



Sugar factory automation and optimization

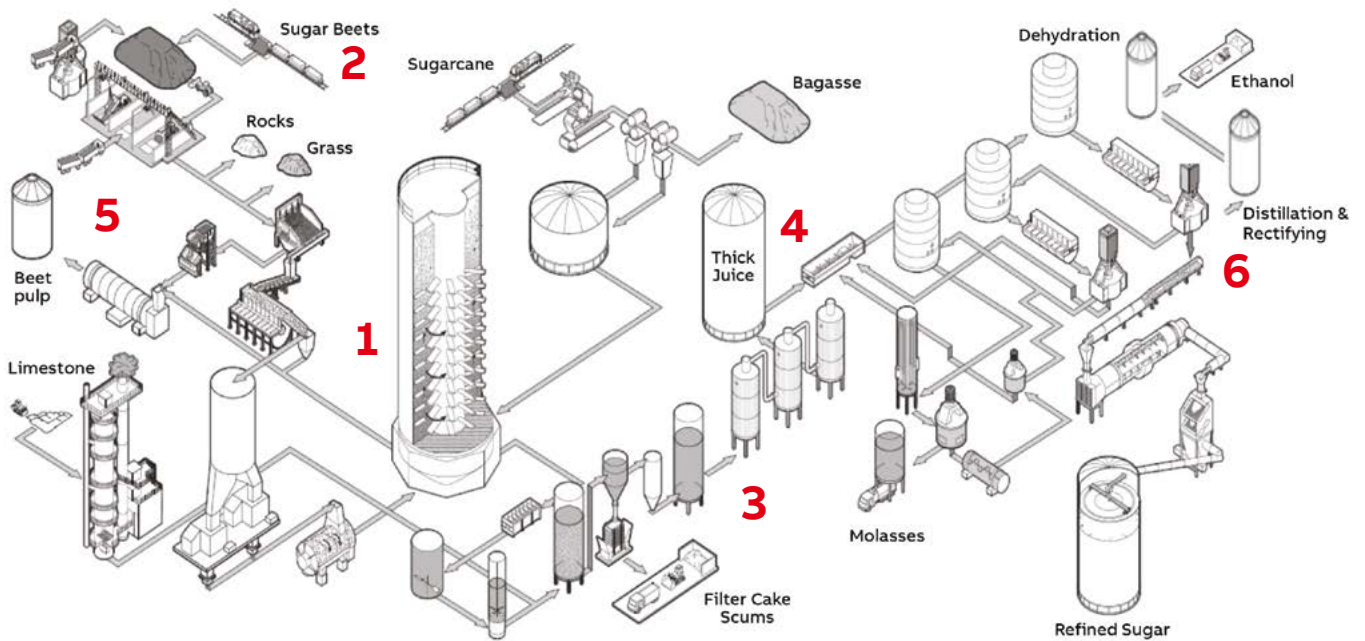
Control. Visualize. Optimize.



- Lowering energy consumption
- Increasing throughput
- Improving quality
- Maximizing traceability
- Reducing inventory cost
- Enabling lean and agile manufacturing

Sugar producers are striving to provide competitive products, boost profitability and grow their business. In a climate of increasing globalization and high product development costs, this can prove challenging. Sugar markets are becoming more complex which is why ABB strives to ensure an installed base performs at its optimum level. This in turn, fine-tunes products and systems to squeeze out every gram of efficiency. Here's how...

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Refining data to provide granular information

Strong yields, uniform quality and high plant utilization

Automating sugar production process leads to high yields, uniform quality and high plant utilization with minimized energy losses and environmental impact.

Automation can be subdivided into five different levels required by sugar producers:

Level 0 – Field level contains the field devices such as flow and temperature sensors and final control elements such as control valves.

Level 1 – Direct control is the traditional instrumentation level with PLC systems and controllers as well as complete process controllers.

