How do digital champions manage energy as they drive to achieve sustainability goals? Part 1
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 1
Recent headlines

Consumers, investors, governments and industries care about sustainability, but only few have a “credible” plan. The sustainability puzzle widely remains unsolved.
Industrial sustainability puzzle: don’t wait for all the pieces to be there

Digital energy management is one of the key elements of sustainability strategy
There are strong action imperatives for industries to engage in cost reduction, energy efficiency and decarbonization measures.
However, many cost savings, energy efficiency and emission reduction opportunities remain untapped.
CASE STUDY: Energy audit and EMS implementation yield significant savings

A combination of assessment, hardware updates, and software-based monitoring and targeting help optimize energy and natural gas consumption

Pulp & paper mill
Spain

SITUATION

High downtime caused by power consumption limits
- Problems with tripping of maxi-meters, devices for automatic blocking of power consumption on reaching pre-determined limits (critical to avoid penalty payments to local electrical utility for consuming too much energy)
- Lack of real-time visibility of limits breaches
- Age and lack of servicing identified as factors leading to maxi-meters becoming faulty

SOLUTION

Energy audit and energy management software installation
- Energy audit, including on-site assessment and off-site analysis to measure values, collect information, and draw up list of opportunities – including hardware updates.
- Implementation of ABB Ability™ Energy Management System to optimize energy consumption

Savings in tons of CO₂:
1.467 tons / year

Online article

OpEx

April 26, 2023
Slide 7
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Monitoring and reporting

Reference examples

<table>
<thead>
<tr>
<th>Reference</th>
<th>Cement</th>
<th>Mining</th>
<th>Metals</th>
<th>Pulp &amp; Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>Large cement producer, 50-100 MW plant with up to 10'000 TPD plants</td>
<td>Large and modern underground mine</td>
<td>Large metal plant &gt; 1 mtpa steel production</td>
<td>Paper plant producing machine-glazed kraft paper</td>
</tr>
<tr>
<td>Highlights</td>
<td>Energy monitoring of cement and captive power plant</td>
<td>Monitoring, reporting for HQ, several mines and harbors</td>
<td>Online and automated reporting of all used energy types</td>
<td>Energy meters installation for monitoring at right granularity</td>
</tr>
<tr>
<td></td>
<td>Power quality (current, frequency, voltage), losses (distribution, transformer) &amp; single line diagram</td>
<td>Increase energy and operational efficiency</td>
<td>Transparency to energy consumption and cost structure</td>
<td>Alarms to avoid peak loads as per contract with local utility</td>
</tr>
<tr>
<td></td>
<td>Fuels &amp; calorific energy usage</td>
<td>Enable reduction of carbon dioxide and sulphur dioxide</td>
<td>CO-gases, process steam, district heating, Compressed Air, LNG</td>
<td>Enable detection of energy saving opportunities, raise efficiency</td>
</tr>
</tbody>
</table>

Energy consumption & cost structure transparency | Energy efficiency | Continuous improvement | ISO 50001
Poll #1

Is your site certified according to ISO 50001 Energy Management standard?

A. Yes, we are already certified
B. We have started the certification process
C. We would like to get certified in the coming years
D. No plans to get certified
E. Not aware of this standard

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CASE STUDY: ABB factories & offices reduce energy costs

Transparency to energy consumption and cost structure for better forecasts & continuous improvement

We cut 300k€ off our 2M€ energy bill during the first year

Pekka Tiitinen, Country Manager, Finland

SITUATION

14 business units with different energy types: electricity, heating, water
• Annual electricity bill ~2M€
• High electricity cost compared to Nordpool spot market price
• Price is high due to lack of reliable energy forecasts

SOLUTION

ABB Ability™ Energy Management using specific energy consumption and production plans
• Pre-study to analyze savings potential, analyze consumption and specific energy consumption
• Energy monitoring & targeting
• Energy forecasting
• Deviation reporting as source for continuous improvement

SUCCESS

Reduced costs with improved consumption forecast
300k€ total savings over first year
• Transparency to energy consumption and cost structure
• Continuous improvement
## Load planning and forecasting

Reference examples in Metals, P&P, Manufacturing

<table>
<thead>
<tr>
<th>Reference</th>
<th>Metals</th>
<th>Pulp &amp; Paper</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW capacity</td>
<td>350-450 MW</td>
<td>100-200 MW</td>
<td>12-13 MW</td>
</tr>
<tr>
<td>Number of tags</td>
<td>3'500-4'000 tags</td>
<td>~4'500 tags</td>
<td>~5'000 tags</td>
</tr>
<tr>
<td>Main loads</td>
<td>Electric Arc Furnace (EAF) - Rolling mill</td>
<td>Mechanical pulp plant lines - Paper machines - Back pressure steam production - Internal powerhouse</td>
<td>Three (3) main locations - Location specific total electricity consumption</td>
</tr>
<tr>
<td>Forecasting method</td>
<td>EAF minute-wise profile</td>
<td>Paper grade/ production speed dependent production plans</td>
<td>Historical seasonality (No production plan)</td>
</tr>
<tr>
<td>Forecast time steps</td>
<td>30 minutes time-steps</td>
<td>60 minutes (one hour) time-steps</td>
<td>60 minutes (one hour) time-steps</td>
</tr>
<tr>
<td>Power procurement</td>
<td>Enabling centralized power procurement for three (3) plants</td>
<td>Sending outside energy demand to central procurement system</td>
<td>Link to 3rd party energy market company for purchased power (ongoing project)</td>
</tr>
</tbody>
</table>

Enable scenario planning, provide accurate energy forecast, reduce energy procurement cost by 2-5%
Poll #2

How are you forecasting your energy consumption towards the vendors?

