

The metals industry thinks big and gets practical about digitalization Best practices



The metals industry is under great pressure to transform from an environmental, political, and cultural perspective. This pressure will continue until major action is taken. ABB customers are setting ambitious goals for energy management and emission control, increased productivity, uptime, better operational cost control, and optimized capacity.

A complete paradigm shift and new ways of achieving these goals become possible through digitalization. Eager to attract the next generation of digitally literate talent to whom issues such as climate change are a genuine concern, companies want to demonstrate that they are serious about sustainability and innovation.

Working alongside visionary leaders on their most critical challenges often results in new industry perspectives. Sanjit Shewale and Tarun Mathur from ABB share their insights about metals producers successfully converting from conventional to more modern operations that are safe, smart and sustainable.

Read on to see practical examples of how to envision, create and manage digitalization initiatives and capture real value.

Seeing the future

So, how are metal producers supposed to bring metals digital plants to life? **It all starts by envisioning the future:**



Powerful, integrated solutions speeding up decarbonization.



New business models that ensure value outcomes and competitiveness.



Autonomous operations across transparent value chains.

No single company can do it alone. We believe that this can only be achieved by collaboration with the best ecosystem partners. When embarking on a digital transformation journey, it is also important to balance both short and long-term targets, driving rapid change while keeping sight of the larger vision.

Bringing metals digital plants to life - starts with your vision

- Powerful integrated solutions speeding up decarbonization
- New business models that ensure value outcomes and competitiveness
- Autonomous operations across transparent value chains
- Achieved by collaboration with the best ecosystem partners

Making an impact, layer by layer

Today's business leaders require organization-wide visibility and control, so that they can quickly evaluate how production is impacted by rising material costs, adapt pricing strategies, better manage supply chains and assets. **Data integration at all levels—from equipment and processes, to engineering and business systems—becomes one of the core business imperatives.**

Metals producers are already generating a lot of data, but are struggling to make it valuable for digital applications, ready to communicate towards the cloud and the shop floor in real time—and affordably. Digital apps simply do not make sense without such trusted data.

In real-world scenarios, converging operational, IT and engineering data can be challenging, especially when enterprise information infrastructure includes heterogeneous information systems. Most metals plants also live with incompatible legacy OT systems, which can become a massive hurdle to integration. The integration process requires expertise on both the domain and system level, and specific connectivity solutions. ABB has the right combination of domainspecific expertise and knowledge of both OT and IT infrastructure to ensure that your data management approach is closely aligned to your business strategy. We know how to label, model and structure industry-specific data, and how to store, compute and stream high volumes of data securely and cost-effectively. Traffic between layers can be secured and controlled down to the smallest detail.

CASE STUDY

ABB recently supported a steelmaker to establish a data platform delivering exhaustive plant data collection and smooth data flow upwards, enabling meta-data—structure and information within data itself and a site Data Lake—with cloud connectivity.

This steelmaker will use the data platform for better production knowledge and continuous improvement (such as speed, quantity and price), equipment condition monitoring (for availability) and more. We also ensured the reliability of sensors (avoiding temperature drift) and opened production data to customers (for direct sales).

Further options include:

- Cloud Data Lake
- Data integration for specific digital use cases
- Edge computation service environment
- KPIs, calculations, applications, visualization services, training and support

The old way versus the new way

When basic data requirements are fulfilled, there are plenty of potential use cases opening new possibilities. From our experience, the pain points that often come first are how to improve disparate equipment availability and ensure processes are running at the most optimal and profitable level.

To operate assets and processes optimally, don't treat them separately. The real value comes when you start uncovering previously hidden relationships and correlations.

ABB is helping customers improve interactions with other parts of the value chain, and get people engaged on all levels in real time, so that everybody is working towards common goals with a sense of belonging to one family.

We help operations people manage all resources in real time and provide contracted product quantities and qualities faster.