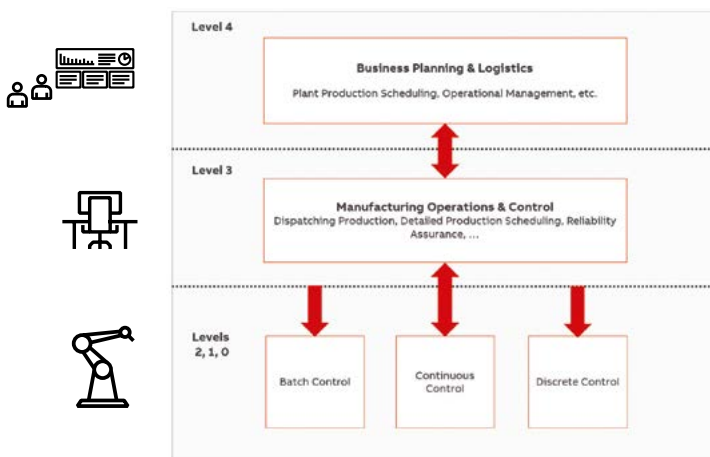
Level 2 – Plant supervisory comprises **ABB Ability™ System 800xA** and is used in process automation applications requiring high computing power. Extended automation is for customers who want to go beyond the classical scope of a DCS, involving a rich context of information. System 800xA also takes data from ABB's **sugar application library** (detailed below) which is used to design tailored applications and scenarios for use within the control system.

Level 3 – Production control does not directly control the process but monitors production and targets. **ABB Ability™ Manufacturing Operations Management (MOM)** is used for production coordination across whole plants to minimize costs and maximize yields and quality control. Typically, these are managed via manufacturing execution systems (MES) which analyze and control various elements of the production process (e.g. staff, inputs, equipment) in real-time.

Level 4 – Production scheduling covers Enterprise Resource Planning (ERP) systems and allows companies to manage similar variables across multiple, geographically dispersed production sites, while also automating many back-office functions. ERP passes data back to Level 3 where it is then translated into action at Level 2.

Sugar application library

ABB's sugar application library can unlock the data that affects every job function in the sugar industry. It is a complete, consistent and comprehensive software databank of all sugar process applications, extending from beet and cane to refined sugar.



The library comprises components for control and supervision. Each are complete functional units, ready for use and which can be adapted to specific user needs or process requirements. Each offer the sugar industry specific advantages that help achieve the targeted outcomes and benefits. For instance, the library helps manufacturers increase operation efficiency and release manpower to focus on other important plant activities, while safeguarding product quality.

Lowering energy and greenhouse gas emissions

Transparency throughout the plant

As electrical and steam consumption are among the sugar industry’s biggest costs, there are many energy saving opportunities. Steam consumption can be calculated, monitored and controlled to match the actual demand of individual parts of the plant. This can have a direct impact on the overall energy consumption, resulting in a 20 percent reduction.

Sugar application library

While providing precise control of all applications, the sugar application library provides detailed process data that helps benchmark operational costs such as energy use.

For example, one of the applications is the vacuum pan library. It monitors and controls the steam used during every batch. At the same time, it provides complete process control of variables such as level, pressure and temperature. This helps stabilize all control loops, the outcome of which is a reduction or elimination of energy waste.

