Lahcen Abellaoui, ASEC Automation

Electrical and automation upgrades: An effective solution in the Philippines

In 2012 Republic Cement, now part of CRH-Aboitiz Company, decided to undertake electrical and automation upgrades at its five plants in the Philippines. At the same time, the decision was taken to install two new cement grinding plants based on the FCB Horomill technology at its Teresa and Norzagaray plants. Republic Cement awarded the project to ASEC Automation, an Engineering, Procuring and Construction (EPC) contractor that had already provided services to the cement industry for more than 20 years.

Electrical and automation upgrades or revampings are known to be difficult. However, specific conditions, including a tight turnaround time, precise budgets and a requirement to deliver a turnkey product may further complicate the situation. The turnkey requirement necessitates a full plant survey during the bidding phase, often for weeks in collaboration with engineers specialised in cement plant maintenance, electrical systems, instrumentation, automation and erection. These conditions applied during ASEC's work with Republic Cement.

The other challenge here was to comply with Republic Cement's minimal business disruption requirements, with three days shutdown for a crusher, 7-10 days for a cement mill and 21 days for the pyroprocessing line (including raw meal transport, raw mill, kiln, cooler and utilities). The process control systems (PCSs) would be new and the motor control centres (MCCs) would be renewed or at least refurbished to comply with the standards. A specific shutdown schedule was drawn up for all steps, along with associated timings for pre-shutdown, shutdown, start up and post-start-up.

Price and commercial conditions were another challenge. Although only a few companies with strong references in the automation and electrical upgrade sector can meet the above conditions, the competition is still tough.

The installation of a new PCS means that a new technology would have to be transferred under the best conditions to the plants' process engineers, operators and automation engineers based on specific and dedicated training. To do this, a training centre was developed, installed and commissioned.

Right: Central control room at the Batangas plant, prior to the upgrade.

The use of a new PCS also means new levels of connectivity between all communicating devices. This ranges from Level 1 devices, such as local programmable logic controllers (PLCs), proprietary PLCs, proprietary cubicles and electrical devices, up to the availability of the resultant 'big data' for Level 3 systems such as process optimisation systems, quality control systems and record-keeping systems.

Teresa and Batangas upgrades

Although this investment process has continued under CRH-Aboitiz with the work in Norzagaray and Iligan progressing, this article presents case-studies of the upgrades at CRH-Aboitiz's Teresa and Batangas plants. Prior to the upgrade, the Teresa plant had a very old proprietary PCS and electricals systems and the Batangas plant had outdated electrical systems with no automated process control system at all.