Industrial analytics and AI enable deeper insights

Companies focused on continuous improvement are eager to explore how powerful enterprisegrade industrial analytics and AI can provide them with still deeper insights about their activities, asset or process behavior and reap the benefits of higher productivity, lower energy consumption, lower emissions, and better industry reputation. Leaders with the need for deeper actionable insights are asking: How can I get real-time visibility into my business, mill, process or equipment—no matter the location or time?



Typical production

data collection

landscape





What digital solutions are out there?

When lacking in-house expertise in certain areas, **metals producers are turning to ABB** to get fast access to the best experts for cyber security services, predictive maintenance, critical equipment or process performance optimization and shared risks.

Technology leaders wish to see plants adopt new solutions to benefit operations, but sometimes the digital landscape is intimidating, with a surplus of vendors and software solutions. Decision makers in metals companies' c-suite, along with their managers and operators, must be convinced that technology applications will deliver measurable results.

What solutions are out there and how can they be applied to create value? We have selected real-life examples providing evidence that digital transformation strategies are working and demonstrating value in the metals industry.

There are five digital solution areas in the ABB portfolio, representing the value pillars at right.



Operational excellence

Get flexibility, value chain visibility | Execute strategy reliably, consistently ABB Solutions: Manufacturing Operations Management System, Smart Melt Shop, Stockyard Management System

Process performance

Improve quality, throughput | Reduce variability, lead time ABB Solutions: Advanced Process Control, Simulation, Process optimization services

Asset performance

Increase uptime | Reduce maintenance spend ABB Solutions: Asset Performance Management, Predictive maintenance services

Sustainability solutions

Manage compliance reporting | Reduce resource costs & risks ABB Solutions: Energy management, Emission monitoring

Connected worker

Enhance safety & productivity | Protect and retain knowledge ABB Solutions: Augmented and Virtual Reality, Mixed Reality, Remote services

Operational excellence

Operational excellence is about flexible manufacturing execution, improving insights from operations by integrating different areas – from production to upper-level systems – and optimizing costs across distributed plants. This includes KPI monitoring, analytics and remote operations capability.



CASE STUDY

Middle East and North Africa Al Ezz Dekheila Steel Company Alexandria S.A.E. (EZDK) Manufacturing Operations Management	O ezzsteel
Management	
	Middle East and North Africa Al Ezz Dekheila Steel Company Alexandria S.A.E. (EZDK) Manufacturing Operations Management

One of the largest manufacturers of metal and flat steel products in the Middle East and North Africa region is Al Ezz Dekheila Steel Company Alexandria S.A.E.. The company implemented ABB's Manufacturing Operations Management (MOM) system tailored to metals processes—including complete tracking from furnace charging area to C hook conveyor.

The solution gives EZDK 24/7 and year-round access to production management system dashboards from any mobile device, making it even easier for them to visualize their processes and utilize the information provided to further optimize operations.



CASE STUDY

Region: Company:

South Asia JSW Steel Ltd. **ABB solution:** ABB Ability[™] Smart Melt Shop



JSW Steel Ltd., India's leading steel company, adopted a complete smart factory solution for energy-efficient, safe and productive melt shop operation—which is unique in the industry. This digital solution connects steel melt shop operations with ladle and crane tracking and thermal loss prediction for higher casting speeds and additional output.

The ABB solution addresses one of the major challenges facing steelmakers today, which is to maintain the optimal temperatures required to make molten steel while balancing high electrical energy costs. Ensuring the right temperature at the right time, together with other parameters in the molten steel, directly determines steel quality and productivity.

JSW Steel expects to increase the company's EBITDA profit by around US\$2 million per annum through 4% higher casting speeds, time savings of one working day per month, and additional output equating to 24,000 tons a year.

In wider benefits, the lower energy consumption means fewer consumables used per batch and therefore a lower carbon footprint with less CO₂ per ton of steel produced. Automatic tracking and scheduling enable better maintenance planning and increases personnel safety as they are removed from the production area during crane and ladle movements. The scheduling solution also results in reducing tapping delays by ensuring these movements are synchronized with process requirements.