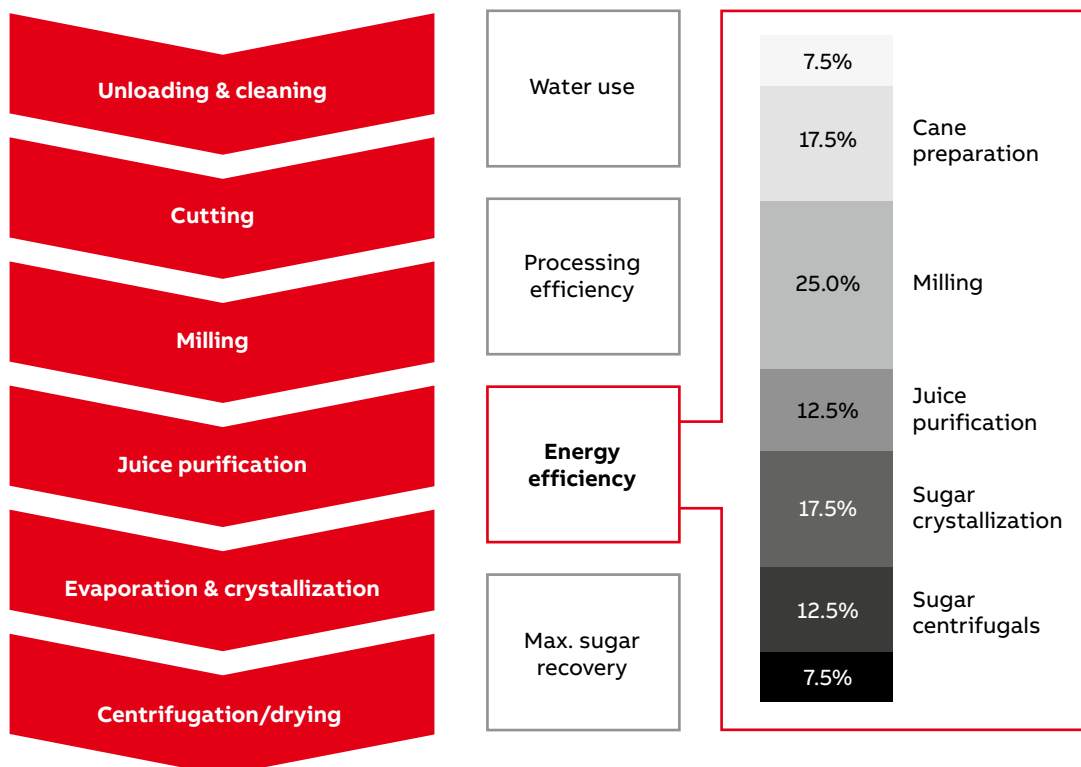
ABB Ability™ Manufacturing Operations Management (MOM)

MOM features an energy monitor app which provides fast, web-based, access to all energy, production and environmental data. It is easily integrated into existing energy meters or network analyzers and provides comparison of days/ weeks/months/years or production lines/sites/ countries in web dashboards.

Benefits

- Lower energy and carbon dioxide emissions
- Transparency of energy use across plant
- Increased refinery capacity
- Reduced production costs
- Improved profitability

01 The sugar process is packed with energy intensive applications, each consuming significant amounts of power. As a result, costs need to be tightly controlled.



Reducing inventory costs

Minimizing stock out and shortages

In the sugar production industry, good cost and waste control is crucial to inventory management. To ensure an adequate supply of raw materials, work in progress and finished goods to satisfy the demands of customers, active inventory management is crucial. Having the right system in place minimizes stock out and shortages which could lead to costly interruption in operations.

Inventory management is also essential if waste is to be controlled. For example, producers are looking at using bagasse (a by-product of sugar cane) for power generation, paper production, particle board and cattle feed. Molasses is being considered for butanol, yeast, industrial alcohol and high protein molasses. Lime, a by-product of the sugar extraction process, is produced and sold as a soil conditioner, so helping to preserve valuable limestone reserves.

Furthermore, many sugar facilities have created islands of automation by using control systems from various vendors. This can lead to material and energy waste as conflicting systems cannot always communicate with one another.

ABB Ability™ Manufacturing Operations Management (MOM)

MOM assists with inventory control including:

- **Material management** – provides an efficient way for receiving materials, registering and booking to internal warehouse, keeping track of consumed and produced material and reporting back to the ERP system
- **Weigh and dispense** – ensures correct material and quantity is dispensed by verification checks on materials, containers and scales through barcode identification
- **Inventory management** – enables the efficient control of the warehouse structure including information about order, lot, amount, fill date/ time, need for refill, expiration date handling, etc.

Benefits

- Check against loss of materials through poor production or theft
- Ensures an adequate supply of materials, stores and spares
- Minimizes stock out and shortages
- Reduces manufacturing cycle to a minimum
- Eliminates waste
- Balances supply of inventory with demand



Increasing asset utilization and throughput

Decreasing lead times

The duration of a sugar campaign is usually five to eight months. During this time, all process equipment - from vacuum pans to centrifuges - must operate reliably and perform optimally to produce the highest quality end product.

For this reason, production and maintenance departments work closely together to ensure that production never fails during a sugar campaign. Any maintenance or production stops, are arranged on a designated time and day and for a predetermined duration. Good asset practices translates into good production output.

