How do digital champions manage energy as they drive to achieve sustainability goals? Part 2
Meet ABB Process Industries’s digital experts on sustainability

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How do digital champions manage energy as they drive to achieve sustainability goals?

PART 2
A key factor in accelerating industrial decarbonization

Well-designed government programs that are adapted for the country-specific requirements of the industry sector.
ISO 50’001 energy management standard makes it easier for organizations to integrate sustainability into daily operations

- Organizations decide to implement the ISO 50’001 certification for the benefits it provides and to show their decarbonization engagement to their supply chain partners and local authorities
- ISO 50’001 has seen a 9.7% increase in worldwide certificates in 2020
- Germany, China, France, Italy, UK, Hungary and India have the highest number of certified sites across all sectors

<table>
<thead>
<tr>
<th>Country</th>
<th>Certificates</th>
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<tbody>
<tr>
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Number of ISO 50001 certificates in 2021

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<th>Sector</th>
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<td>Pulp &amp; Paper</td>
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<td>Cement</td>
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<td>Metals</td>
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<td>Electrical equipment</td>
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CASE STUDY: Effective energy saving methods at cement plant in China
Outstanding energy efficiency practices compared to similar enterprises driven by ISO 50’001 adoption

SITUATION
Two 5000t/d cement clinker production lines
Own characteristics in terms of the energy purchase, storage, processing, conversion, distribution, transmission, use and statistics management.

SOLUTION
ABB energy monitoring and reporting system
Automated data collection, energy monitoring benchmarking, regression analysis
Process improvements and upgrades
Energy audit, energy-saving diagnosis, carbon emissions verification, thermal calibration, energy metering system and other hardware-related work

SUCCESS
Energy performance increased by 7.53% annually through the ISO 50’001 energy management system certification.

Savings of $316,332.87 during operation of the energy management system and $16,16066.37 for capital investment projects, resulting in total energy savings of $4,779,392.24 in 5 years.

On-line article
Centralized operation of iron ore mine in South America

Central control room brings together the lessons learned from mining automation and digital solutions.

The project uses 93% less water, consumes 77% less fuel and emits 50% less greenhouse gases than a comparable operation based on conventional methods.

**SITUATION**

Mayor capacity expansion while building sustainable future mine

Lack of a central system for information exchange and plant management. Need to
- Extend the lifespan of iron ore mines
- Process low-grade ores
- Expand production capacity
- Contribute to environment preservation
- Truck-less system to transport the iron

**SOLUTION**

Digital solutions
- Advanced Process Control and Autonomous Stockyard Management System
- Energy Management System (EMS)
- Asset Management (>12000 Devices Integrated)

Best-case integration system – automation & electrical
- IEC 61850 standard allows for interoperability of IEDs, freedom of configuration and long-term stability in a rapidly advancing technological field

ABB Service Center with mobile workshop and parts inventory, as well as remote diagnostic for monitoring and carrying out preventive actions.

**SUCCESS**

Central control room with unified interface for maintenance and other information

Lower carbon emissions, reduced operating costs (world’s lowest iron ore production cost) and increased safety
- Dry processing of ore helps to almost eliminate water usage
- Installation of long-distance conveyor belt powered with electricity eliminates the need to transport ore with diesel trucks.
Introduction to energy demand side optimization

Utilize an asset when the demand is small and supply large
Introduction to energy demand side optimization

Utilize an asset when the demand is small and supply large
Introduction to energy demand side optimization

Optimize asset usage
Add constraints

- **Min 5 hours work during office hours**
- **Min 1 hour family time per day**
- **Max 1 hour driving per direction**
- **No wakeup call before 5 am or later than 9 am**
Introduction to energy demand side optimization
Add cost functions and optimize

Optimization task: Maximize $F_1(\cdot) + F_2(\cdot) + F_3(\cdot) + F_4(\cdot) + K_1(\cdot) + K_2(\cdot)$ → Drive to work at 6 am, drive home at 3 pm
CASE STUDY: Reducing costs with optimal energy demand scheduling in the steelmaking process

Automatically and optimally create a new schedule, or manually update an existing one

SITUATION

A complex melt shop

Significant impact of energy costs on operations

Highly volatile electricity spot price

Too many parameters in the play, difficult to make the right decisions

SOLUTION

ABB Energy Management System leverages flexibilities associated to the batch-oriented nature of steel process, to adapt production according to energy cost

- The system is flexible enough to support different melt shop configurations, and steel product portfolio
- The system includes all necessary information:
  - External day-ahead electricity market
  - Processing, transportation, setup and cleanup times
  - Maintenance plans, and availability of equipment

The benefits are estimated to be in the range of 2 to 5 percent

The production scheduler can automatically and optimally create a new schedule, or update an existing one to optimize energy costs

The system is a useful tool for running various simulations and what-if analyses
Industrial demand and supply optimization

Sources of optimization potential

1. Consumption
2. Grid and market
3. Storage
4. Excess production capacity
5. Energy production capacity / additional energy sources

Task: Deliver customer orders on time at minimized energy cost
Enterprise-wide electricity procurement, energy forecasting & optimization

