessment, carried out under the latest Safety Machine Directive 2006/42/CE and harmonized Standard ISO13849-1, is a thorough analysis of the warehouse that identifies all processes, flow and situations. Based on the result, Schneider Electric proposes measures to help improving safety compliance and operational efficiency.

Reallocation of ground personnel significantly reduces risks caused by human interference without impacting crane efficiency.

However, should there be any requirement to enter the yard whilst a crane is overflying, the system detects the condition and the crane is stopped accordingly. Once reactivated, operations can continue in either automatic or manual mode. Specific areas such as maintenance or cutting zones, and new activities needing temporary restriction, can be modified on the fly in relation to the required performance level.

Connected products and intelligent sensors

Our solutions are designed on the supply and integration of connected devices, Safety Integrity Level components, dedicated variable speed drives and intelligent sensors using best-in class products. Installed in strategic locations by our highly trained experts, 3D lasers, scanners and positioning sensors provide necessary information to the edge control without reducing the crane's reliability.

EcoStruxure Hoisting Expert

Embedded in the system is EcoStruxure Hoisting Expert is a dedicated tool designed to help leverage large amounts of operational information. From crane and ground devices to process readings and equipment alarms, our software provides alerts and real-time diagnostics.

EcoStruxure Hoisting Expert also offers a set of advanced modules for smart monitoring, predictive maintenance and valuable KPI dashboards all based on AI, machine learning and digital twin technology. In constant search for game-changing innovations, Schneider Electric Research & Development discovers new patents, invents and develops the innovations of tomorrow providing a continuously improving response to the Industrial needs.

Advanced algorithms and proven anti-sway system

The steel industry requires the movement of suspended loads in the safest and most efficient way. Schneider Electric, with 70 years of hoisting expertise, has developed a high performant and very accurate anti-sway system to assist heavy duty and critical process cranes.

Combined with advanced algorithms, positioning loop and form recognition, the configurable and proven antisway system can handle various types of load and handling tools. For instance, coils can be lifted using an electro-magnet for stockpile optimization.

3D dynamic trajectories

For quality checks or maintenance purposes, the system can be dynamically configured to temporarily restrict a zone or modify access to an area. The cranes detect in real-time the new configuration and adapt the crane trajectories. Combining hoist, trolley and gantry movements, the system calculates obstacle avoidance and optimal path generation for improved efficiency.

Warehouse Management System (WMS)

Specific to the steel industry, the WMS is designed to manage in real time the tracking of every product throughout the production cycle, including the coordination between yard operations and itinerary, as well as storage optimization.

Slabs, coils and other products that may require technical assessment can be automated to improve storage capacity and reduce inventory errors. The number of storage levels isn't limited by the software. Multiple and different handling assets – such as cranes, roller banks, walking beams, conveyors and transfer cars – are managed in standard by the WMS.

The software optimizes every movement in order to satisfy demand and organizes the stock based on the most appropriate action and storage location.

Available for Transport Management System (TMS), the system is designed to manage all types of transportation – both internal and external to the plant (trains, trucks and pallets) – in addition to the loading and unloading performed by cranes in automatic mode.

Schneider Electric Hoisting Business Center

The resources and expertise behind our solutions

- Consulting services covering site surveys, feasibility assessment and safety risk analysis
- R&D organization and dedicating hoisting experts
- Turnkey projects providing unmanned yard and crane operations in steel facilities
- After sales technical support to help you anytime, anywhere. Available by phone or via digital tools, our Customer Care Center is dedicated to supporting your individual needs. On site services are also available with local and global hoisting experts.

Baosteel Group

Shanghai, China

Autonomous Slab Yard

Baosteel is a state-owned iron and steel company headquartered in Shanghai, China. It is part of Baowu Group, the largest steel producer in the world (95 million tons annual output). As of 2020, Baosteel employed more than 50,000 employees and had an annual revenue of around $43 billion.

As the world's leading modern steel company, Baosteel actively practices an intelligent manufacturing strategy. In 2015, the 1580 hot rolling smart workshop was one of a handful of projects in the steel industry selected by the Chinese Ministry of Industry and Information Technology for inclusion in the national intelligent manufacturing pilot program.

"The implementation of an unmanned operation for the slab yard in the hot rolling workshop is widely considered the most difficult part. With Schneider Electric's expertise in energy management and automation, the 1580 hot rolling smart workshop will see significant improvement in engineering control, efficient operation, safety and reliability, and intelligence operation."

"When the project is completed, it will become the first truly unmanned hot rolling workshop in China, providing experience for the smart transformation of China's steel industry."

