Bulent Kolanci, ABB, describes the upgrade of Cement Knowledge Manager and LIMS at The Monarch Cement Co.

Introduction
From food to petrochemicals, producers in the process industries are turning to digital technologies to improve operations, increase efficiencies, lower costs, and maintain their competitive edge. The cement industry is no different.

In 2017, The Monarch Cement Co. invested in the latest version – Version 9.0 – of ABB’s Knowledge Manager with ABB Ability™ System 800xA control system integration, as well as ABB’s Laboratory Information Management System (LIMS). It also upgraded its older AC 410 controllers to the latest AC 800M series. The LIMS project was completed in July of 2017 and the change over to Knowledge Manager occurred in the fall.

“With all of my experiences with ABB this was the best,” said William Peters, Monarch Cement's Automation Supervisor. “We had version three at one time and then we upgraded to version five. I knew six was out and eight was coming out. Then they offered us a beta for version nine so we went with that.”

These upgrades allow the company to improve the collection, consolidation, and distribution of data related to production, product quality, and energy consumption. They also improve data mining and data sharing capabilities, because the LIMS is an integral part of Knowledge Manager, not an isolated function. The plant’s operators can access all laboratory information directly from their System 800xA dashboards by simply right-clicking on any production object in their display.

“My main interest was in the LIMS add on,” said Mitchell King, Monarch’s Assistant Quality Control and Environmental Supervisor. “On the quality side, we hadn’t had a LIMS
prior to this. It was all paper logs, and we used the functionality of the ABB 800xA operating system to feed some of that quality data into the production line."

King continued: “there are other vendors and they all have their advantages and disadvantages but, since we’re feeding our data into our production line and it’s such an integral part of that, marrying the production data and quality data, ABB’s LIMS was just a natural fit with the 800xA.”

This common interface not only improves knowledge transfer between the laboratory and the control room but also allows engineers, managers, and other authorised and authenticated stakeholders to access the data remotely, because the data is accessible via any device with a web browser.

“With our old Knowledge Manager, we used it more as a data repository,” said Peters. “Now, we are able to integrate our laboratory data with our production data and that’s huge. We use features like the downtime report so we can go back and do root-cause analysis; there’s just a whole lot that we can do now. “

Using technology to stay competitive

In operation for over 90 years, Monarch Cement produces 1.3 million tpy of portland and bagged masonry cement for customers in the US heartland. The company operates a single plant in Humboldt, Kansas, with distribution terminals in Des Moines, Iowa, and Dodge City, Kansas. The company owns a limestone quarry and various affiliates that sell ready-mixed concrete, concrete products, and sundry building materials. This independence gives the company the freedom to experiment and use technology to compete with larger rivals.

“Single plant operations are not the norm in the cement business, so this is part of how we stay viable and profitable,” said King. “Monarch is always looking for an edge, so when we test something or try something new it doesn’t have to be implemented across nine sites simultaneously. It’s a company that always is willing to stay current. It’s a real driver for Monarch."

To produce its product, Monarch operates a 260 tph Pfeiffer roller mill that uses heat from the company’s two precalciner kilns for drying. The mill then uses three 31 t rollers, positioned vertically and tangentially to the grinding table, plus an additional 1500 psi of hydraulic pressure, to crush the limestone.

Finish milling is done by five ball mills. As feed enters the mill, the balls continuously crush and grind the clinker and gypsum into the fine powder that becomes cement.

To maintain quality, technicians perform bi-hourly tests on raw materials, clinker, and finished cement using the ARL 9900 Total Cement Analyser and other methods, including Blaine testing and 325 mesh percent passing to measure fineness; sulphur (SO₃) content; and free lime to make sure the clinker is completely
retested. Altogether, Monarch Cement collects data from thousands of points in the process. Classical wet chemistry methods are employed to determine loss on ignition, insoluble residue, free lime, solid fuel analysis, and water analysis.