Based on advanced digital algorithms and mathematical modeling, ABB Ability[™] Smart Melt Shop is a true example of technology convergence as it utilizes cameras and image-processing, weighing systems, radar, laser and wireless-based technologies to ensure steel melt shops operate at optimum levels where crane and ladle tracking and their availability are critical to the entire steelmaking process.

CASE STUDY

Region: Company:

Sunflag Iron and Steel Company Ltd.

South Asia



Working alongside Sunflag Iron and Steel Company Ltd. in Bhandara, India, ABB has tied together all manufacturing and operational data from steel melt shop and rolling mills to improve production planning and plant performance optimization. The plant, which has a capacity to produce 500,000 metric tons of high-quality special steel per annum, **now has the platform to integrate data sources across 17 operational areas**, including non-ABB systems. ABB integrated with the existing automation systems for process and quality monitoring in real time, aligning with user-friendly operator dashboards available via a web page or mobile. The platform enables identification and diagnosis of issues or use of extra resources. This is allowing for better decision making and will ultimately show long-term returns in productivity, quality and resource efficiency.



ABB connected all manufacturing and operational data to improve production planning and plant performance.

CASE STUDY

Region: Company: ABB solution:

South Asia Premier steel manufacturer ABB Ability[™] Data Analytics Platform Another premier steel manufacturer in India was suffering from poor visibility across 35 systems from multiple vendors with a multi-level, hierarchical structure. The company needed to get a better understanding of complex interrelations of energy flows, operational modes, and other aspects.

It turned to ABB to establish a Central Command Center for better plant operation planning and coordination between multiple processing units. Now the production data, downtime, movement of heats, raw material, trends, SPC, alarms and events, are continuously monitored. The ABB Ability" Data Analytics Platform analyzes complex, large data across time frames and facilities, leading to significant savings from solving production bottlenecks and quality issues. Supply chain optimization goes along with planning and scheduling, with steelmakers looking for decision-making and end-to-end material tracking. A compelling example is the **ABB Ability[™] Stockyard Management System, which enables real-time supervision, planning, automated reporting and simulation of bulk stockyards.**

This solution opens the door to fully automated and autonomous operation of material handling chain and stockyards. It gives users a high level of situational awareness showing utilization of material, available quantities and qualities. It is also a formidable job scheduling, optimization, reporting and forecasting tool, and can include full-site automation for major handling machinery, **increasing stockyard productivity by 5-10%.**

CASE STUDY

Region:	Europe
Company:	Steelmaker
ABB solution:	ABB Ability [™] Stockyard
	Management System

ABB recently concluded a successful project for a German steelmaker seeking a quick digital solution for material batch planning and quarterly yard inventory validation. Thanks to the ABB solution, including 3D stockpile visualization, quality allocation and automated inventory estimation modules, the customer gained a much higher degree of transparency, resulting in better blend quality, optimization of material sourcing and trading, and overall production planning. Capacity utilization improved by stacking multiple ores in a single pile. Barge and train waiting time was reduced as yard planning and optimization became faster and more efficient.



Process performance

The process performance area includes solutions around advanced process control (APC), optimization and related services. **This lets the industry achieve sintering and pelletizing process stability, improve quality and output, and reduce costs by employing Model Predictive Control** that acts as an autopilot and sustains benefits over time.



CASE STUDY

Region: Company: ABB solution: South Asia Premier steel manufacturer ABB Ability[™] Advanced Process Control At an Indian steel plant, the task was to maintain the outlet temperature at a desired setpoint. The company implemented ABB Ability[™] Advanced Process Control with dryer outlet temperature as the controlled variable and fuel flow as the manipulated variable.

The company developed a model of dryer outlet temperature based on plant data to include the fuel flow control valve and disturbance variables, such as feed rate. They used the model to predict the upcoming control performance, calculating setpoint corrections, which were then downloaded to Level-1 proportional–integral– derivative (PID) controllers.

ABB Ability[™] Advanced Process Control maintained the dryer temperature even with changes in feed rate and process delays, **achieving a 10% reduction** in the standard deviation of the temperature. The implementation of ABB Ability[™] Advanced Process Control stabilized temperature conditions within the dryer, improving overall performance and productivity.