Teresa plant

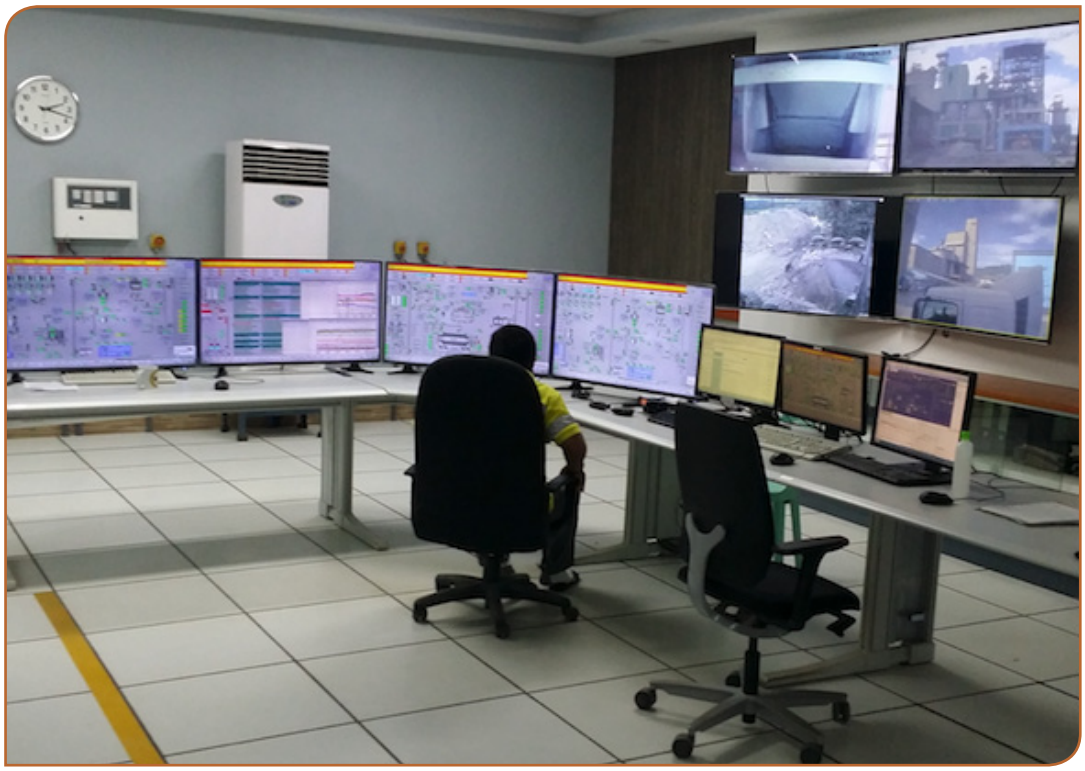
CRH-Aboitiz's Teresa Plant, located in Rizal province, 30km east of the capital Manila, was the first plant to be upgraded by ASEC Automation in 2014.

The plant's PCS was based on the proprietary POLCID-DC system from Polysius with Vax stations, Real Time Computers (rt Vax) and Schmitz remote Inputs/Outputs (I/Os). Aside from the common POLCID-DC programming control language (STL-type programming), the system used Fortran-based programming for special programs used in the system. One of these was the cement roller press (Polycom control system), which controls the grinding pressure, roller parallel and power for efficient operation. On top of this, the POLCID-DC system had not been supported since June 2004. It is therefore easy to understand the plant's urgent need for a PCS upgrade and its demand to no longer depend on a proprietary system.

The new PCS had to be compliant with the company's standards, which limits the choice to four PCS manufacturers: ABB, Siemens, Schneider and Nexeya. Finally the plant engineer chose to use the Siemens PCS7 System. All the local PLCs were also upgraded to the latest Siemens equivalent PLCs such as the REPOL Cooler Grates and the PILLARD main burner. Along with the PCS, a new control room was designed with new automation and networks panels as well as new I/O panels. All cables (optical and copper) for all the necessary communication protocols (Ethernet, Profibus, Modbus, etc) were also supplied.

Concerning the communication with Level 3 systems, the open platform communications (OPC) server was programmed and tested based on predefined data tables of all kind of process variable. Final factory acceptance tests were carried out with each of these systems.

For the electrical part, all MCCs were retrofitted or renewed according to the company's standards. Newly-supplied MCCs were ASEC Automation's MCC30 fixed type Plug-In Design. These MCCs allow for highly-reliable operation, high flexibility and reduced maintenance. This type of MCC is considered by many to offer the best price / performance ratio for the cement industry. The control voltage was also changed from 48V to 24V DC. Some of the



Left: Central control room at the Teresa plant, following the upgrade.

instrumentation devices were also changed, based on the audits made in the plant and the list that had been agreed with the plant engineers.

Last but not least, and in order to compensate for a prior lack of automation and electrical drawings and documentation of the plant, a complete set of new engineering drawings was generated based on the company's standards.