ABB Ability™ System 800xA

The system provides a high-performance HMI, that substantially decreases human error during operations. The platform monitors and coordinates all the key electrical, instrumentation and control assets. It offers the complete solution to seamless manufacturing and business process integration.

Sugar application library

The library's Aspect-Object process control philosophy provides comprehensive control and simple operation interface, together with precise diagnostics and alarm management. This increases

the operating efficiency, shortens troubleshooting time and increases utilization.

ABB Ability™ Manufacturing Operations Management (MOM)

A downtime management module enables the collection and tracking of downtime information and causes, as well as real-time communication with equipment and personnel involved. It makes it possible to identify time spent on non-productive activities, such as downtime due to cleaning or meetings, and highlights idle and rework time.

OEE software enables customers to calculate and analyze overall equipment effectiveness (OEE) in real time, based on data collected from their production processes. The software helps uncover hidden potential and motivate production teams to maximize equipment utilization, uptime and quality.

Benefits

- Throughput increased by up to 25 percent
- Manpower costs reduced by 50 percent
- Information made available through SMS
- Plant managers receive daily production reports via email



Improving quality, reducing variations and errors

Turning data into useful information

Turning data into accurate information ensures production is right first time, while avoiding any variations in sugar quality and eliminating waste. ABB provides producers with a repeatable process which is key to maintaining consistent quality and maximizing the output from both processing and refining operations.

ABB Ability™ System 800xA

The integrated platform provides continuous control and precise handling of all process steps and ensures consistent, high quality product is produced every time.

Sugar application library

The library ensures that recipes are executed consistently from affination through to drying, and that critical quality and process data is directly linked to specific phases of each batch cycle. It provides a simple human machine interface (HMI) that makes it easier for the operator to control their equipment. For example, with vacuum pan control only simple setpoints are needed to achieve very complex control that matches the boiling curve. This leads to a more consistent and higher quality end-product.

ABB Ability™ Manufacturing Operations Management

- **Quality management** - process enforcement of quality and compliance measures (checklist, automatic or manual collection of quality data)
- **Tolerance management** - non-conformance reporting, systematic collection of product deviation, process, procedure, or compliance specifications
- **Electronic work instructions** - Guides operator through important steps with production and safety instructions and checks
- **Virtual trainer** - Helps maintain knowledge about process, product and safety on shop-floor

Benefits

- Consistent and precise control using sugar application library
- Provides a solid and transparent platform for making the right decision based on valuable information retrieved from historic data
- Provides simple and efficient operation through HMIs which help operators to eliminate or decrease operation error
- All signal loops and sequence steps are supervised and controlled by ABB Ability System 800xA and sugar application library



Maximizing raw material traceability

Meeting regulatory compliance

To optimize production yield and improve plant efficiency, it is vital to deliver raw material traceability, while complying with the latest regulations.

Sugar producers need to provide different insights into quality and safety, depending on the destination of the product. Refined sugar, packaged as a final product to consumers, must contain records and test data that show complete traceability to satisfy regulators and retailers. Alternatively, when shipping raw sugar for refining, or sending bulk shipments for use as ingredients, then more detailed quality information will be required. This information will, in turn, form part of the supply chain's quality record.

ABB Ability™ Manufacturing Operations Management

ABB's manufacturing execution system (MES) improves product quality, reliability, tracking and traceability for regulatory compliance. It provides management access to all types of operational data enabling decision support for corrective actions and performance improvement. It provides a window into the production environment, powering process analytics and operational metrics with objective, detailed data.