Process performance

Improving process performance with industrial analytics, AI and ML



Across all digital solution areas, there is always the opportunity to make enhancements with industrial analytics, AI and ML.

Cold rolling mills

Cold rolling mills have opportunities to optimize their performance and profitability through continuous performance monitoring and realtime expert insights. The ABB Ability[™] Data Analytics Platform for cold rolling mills helps carry out benchmark analysis comparing productivity, quality and yield for golden coil and actual coil.

It lets you find out which process steps (threading, reversing, unthreading, acceleration, deceleration, minimal speed, operation speed and slowdown) are having a negative impact on your productivity.

You can investigate your thickness deviations including related sensors, actuators and control loops or find the root causes of your exit flatness quality issues. If you want to know the state of your mechanics, motors, drives, and automation platform or if you are simply unsure about which issues to prioritize in terms of potential performance improvement, our analytics engine specific to cold rolling will help you focus on the right goal, attain optimum rolling setpoints and achieve world class strip quality and uniformity at the highest rolling speeds.

Bar mills and wire rod mills

For bar mill and wire rod mills with large amounts of plant and process data, it is also not realistic to manually monitor all the important KPIs due to a large number of data sources and process variables.

Operators need more advanced tools to help them better understand the trends and interrelations between the process parameters that cause faults and failures. The ABB Ability[™] Data Analytics Platform for long product mills is increasingly used for this purpose, but success in digital depends on the availability of process expertise in both implementation, operation and maintenance of such tools.

Combining data analytics, process-specific algorithms, real-time continuous monitoring and remote support from ABB experts allows our customers to access a much higher level of process insight, preventing cobbles and continuously improving yield, quality, productivity and margin.



Asset performance

Asset performance is about increasing the uptime of the plant through asset monitoring and failure prediction, prolonging the life of assets, and achieving the best performance from them. **Asset-intensive industries, including metals, have a focus on reducing maintenance costs.**



CASE STUDY

Region: Company: ABB solution: Southern Europe CELSA Barcelona ABB Ability[™] Asset Performance Management

According to ARC Advisory Group, 18% of assets have age-related failure patterns, and 82% of asset failures happen at random intervals. Switching from time-based equipment inspections, without any sensors on assets, to checking equipment health status on-line, with real-time predictive notifications, means faster decisions, easy rootcause analysis for quick failure detection, faster corrective actions thanks to the recommendations and continuous improvement culture.

CELSA Barcelona, one of Europe's largest steel producers, deployed ABB Ability[™] Asset Performance Management solutions. The application monitors the health of a variety of production assets, including automation, instrumentation, electrical, mechanical and process equipment. This has resulted in the company obtaining a complete overview of its production assets' health, avoiding unnecessary maintenance and unplanned shutdowns, reducing exposure to hazardous areas, and speeding up repairs.

The next generation of Asset Performance Management

Asset performance management means different things to different people. People have varying degrees of difficulty locating and analyzing data across an organization. Some assets do not last their originally predicted design and service life. Assets commonly operate past their design life, and that produces performance problems and safety risks.

The next generation of asset performance management solutions is getting enhanced by AI and ML. At ABB, this is underway with ABB Ability[™] Genix APM. Based on ABB's Industrial Analytics and AI suite, ABB Ability[™] Genix APM helps you get the most from disparate data sources by:

- automating data integration
- identifying previously hidden relationships
- making correlations with processes
- analyzing performance trends
- making timely predictions and accurate asset life assessments

The business value from this holistic view and tighter control over assets is tailored to specific roles in your organization and enables crossenterprise actions. This can only be achieved if you trust the people who are building the optimization models, trusting their deep process expertise, and their know-how of your operations, processes and asset behavior. Now, their expertise and ingenuity can be captured and shared on a common platform—augmented with edge, cloud and ML technologies for maximum impact. We are particularly excited about this new APM solution, which will be a step change for the industry.

