IndustrialIT Ensures Coherence in Distributed Fertilizer Production at Kemira, Denmark

ABB and Industrial IT are introducing 21st century process controls into Kemira’s world-class dicalcium phosphate (DCP) facility in Denmark

Client: Kemira
Location: Fredericia, Jutland, Denmark
Scope of Work: OperateIT operator workstations, a Control Builder and ControlIT controllers connected by redundant fiber optic cable.

“It was decisive for us that ABB’s IndustrialIT solutions are built on the open IEC 61131-3 standard, which greatly simplifies integration with existing control and information systems.”

Volander Rasmussen
Kemira Denmark

Located in Fredericia, Jutland with an annual production of around 650,000 tons and over 400 employees, Kemira Denmark is one of the main production sites for complex fertilizers, acids and speciality products.

Complex fertilizers based on nitrogen, phosphorous and potassium constitute the bulk of the company’s production. Nitric acid is produced on site by burning ammonia. The resulting nitrogen oxide (NOx) is dissolved in water to produce nitric acid (HNO₃), the main source of nitrogen. Phosphorous is supplied from Kemira’s own mines in Finland and elsewhere and like the potassium this is delivered by ship to the company’s own port facilities adjacent to the production plant.

The manufacturing process involves the mixing of raw phosphorous with nitric acid and the subsequent addition of potassium, micronutrients and acids to ensure that the finished product is soluble in water. The resulting slurry is dried in a so-called spherodiser, where the liquid product is sprayed on to reprocessed granulated fertilizer. The granulate is dried using hot air, which passes through the spherodiser together with the fertilizer. The aim is to produce perfectly spherical granules with a very even particle size to ensure an efficient spreading of the commercial product. The capacity of the plant, which operates 24 hours a day, is a stunning 100 tons of finished product per hour.

A competitive market. The market for commercial fertilizers is highly competitive with only a handful of international players supplying the bulk of the market’s

Kemira is a global company with activities in sectors such as chemicals for the pulp and paper industry, paint and fertilizer production. Kemira has production facilities in more than 30 countries. Accounting for over 40% of the company’s sales, the Agro business is by far the largest business unit. At Kemira Denmark, one of the company’s ten fertilizer plants, the three-phase implementation of a new production control system based on ABB’s IndustrialIT platform has recently been completed.
benefits. This means that where previously the market was characterized by small, local producers, today a considerable amount of fertilizer is being exported to other parts of the world. The concentration of the global fertilizer production in large, centralized units requires a continued focus on production optimization to increase output. At the same time, energy consumption and the use of raw materials must be reduced in order for the plant to remain profitable and competitive. At Kemira Denmark the efforts to improve the plant’s efficiency have resulted in an ambitious investment plan, which over the coming few years is intended to result in a complete integration of the production control systems in the specialty products sector (SPS sector).

**Three steps towards integration.** Kemira Denmark’s SPS sector is responsible for the production of dicalcium phosphate (DCP), which is used in feed mix, and potassium nitrate, a specialized fertilizer for use with irrigation equipment. The DCP product is manufactured using an advanced and patented ion exchange process to ensure an extremely pure product and a high output.

The SPS sector consists of five decentralized Plants, which were originally equipped with three different DCS control systems, two PLC systems and a lot of single instruments in old mimic panels. This set-up, however, did not provide the necessary overview and control of the complete production process. Furthermore, the mixture of both DCS and stand-alone systems did not allow the plant to establish a common control room from where all aspects of the production process could be monitored and controlled. Consequently, it was decided to initiate a three-phase process with the aim to integrate the control systems, to establish a common control room and to renovate process and production equipment wherever possible.

**The decisive facts.** When defining the demands for a new control system for its SPC sector, Kemira Denmark emphasized four criteria that had to be met. These included competitive pricing, facilities to allow the company to do the programming themselves, easy integration into the existing process and a supplier who would also be around in years to come ready, to modify, upgrade and improve the system.

Based on these criteria and a list of demands for the new control system, Kemira Denmark chose ABB as partner, because it found that the company’s newly developed IndustrialIT platform consisted of Process Portal operator workstations and AC 800M controllers connected by means of a redundant fiber optic cable would provide the flexibility and efficiency needed to control the intricate SPS production. Among the decisive factors for Kemira was the fact that ABB’s IndustrialIT solutions are built on the open IEC 61131-3 standard, which greatly simplifies integration with existing control and information systems. The use of open standard systems also facilitates programming, maintenance and the design of process representations, which is handled by the company’s own programmers.

The controllers, I/O system, functionality and engineering tools are all modular and can be selected to meet each user’s current needs without sacrificing the possibility to add them on to the existing system later as the needs develop. This scalability is a unique feature of the IndustrialIT system, which makes it a logical choice wherever future changes or extensions must be envisaged.

**Aspect Object™ organized information.** ABB’s Aspect Object technology associates production and Enterprise information with the plant and business entities to which it is related. By doing so, it mirrors reality making information gathering simpler than ever before. The flexibility of this technology allows easy access to all available information by simply clicking on the relevant object. At the same time, different aspects enable every user from operator to top management to zoom in on exactly the information they are interested in without having to navigate through endless amounts of irrelevant data.
First phase integrates three plants. In the first phase Kemira Denmark chose to install and implement the new IndustrialIT control system in the ion exchange, the vacuum dehydration and the calcium chloride plants. Further plants and renovation of the production equipment will follow in the next two phases.

When implementation according to plans is completed, there will be a common control room with four OperateIT Process Portal operator workstations, three local control rooms, each with one OperateIT Process Portal workstation, an engineering room with an Engineering Studio and with Control Builder, as well as six ControlIT AC 800M controllers distributed throughout the plant. The system includes more than 3,600 I/Os, a 1,000-meter fiber optic plant network and a similar control network connected on two parallel Aspect and Connectivity servers to provide redundancy.

An ambitious plan. Following weeks of intensive collaboration between Kemira Denmark and ABB to ensure that all aspects of the production process could be handled seamlessly, the control system was subjected first to the usual Factory Acceptance Test (FAT) at ABB in Denmark and subsequently after installation but prior to commissioning to a Site Acceptance Test (SAT) at Kemira Denmark.

FAT and SAT tests are standard routine in all ABB projects and as such an important contributing factor to the rapid implementation of the company’s process control systems, reducing downtime to minimize loss of production.

In addition, it took ABB only three days to do the complete recabling of the three Kemira plants, and the total installation and commissioning were carried out with a plant downtime of only eight days. This is an impressive result considering the huge logistical challenges and complexity of the plant. And, already after two days of commissioning, the plant had resumed 80% of normal production.

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ControlIT AC 800M controller and S800 I/O units at the Kemira plant.

The capacity of the plant is a stunning 100 tons of finished product per hour.