A. Based on averages
B. Based on the actual production plan
C. We do not forecast

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CASE STUDY: Reducing costs with optimal production timing at a pulp mill

Industrial demand-side energy management exploits real-time process and energy price data

SITUATION

High energy costs at Refined Mechanical Pulp plant
- Significant impact of energy costs on operations
- Highly volatile electricity spot price
- About the mill:
  - Two board machines, creating 520,000 t/year
  - Refined Mechanical Pulp plant, 10 MW power, feeds board machines
  - 500 m³/130,000 gal storage tank between RMP plant and board machines

SOLUTION

ABB Ability™ Energy Management for optimal production timing
- Minimizes the electricity costs by optimizing the refined mechanical pulp (RMP) operation according to electricity spot price
- Provides accurate energy planning and power consumption forecast for electricity purchase
- System extension to new biogas power plant

SUCCESS

Reduced costs

14.5% total savings over two sample periods (when optimization was possible and results were utilized by operators)

I know companies offering similar products, but in my opinion, the ABB one is the best.
CASE STUDY: Cement production goes digital
Optimal production schedule to minimize energy costs

SITUATION
Ad hoc reactive schedules > higher energy costs
• Cement plants’ objectives and operational constraints vary depending on restrictions in material transport and storage, planned and unexpected maintenance, complex energy tariff schemes, equipment power start-up curves, etc.
• One day, optimizing your energy tariffs may be the main goal, and the next it’s the reduction of carbon emissions.

SOLUTION
Energy Optimization for Cement
• Information about energy tariffs and equipment availability is made available
• Online Information about product demand and silo inventory is acquired
• Schedule is calculated that satisfies product demands while minimizing the costs
• Operators can easily adapt to changing goals, assess "what if" situations and consequences

SUCCESS
• Savings in energy bills
• Minimized deviations from emissions limits
• Consistent and systematic planning procedures

I can choose my objectives based on certain given criteria, and review the outcome before they are set to publish for action.
## Energy Optimization

Reference examples

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<tr>
<td>Case</td>
<td>Large cement producer with ad hoc reactive schedules leading to higher energy costs</td>
<td>Complex distribution networks: electricity, steam, byproduct gases, fuels</td>
<td>Need for enterprise-wide real-time decision support to reduce costs across 14 mills</td>
<td>Complex optimization problem at digester, bleach &amp; pulverized fuel boiler plants</td>
</tr>
</tbody>
</table>

Join our next webinars on May 4th and May 18th to learn more
Poll #3
How flexible are your processes and energy mix?

A. We can reschedule production without interrupting the rest of the process
B. We can switch between several energy sources when one is cheaper than the other
C. I am not sure about the flexibility of our operations

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How do the digital tools help achieve energy efficiency, cost reduction, decarbonization and compliance targets?
ABB Ability™ Energy Management System for industry
Module 1: Monitoring and reporting

Improve energy efficiency, ESG compliance and productivity

An online platform for monitoring, automated reporting against targets and decision support
- bring transparency over energy consumption and sustainability performance
- influence organization and routines around continuous improvement of energy efficiency
- achieve and maintain ISO 50’001 certification

Covers multiple energy types and emission monitoring
Sets benchmarks following your process areas & asset hierarchies
Triggers alarms for non-intuitive consumption patterns (AI/ML)
Makes improvement potential visible in real time
ABB Ability™ Energy Management System for industry

Module 2: Forecasting and planning

Avoid energy demand and supply risks, price peaks, and penalty charges

Planning tools that forecast energy consumption & calculate the corresponding energy supply schedule to

- purchase the right level of power in liberalized power market and minimize costs
- predict complex/variable energy demand with temporary peaks more accurately
- design the most effective production plan given power/energy constraints

Predicts energy consumption patterns for each consumer

Supports multiple energy types & forecasting methods

Adapts to grade / rate / cyclical profiles, rule-based

15-30-60 min or day-ahead balancing, strategic planning over months/years
ABB Ability™ Energy Management System for industry

Module 3: Energy optimization

Utilize energy price volatility and process flexibility for optimal production scenarios

Holistic energy supply & demand optimization depending on your business objectives:
• minimize the total energy cost, reduce emission levels or maximize the total profit of the operations
• leverage process flexibility for peak shaving, load shedding, shifting production when energy is cheaper
• leverage flexibility in energy sources to enable effective energy procurement strategy

Supports multiple energy types and optimization scenarios

Optimizes energy generation, procurement, trading

Shifts consumption to off-peak hours

Provides decision support & APC set points for optimal startup / operation
A successful industrial energy management strategy
A comprehensive energy management solution to deliver on sustainability targets and energy cost savings

- Established targets for energy usage
- Monitoring, alarms & reporting of real-time energy usage, performance against targets
- Load planning & forecasting to predict energy demand based on production plan
- Balancing energy usage Against purchase commitment
- Optimization of energy usage, production & procurement

April 26, 2023
February 21, 2023
Join our next webinar on May 4, 2023 to learn more

Effective energy saving methods at cement plant in China
Outstanding energy efficiency practices compared to similar enterprises

Integrating sustainability into centralized mining operations
Central control room brings together the lessons learned from mining automation and digital

Enterprise-wide electricity procurement, energy forecasting & optimization for 14 P&P mills
Real-time decision support on how to use, generate, purchase or sell energy and emission rights

Paper mill ensures more stable and reliable energy supply while reducing operating costs
Advanced Process control in the digester, bleach & pulverized fuel boiler plants

Site-wide optimization of byproduct gas and other energy assets for steelmaking process
Managing energy purchase and production including site power plants and turbines

DEMO
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