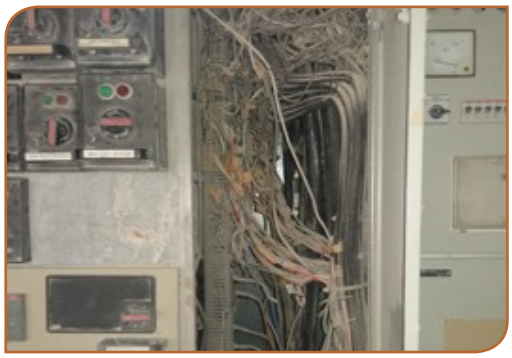
Plant engineer and operator training is always an important issue when a new brand of PCS is used. ASEC Automation has always offered its solution, which consists of extensive 'on job training.' Plant engineers are invited to participate with ASEC Automation engineers in all the phases of the project – engineering, programming, factory acceptance tests (FATs), commissioning, start up and post-start up - a process that can last for several months. Special training is also provided to operators during the 'on job training' and the commissioning phase.

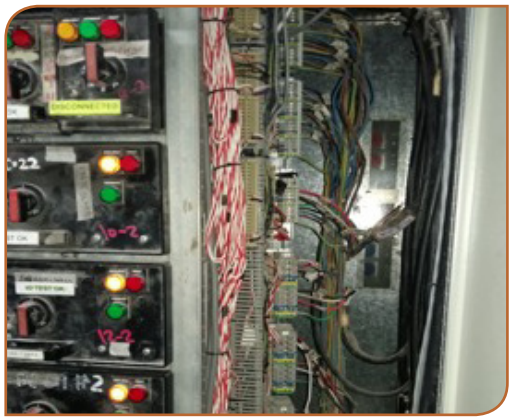
Further to this training, plant engineers now handle the new system without any external help. An Automation Center training facility has been installed in the Teresa Plant that serves all the CRH-Aboitiz plants.

Batangas plant

The Batangas Plant, located in the Taysan Municipality, 110km south of Manila, was the third plant to be upgraded by ASEC Automation, in 2015.

This plant had never been upgraded and didn't have a PCS at all. Each stage of production was driven individually by a local mimic control panel without any kind of interaction with other areas of the plants. For this plant, the arrival of the new PCS also necessitated the first ever central control room. As for all of the other plants in this project, the Siemens PCS7 System was selected.





Images: Typical MCCs before (above) and after (below) an upgrade.

The whole plant process was thoroughly reviewed by plant process engineers and operators. The complete automation documentation, complying with the company's standards, was generated in this plant for the first time. The existing mimic control panels were removed, along with their associated cables. This constituted a painstaking effort, but it was necessary to simplify for the future plant maintenance works.

The majority of the MCCs were renewed based on ASEC Automation's MCC30 fixed type Plug-In design and the rest were refurbished in order to comply with the company's standards. The control voltage was also changed from 48V to 24V DC.

All power cables were tested and some were renewed. The majority of the local panels were completely redesigned due to being outdated and an associated lack of documentation. Some of the instrumentation devices were changed based on the earlier plant audits and the list agreed with the plant's engineers.

The critical issue of electrical safety was settled for all the plant by fulfilling all the company's standards. Complete electrical documentation was issued for the whole plant.

All the site activities, pre-shutdown, erection, site acceptance tests (SATs), commissioning, training, start up and post-start up, were conducted successfully and on time. They required, during the pyroprocessing line phase, the presence in the plant of 65 people from ASEC's local erection company and 45 people, engineers, supervisors, technicians and foremen, from ASEC Automation.

It is also noteworthy that the critical issue of the Batangas plant engineer and operator training was easily overcome thanks to the Training Center at Teresa.

Conclusion

Electrical and automation upgrades in the cement industry represent a complicated process at the best of times. Such tasks become far more complicated when they have to accommodate a tight schedule, a limited budget and delivery on turnkey conditions. A thorough knowledge of the plant during the bidding phase and during the execution is mandatory. This cannot be achieved without a team of engineers, including those dealing with maintenance, electricity (medium voltage and low voltage), instrumentation, automation and erection and... crucially... with a strong background in the cement industry.