Vietnam is one of the leading manufacturers of cement in the world, producing approximately 100Mt/yr. To optimise operational efficiency and maintain strict quality control during high-volume production, Vietnamese cement plant operators are increasingly turning to Industry 4.0 solutions that offer unparalleled levels of control and visibility at every stage in the production chain.

Working with ABB, Tan Thang Cement is installing the latest digital and automated technologies to ensure operational efficiency and reliable electrical supply at its new production plant in Nghe An province, 250km south of Hanoi, while also keeping personnel safe amid the Covid-19 pandemic. The US$211m facility is on track to produce 2Mt/yr of cement, with low energy consumption and a minimal environmental footprint. It features specialist equipment imported from companies based in the EU and G7. For example, the 60.7m-long, two-pedestal kiln is 5m in diameter and holds 484t of material at any one time. Danish and German companies were involved in the supply chain, including for provision of the clinker mill and high-precision bagging machines.

Tan Thang divided the equipment tendering process into five packages, with ABB selected as the supplier of electrical equipment and automation. In contrast to other cement industry greenfield projects – which are assigned on an engineering, procurement and construction basis – Tan Thang chose to secure a direct contract with a single supplier that was also the equipment manufacturer, with the aim of equipping its Nghe An facility with future-proof digital solutions.

**ABB Ability™ System 800xA**

ABB provided the ABB Ability™ System 800xA DCS (distributed control system), which integrates process control, electrical and communication systems for optimal visibility into all processes for stable production and the efficient use of raw materials and energy. The package also included ABB Ability™ Expert Optimizer and ABB Ability™ Knowledge Manager, which are closely integrated with the DCS. ABB not only provided the tightly integrated software solutions but also engineered and provided all related hardware infrastructure, ensuring full connectivity of electrical and process devices while minimising the footprint.

Unlike other cement production projects that employ different process suppliers, and therefore multiple sub-automation systems, throughout the factory, all facets of operations at Nghe
An are visualised using a single ABB Ability™ System 800xA automation system, which contextualises the various data sets.

For example, with one click of a mouse, the operator can access multiple pieces of data from a single motor, everything from temperature trends to lining temperature parameters, as well as related documentation. This granular insight optimises operations, resulting in significant productivity gains.

From the ABB Ability™ System 800xA, the operator has a direct link to the Overall Equipment Effectiveness (OEE) information of a specific motor or machine through the integrated connection with ABB Ability™ Knowledge Manager. With other systems, the operator would have to switch from the DCS human-machine interface (HMI), to the Information Management System (IMS) HMI and look for the respective motor/machine to access this information.

The operator also has direct access on the ABB Ability™ System 800xA HMI to access the parametri- zation details of the intelligent motor controller within the Motor Control Center (MCC). If this was not in place, the engineer would have to visit the e-room with a laptop computer and connect directly to the MCC panel.

The integration of ABB Ability™ System 800xA with two other Industry 4.0 platforms, ABB Ability™ Expert Optimizer and ABB Ability™ Knowledge Manager, adds value. In cases when further devices are periodically added to the plant control system at Nghe An, the necessary parameters will automatically be created in the database, reducing engineering complexity and securing data consistency when changes are made to the process.

On the electrical side at Nghe An, ABB provided a 110kV air insulated substation, with a Supervisory Control and Data Acquisition (SCADA) system based on ABB Ability™ System 800xA for Power Control, as well as telecommunications, and high voltage primary and secondary equipment to support the electrical infrastructure. ABB also delivered power transformers, distribution transformers, an intelligent motor control center, auxiliary control center, emergency diesel generator, DC power supply, various field devices and related commissioning services.

ABB Ability™ Expert Optimizer
Advanced process control (APC) - such as ABB Ability™ Expert Optimizer - can be conceptualised as the autopilot that drives a cement operation to its optimum state. Using model predictive control, it reduces process variation and moves it closer to the constraints. It does this by understanding process interactions and delays through data-driven empirical models, then makes small changes much more frequently than a human operator could to create a more stable process environment.

ABB Ability™ Expert Optimizer utilises a range of advanced process control technologies to manage critical cement plant components at Nghe An, such as the kiln, alternative fuels, mills and blending. It identifies the optimum operating conditions to maximise productivity and reduce costs. By acting as an autopilot for the cement plant, the platform enables personnel to focus on other tasks, alleviating workload around constant process optimisation, as well as reducing shift to shift variation.
ABB Ability™ Knowledge Manager

ABB Ability™ Knowledge Manager is a digital solution that provides visualisation of large volumes of complex plant data, allowing Tan Thang plant operators and management to optimise efficiency. The system delivers relevant, timely information to workers at Nghe An via web and mobile interfaces.

The latest version of Knowledge Manager 9.1 offers new features to improve usability with visually improved dashboards. It also supports engineering based on standard ISA-95 equipment models. It provides engineering synchronisation with other ABB solutions, for easier integration. In addition, new data collection mechanisms using the Open Platform Communications United Architecture (OPC UA) standard are now also available, enabling simpler and more secure integration with other systems and solutions.

Remote possibilities: The impact of Covid-19

The benefits of digitalisation were further highlighted when the Covid-19 pandemic struck in March 2020, just as the Nghe An plant was due to come online. ABB worked with the other European process equipment suppliers and a consortium of ABB Switzerland and ABB Vietnam on a complete plant power supply and automation system, providing engineering support through a remote platform to ensure the project remained on track. This approach involved coordination points with the various mechanical suppliers to ensure the interfaces and control and electrical systems were correctly integrated.

Another key factor in the success of the project was ABB’s local supply capability. Contractually, ABB was obliged to source a relatively large portion of the supply and manufacturing in Vietnam itself, and thanks to its strong engineering base in the country, was able to satisfy the client’s requirement.

A digital future at Nghe An

ABB aims to complete much of the remainder of the two-phase ABB Ability™ Expert Optimizer commissioning process – an initial phase where ABB experts analyse the process and programme the logic on site, followed by tuning to optimise the logic - remotely, with completion scheduled for April 2021.

ABB’s involvement in the Nghe An project began when it supported Tan Thang in drafting technical solutions on how to power and run the new plant. The public tendering process concluded in 2016 when project financing was secured, and commissioning began in 2019.

In addition to providing a highly-skilled technical team to operate the various digital and automated applications at the Nghe An plant, ABB carried out on the job training with Tan Thang staff during commissioning and installation, allowing them to run the plant and maintain cement production after plans for overseas training in Switzerland were put on hold due to Covid-19 travel restrictions.

“Tan Thang Cement is proud to complete this project even though Covid-19 did not make it straightforward,” said Mr Hoang Anh Tuan, General Director, Tan Thang Cement. “With ABB’s expertise in the cement industry and its technology, the plant now has the latest digital solutions to strengthen its position as one of the most modern cement production plants in the region and which will help us reach our business and production goals.”