— Wenqing Yuan
Hot Rolling Mill Plant Director, BaoSteel

Project description

- 6 overhead cranes in 3 bays
- 1580 hot rolling smart workshop
- Up to 3 slabs handled by the cranes
- Electrical clamps utilization
- 2 roller tables
- 3 transfer car STC
- Roller table furnace rejection
- 5 loading and unloading truck areas
- 9 furnaces and insulation pits
- 55 configurable danger zones
- 2 exchange zones (manual crane entering automatic bay)
- Cutting zone (with semi-automatic control)
- Walking beam with 8 positions
- Slab marking area

Key values

1. Real-time tracking of every slab through the entire process
2. Coordination between yard operation, continuous casting and hot rolling
3. Arrangement of slab track positions based on succeeding processes
4. Crane task assignment based on real-time positions
5. Positioning of the cranes in severe environments using optimal path generation
6. Division of on ground safe areas along with crane coordination and management
7. Real-time 3D load anti-sway
8. Combined anti-sway and positioning control

Customer challenges

- Industrial challenges caused by excess capacity, energy saving needs, cost constraints, and a need for innovation
- Rising labor costs and higher standards of operational safety requires an industry-wide digital upgrade with improved automation levels

The solution

- Automated solutions include breakers, drives, programmable logic controller (PLC) and WMS software management platform
- Optimize the hoisting and logistics system algorithm for the entire workshop
- Build a connected system
- Utilize expert engineering services

Customer benefits

- Reduced labor costs: a total reduction of 20 roller operators and several ground staff
- Increased safety of operators/non-operators in the workshop
- Improved productivity: daily capacity will increase to 10,500 tons, which means 15% to 30% up on average
- Reduced mechanical loss, easy maintenance
- Improved digital operations and a smarter supply chain utilizing real-time analytics
- Expert guidance and customized solutions for improved time management

The results: Life is On...

- Up to 30% improvement in productivity
- The 1580 hot rolling smart workshop achieved fully automated/unmanned operations, helping to ensure the smart manufacturing transformation and upgrade of Baosteel

Click here to see more

ArcelorMittal

Montataire, France

High density coil yard

ArcelorMittal is one of the world's leading steel and mining companies. Guided by the philosophy of 'safety first' and sustainable steel production, it is the leading supplier of quality steel products in all major markets including automotive, construction, household appliances and packaging. ArcelorMittal is present in 400 locations and has an industrial footprint in 18 countries.

The Montataire plant produces rolled steel sheets. The facility has three hot dip galvanized lines, producing one million tons of galvanized steel per year.

In order to increase its shipping capacity, ArcelorMittal has built an extension and equipped the warehouse to operate completely automatically. The handling tool is an electro-magnet with a maximum working load of 33 tons and a 43-meter cover.

ArcelorMittal entrusted recognized manufacturers for this project. The mechanical realization of the crane went to ADC of Fayat Group. Schneider Electric managed the upgrade of the yard to unmanned operations (automation and power system).

The overall expectation was to ensure the optimal handling quality of finished products and implement ArcelorMittal's health and safety policies to better protect field personnel and improve yard operational reliability.

Project description

- Overhead crane in single bay
- 3 loading/unloading deck areas
- 2 level coil storage
- STC transfer car
- Electro-magnet tool utilization
- 3 semi-automatic truck loading areas

Key values

1. Fully automatic crane with electro-magnet
2. Increased yard efficiency
3. Highly performant anti-sway system for:
   - Accurate handling
   - Precise load positioning
   - Reduction of damage to finished products

Customer challenges

- Improved handling of finished products
- Surface optimization for coil storage
- Reallocation of personnel
- EU Safety Directive compliance
- Coordinating management of automation supplier and crane manufacturer

The solution

- Detailed safety risk analysis
- Crane automation conversion
- Close loop anti-sway system combined with auto-positioning for increased accuracy
- Co-development of a fully automated solution

Customer benefits

- Surface reduction at ground (2-3 cm between coils)
- Significant scrap rate reduction
- Head count reduction
- Performance commitment
- Competencies transfer
- Availability of the crane > 99%

The results

- Safety compliance
- First fully automated yard with electro-magnet
- Semi-automatic truck loading
- Improved material detection
- Cycle optimization by implementing advanced anti-sway

Life Is On | Schneider Electric

More Schneider Electric solutions for the steel industry

- Process control and supervision
- MV and LV solutions
- Energy & Sustainability Services
- Industrial Control Equipment
- Data Centers

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