Sustainability solutions

In addition to the recurring challenges of optimizing efficiency, maintaining throughput and quality control during high-volume production, **metals producers must now comply with increasingly strict environmental legislations aimed at reducing emissions, or face penalties.**

Iron ore reduction is where the vast majority of carbon emissions come from in steelmaking. Transforming the ways to make steel depends on the energy sources available. But the world will continue to rely on iron ore until around 2100. The carbon challenge for the industry in the coming decades is to transition to alternative sources of energy and to optimize their use for iron ore reduction.

CASE STUDY

Region: Europe Company: Steelmaker ABB solution: ABB Ability[™] Energy Management The sustainability solution area reflects the need for managing environmental compliance and reporting for energy, water, emissions, and waste. For example, in a European steel plant with an annual capacity of up to five million tons of steel, complex distribution networks for electricity, steam, by-product gases and imported fuels make up to 20% of production costs.

Digital Energy Management in the steel industry has a proven track record of short payback times and long-term benefits. It not only optimizes costs, throughput and quality, but also energyrelated costs, raw material usage, carbon, greenhouse gases and waste emissions. It relies on decades of experience in the process industries, and steelmaking in particular, captured in predictive energy management algorithms. This steelmaker is using ABB Ability[™] Energy Management solutions for site-wide optimization by managing energy purchase and production. The software assists gas dispatching, calculates optimal power production based on real-time data and is adapted to power market. It also optimizes energy consumption and secures energy availability considering steam yield, consumption of by-product gases, energy purchase and production including site power plants and turbines.

ABB helped this customer achieve **10% less flaring of gases** thanks to data and optimization model and **15% accuracy improvement** of electricity procurement forecasts. The company now saves roughly **15,000 Euros per month.**

Improving waste gas utilization in metals production

Waste gas utilization in metals production can be greatly improved by monitoring generation and consumption across plant facilities in real time. Data is collected from multiple systems to compare allocation with actual consumption, provide real-time demand and supply calculations, balancing, benchmark and optimal distribution as well as forecasts based on production plans and historical data modeling. Root cause analysis is also applied to the data whenever a gap occurs between supply and demand.

Complementing digital energy management systems with data contextualization and digital twins further optimizes energy consumption through load profiling and balancing, and process parameters (such as air temperature at compressor intake). The latest possibilities from an enterprise-grade platform and suite of AI and ML tools let you deploy and monitor advanced controllers, data analytics and optimization solutions at the edge, to and from an industrial cloud/multi-cloud or on-premise.

Deploying digital energy management system - modular approach



Connected worker

Safety, productivity, compliance, and training of your workforce in these areas can be more effective through software solutions,

where knowledge retention is an issue for companies.

The industry rarely has key experts in the same role for 25-30 years as was the case in the past, so there is an opportunity to retain and speed up knowledge transfer through simulators and technology advances from the augmented reality (AR) and virtual reality (VR) space. ABB is working on helping companies move towards an immersive workspace with mixed reality (XR) helping people master necessary skills more effectively and faster, establishing a foundation of consistency no matter the personnel.



CASE STUDY

Region:	Southern Eu
Company:	AST Terni
ABB solution:	Remote FAT



AST Terni needed to upgrade the cycloconverter drives at its No. 8 Sendzimir steel mill. The facility uses multiple processes from melting to surface finishing treatments over a one-and-a-half square kilometer facility. The cycloconverter upgrade needed to be completed within a short time window—during the global COVID-19 pandemic.

Europe

ABB brought together two teams, one from ABB Process Automation and one from ABB Motion for this project. The pandemic presented several unique challenges, especially for factory acceptance testing, which typically requires ABB engineers to visit the customer's site.



ABB successfully deployed augmented reality encompassing audio, video, document sharing and live annotations for remote testing during travel restrictions.

AST Terni is now enjoying improved usability, flexibility and control, along with increased reliability, process stability and uptime. The AMC34 control platform, part of ABB's cycloconverter upgrade package, provides high-control performance with better accuracy of motor models, resulting in greater dynamic response, increased production capacity, less energy consumption, reduced maintenance costs, and extended lifetime of the equipment. Application software improvements also enhance flexibility and come with new built-in safety features.