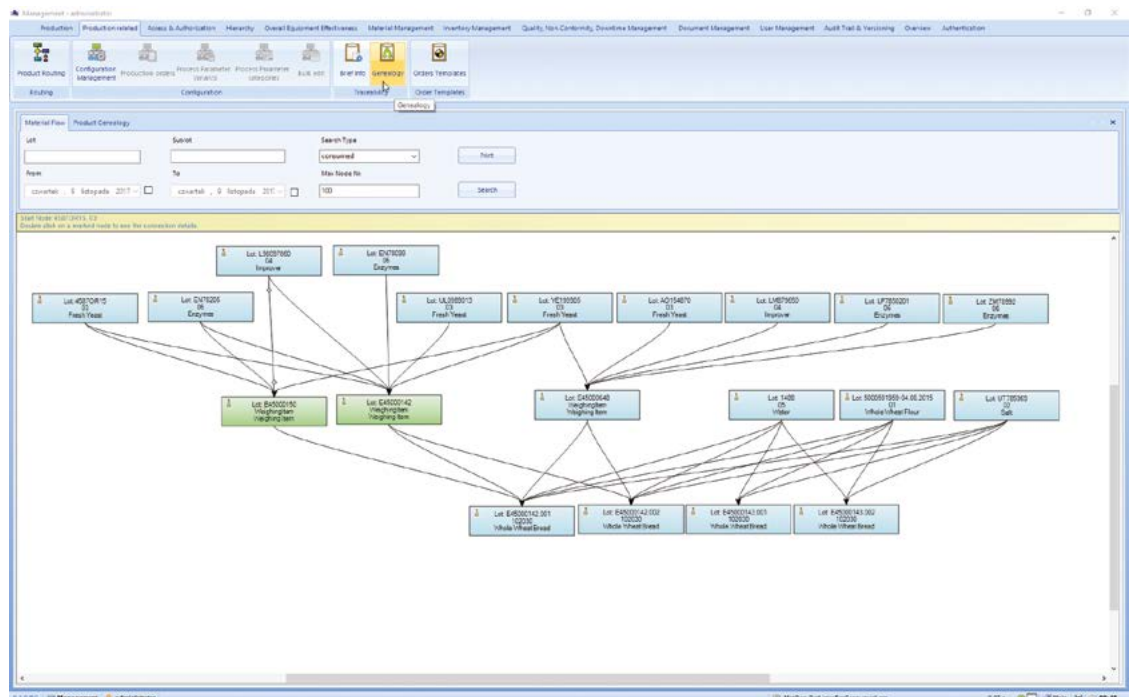
Its material management software identifies and tracks produced and consumed materials, while prioritizing and controlling material source and destination as well as compatibility, weighing, picking and packing.

The material track and trace module provides powerful product genealogy reporting by allowing searching and analysis of production data.

Benefits

- Tracking and tracing of individual, lots and batches
- Material identification, real-time reporting of material consumed and material produced
- Management of material compatibility and availability
- Weigh & dispense support
- Material genealogy
- Enabling monitoring of transportation and warehousing activities
- Provides early identification of defective products, avoiding consumer recalls
- Fast, accurate and easy diagnosis of problems
- Less time spent on troubleshooting which can hinder regulatory compliance and traceability
- Manufacturing costs reduced

Among the many dashboards available is material genealogy which helps trace the flow of materials.



Enabling lean and agile manufacturing

Better management of a plant's assets

Lean manufacturing is about doing more with less and applies well in a supply chain with high volume, low variety and good prediction. Agile manufacturing is the ability to respond rapidly to changes in demand, both in terms of volume and variety. During good weather, for instance, a sugar cane supply chain needs to be as lean as possible. However, during rain, or a crisis, agile resources are needed to minimize losses.

Furthermore, companies, suppliers and customers are not closely linked and departments such as engineering, production and service are not always communicating with each other effectively. Yet the need for agile manufacturing where production can be adapted to meet specific customer demands, can only be achieved if everyone is talking the same digital language.

ABB Ability™ Manufacturing Operations Management (MOM)

MOM brings end-to-end visibility of to an entire sugar production process. It is a scalable and modular suite that extends across:

- Process intelligence
- Manufacturing execution

- Production intelligence
- Production optimization

As such it affords the various plant stakeholders effective decision-making and reliable lean production execution through fully integrated operations. It contains rich, out-of-the-box functionality, comprising easy to configure modules that address specific industry needs.

ABB's flexible and secure software platform with common services for connectivity, data storage, visualization and reporting, supports the processes and systems already in place or can be used to completely revamp and improve current processes.

Benefits

- Consistent volumes and quality as production risks reduced
- Fewer decision makers required
- Reduced operating cost
- Realizes tremendous improvements in the whole supply chain efficiency







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