**Integration improves performance**

Released in January 2018, ABB Ability™ Knowledge Manager 9.0 is a data coordinator that pulls together information and data from the System 800xA control system (equipment health and status reports, production stops, alarm statistics, key performance indicators, etc.), laboratory results, manual entries, production information, SAP ERP systems, energy and emissions monitoring data, and other sources, in order to present plant operators with a single pane-of-glass view of everything that is happening in the production process at any given moment.

Because Knowledge Manager 9.0 and LIMS are fully integrated, laboratory results are fed directly into the plant’s System 800xA control systems database and are used to maximise product control uniformity and improve production. This differs from past iterations of Knowledge Manager, where laboratory data was saved separately from control system data, forcing operators to examine paper logs and spreadsheets to get the information they needed to make process changes.

“LIMS and Knowledge Manager have made the data more accessible for everyone that has control over the process,” said King. “Now, a production foreman or control room operator doesn't have to call the lab to find what the results were or look at a piece of paper to make a change. That is the real advantage of this: it makes quality and production data one and the same. For an actual production line, this is the system you want.”

Another benefit of the LIMS system is it frees up valuable personnel for more productive tasks, said King: “In the past, we were investing a lot of time in staff processing that data and entering it into some other format other than the paper logs so it could be trended,” he said. “In the laboratory, we were entering all the trending data manually. [LIMS] freed up man hours to do other things; to immerse ourselves in other projects. It enabled us to get more test results out of our technicians in the lab because they’re doing less data entry.”

Knowledge Manager is fully integrated with the ABB Ability™ System 800xA process control system and includes a mobile interface, so operators can view, analyse, and act on critical process data from any mobile device. It also includes updated tools to create, view, and share reports, charts, and production trend analysis. Taken together, these features enhance overall plant efficiency by reducing the constant need for information and data rediscovery.

“Basically the operator can work on one pane of glass and have all of the information they need,” said Carl Larsson, ABB’s Service Account Manager for Monarch Cement. “That was one of the main driving factors for why Monarch opted to become a pre-release beta-adopter of the new system.”

Knowledge Manager 9.0 draws upon ABB’s long history and knowledge of industry-specific process challenges and solutions. It facilitates access to and draws guidance from ABB’s global network of process industry experts, including beta-testers like Monarch Cement. Standard Knowledge Manager modules include Production Information Management, Production Accounting, SAP Integration, and the LIMS.

Because Version 9.0 is the first version of Knowledge Manager to be fully integrated with the 800xA Minerals Library, ABB’s suite of object-oriented software control modules for designing process control and power applications in a fully-parameterised manner, the configuration of new objects in System 800xA trigger automatic configuration of the corresponding signals and logs in Knowledge Manager. In prior versions, Knowledge Manager configuration was done manually. Now, those steps are automatic, saving time and effort to maintain the system.

The goal of Knowledge Manager is to simplify production management by enabling performance monitoring, downtime management, and maintenance support, as well as providing statistical production analysis and reporting tools out-of-the-box. It facilitates the collection, consolidation, and distribution of production, quality, and energy information via the plant’s web-based reports, trends, and graphs.

Knowledge Manager is part of ABB’s portfolio of integrated digital solutions, ABB Ability™, which combines ABB’s domain expertise with network connectivity and the latest digital technologies to help customers develop new processes and advance existing ones by providing insights and optimising planning and controls for real-time operations.

“It is quite a leap going to the new manager,” said Peters. “You have no idea how much of an improvement this is over our old Excel days of data analysis and trending. I went from a Knowledge Manager that no one ever looked at to a flood of wanting more data. Now, when it goes down or when I have to take it offline, it affects our whole system. We’ve become dependent on it pretty quickly. People are expecting the data and the data to be correct and that's what I like.”

**About the author**

Bulent Kolanci is the Sales and Business Development Manager for Cement, Metals, and Mining at ABB Inc. He holds a bachelor’s degree in Electronics Engineering from Istanbul Technical University and a masters degree in Business Administration from Koc University in Istanbul. He has over 20 years of experience, from engineering to sales management in ABB solutions for various industries, including cement.