Cyber security

Another important aspect across all digital solution areas - and their enabler - is cyber security.

Leading metals customers on the digital transformation path are taking a more proactive security approach to safeguard their people, assets and reputation. And because technology and cyber threats can both change unpredictably, they need to review their strategy periodically, including performing simulations under different circumstances, like a major ransomware incident.

When deploying ABB's digital applications on premise, on ABB-managed Cloud, customermanaged Cloud, or on customer private Cloud/ data center, we safeguard intellectual property and ensure defense in depth cyber security, data protection, reliability, privacy, as well as ongoing services. The Cyber Security Reference Architecture is an ABB-developed design standard for industrial systems and associated security controls in line with current cyber security standards and best practices.

ABB Ability[™] digital services have successfully improved the cyber security of industrial sites across the globe. Many customers have scheduled risk assessments as part of their ongoing annual service agreements, while others have implemented cyber security analytics dashboards to continuously monitor, diagnose and resolve security issues.



CASE STUDY

Region:	Europe
Company:	A global steelmaking co
ABB solution:	ABB Ability [™] Cyber Secu
	services

A cold-rolling mill in Spain wanted to review the cyber security status of their systems using a noninvasive service that identifies strengths and weaknesses for defending against cyber attacks. **ABB's Cyber Security Fingerprint service** found

mpany

rity

the steel mill's process automation systems were running outdated versions of software that were no longer supported. Additionally, the company needed to upgrade its antivirus protection. One of the Fingerprint's key features is that it highlights areas of opportunity for protecting against security breaches caused by company personnel who carelessly or maliciously spread malware through software or USB peripherals, as well as threats from outside hackers. A detailed report was delivered in one man-week, followed by fast resolution for important security issues. This was also used as a foundation for a comprehensive cyber security plan.



Bringing it all together



Digital transformation discussions will continue between the many process industries leaders and technology implementors and innovators.

Increased complexity requires the ability to master different technologies, industry-specific processes, and cyber security, and to provide the needed consultancy and assistance to the end users from the early design stages up to system commissioning and maintenance. The reward for metals plant owners adopting digital solutions will be better performances at a reduced capital cost, overall standardization of operational, process, maintenance, environmental and supply chain management practices, which will help in reducing and managing the inherent complexity. Today, ABB establishes a single source of truth system for all information related to all these five solution areas. By combining perspectives between the shop floor and top floor, ABB directly contributes to strengthening your continuous improvement cycle. With energy cost, efficiency and environmental implications gaining top priority globally—particularly for heavy energy consumers—new digital tools are being developed at a much faster pace than ever before, in collaboration with customers, universities, and other ecosystem players.

Let's join forces to co-develop and collaborate to set new standards for the metals industry.

The authors



Tarun Mathur Global Product Manager, Metals Digital, ABB



Sanjit Shewale Head of Digital, Process Industries, ABB

Tarun Mathur joined ABB in 2006 and has held several positions in research and development, specializing in the development of advanced model-based solutions for process industries.

In his current role, Tarun focuses on projects applying new digital technologies to optimize steel plant performance, process and quality.

Tarun graduated from the Indian Institute of Technology, Mumbai, and holds a Master's degree in mathematical modeling and process control. Sanjit Shewale joined ABB in 2020 as the Head of Digital for Process Industries. He has 20+ years of experience in the advanced industrial software space across many different verticals, including discrete.

Most recently, he was with Honeywell's Connected Plant & Advanced Solutions and Danaher's Product Identification business. Sanjit holds a Chemical Engineering degree from McMaster University and a Management Sciences degree from University of Waterloo.

At ABB his focus is on digital strategy and sustainability. He writes about ways to accelerate the shift to carbon-free and energy-efficient operation, autonomous systems, remote management, asset performance and more.

Sources

ABB in metals
Digital transformation in the metals industry

Learn more