Real-time decision support on how to use, generate, purchase or sell energy and emission rights

SITUATION

20 TWh/y electricity procurement, 14 mills
- Own generation and shares in various power plants
- Purchase and sales to and from external partners and market operators
- Need to manage energy assets centrally on an enterprise level to fully leverage energy assets

SOLUTION

ABB Ability™ Energy Management: 14 mill systems and 2 enterprise control rooms
- Realtime monitoring and reporting
- Energy balance management
- Energy forecasting
- Energy cost optimization based on generation, consumption and market.
- Hydro power stations control

SUCCESS

Real-time decision support helps reduce costs, payback within months
- Managing energy balances in real time
- Energy demand planning and procurement optimization
- Energy cost optimization, taking into account the available resources, their prices and operational constraints
- Additional profits from effective use of energy reserves and hydro-power

The initial system payback time was only a few months
Advanced Process control in the digester, bleach & pulverised fuel boiler plants

Paper mill ensures more stable and reliable energy supply while reducing operating costs

SITUATION
P&P boilers - a complex optimization problem
- Not only is the steam needed at different, very specific pressures and temperatures, but its consumption rate is also highly variable due to the variability of the process conditions, trips and/or starts of steam consumers, etc.
- Steam network stability and reliable power output are difficult to attain, further complexity is added by energy market variables, prices, and local rules for energy markets.

SOLUTION
Ability™ Advanced process Control based on MPC
The MPC makes use of soft and hard constraints.
- Soft constraints are settings determined by the operational staff. The MPC then optimizes the controls without violating these constraints.
- The hard constraints are fixed and are determined on the boiler design and safety of the equipment. The MPC will sacrifice optimum control to prevent violation of any of the hard constraints

SUCCESS

Case study
Take advantage of asset flexibility to reduce production costs while at the same time improving steam supply reliability. Achieve 3% to 5% savings in Steam Costs with ROI below 1 year by applying APC technology.
Site-wide optimization of gas and other energy assets for steelmaking process
Managing energy purchase and production including site power plants and turbines

**SITUATION**
2nd largest industrial site in France
- Annual capacity 4,5 million tons of steel
- Complex distribution networks for electricity, steam, by-product gases and imported fuels make up 20% of production cost

**SOLUTION**
ABB Ability™ Energy Management with integrated by-product gas network
- assists gas dispatching, calculates optimal power production based on real-time data and adapted to power market
- 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

**SUCCESS**
Improved operations and considerable savings
- 10% less flaring of gases thanks to data and optimization model
- 15% accuracy improvement of electricity procurement forecasts
- 15 k€ per month saved (yearly average)

There is no other supplier with an equivalent industrial-scale product
Typical steps and modular approach for deploying a digital solution for industrial energy management and optimization

1. **Measure and Monitor**
   - Monitoring & reporting
   - Start with basic energy monitoring & targeting

2. **Identify and alarm**
   - Forecasting & planning
   - Extend with energy demand planning & forecasting

3. **Report and analyze**
   - Energy optimization
   - Leverage process and production flexibility for holistic optimization of energy supply and use

**ABB Ability User Interface**

**ABB Ability History RTDB Database**

**Plant Automation**

**ABB 800xA Automation Integration**

**OPC Integration**

**Modbus/TCP**

Establish an integrated system for all data related to regulatory compliance, emission monitoring, energy mix planning, consumption, conversion, and trading — including electricity, gases, water, waste, carbon, and more.

**up to 15% cost savings possible with energy efficiency monitoring and optimization using EnMS**

ISO 50001:2018
International Standard for Energy Management Systems conformity assessed by
ABB Ability™ Energy Management System for industries

Mining Demo

More information and downloads
ABB Ability™ Energy Management System for industries

Metals Demo

More information and downloads
ABB Ability™ Energy Management System for industries

Pulp & Paper Demo

More information and downloads
Join our next webinar on **May 18** to learn more

**Industrial water treatment optimization**
Energy efficiency, chemicals reduction, water quality and recovery in P&P and mining

**Predictive emission monitoring**
Lessons learnt from the oil & gas that can be applied to processes with constant quality fuel

**Sustainability pathways with other digital technologies**
Beyond energy management

**Empowering frontline workers with modern digital tools to improve sustainability and safety**
Lessons learnt from a leading utility company using Connected Worker software

**Integrating sustainability into centralized mining operations**
Leveraging Industrial Analytics and AI for Energy Optimization, HSE and beyond

**Cement production lowers operating costs by 3-5% across multiple plants**
Improving energy efficiency, availability, reliability and lifecycle of electrical & process assets while increasing yield & quality

**Tissue mill digital project**
Leveraging Industrial Analytics and AI

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**SUSTAINABILITY WEBINAR SERIES**

**How do digital champions manage energy as they drive to achieve sustainability goals?**

**PART 3**

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**ABB**
Would you like ABB to assess your energy performance and improvement potential?

Type “YES” in the chat now and we will contact you by email.

You can also use the “Contact Us” form on our website any time.

Industrial Energy Management and Optimization