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provides details on Qassim
Cement Company's electrical
upgrades.

Up-to-Date with Electrical Equipment

Introduction

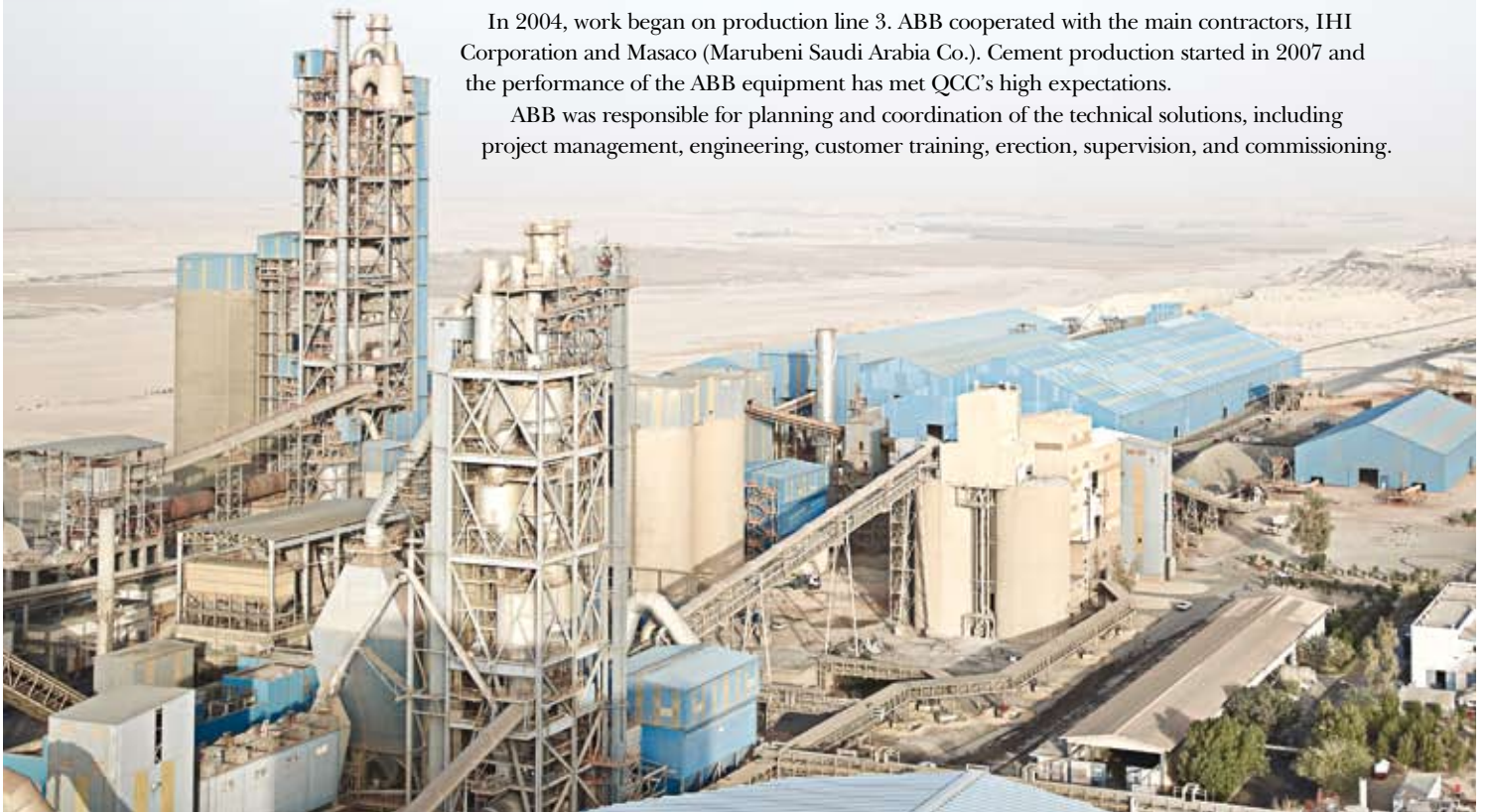
Qassim Cement Company (QCC) is located 360 km north of Riyadh in the Kingdom of Saudi Arabia. QCC started its first production line in the 1970s, using electrical equipment supplied by ABB. The second production line came into operation in the 1980s. Line 3, the final line, began operations in 2007.

In 2003, QCC awarded a contract to ABB to upgrade line 1 from 50 to 60 Hz. The scope of supply included:

- A new 33 kV main station.
- Revamp of the control system by installing an 800xA control system.
- New central control room replacing the Mimic operator desk with 800xA.
- Upgrading MCC and drives systems and adding frequency converters.

In 2004, work began on production line 3. ABB cooperated with the main contractors, IHI Corporation and Masaco (Marubeni Saudi Arabia Co.). Cement production started in 2007 and the performance of the ABB equipment has met QCC's high expectations.

ABB was responsible for planning and coordination of the technical solutions, including project management, engineering, customer training, erection, supervision, and commissioning.



Focus on energy efficiency

In the environmental field, emphasis is placed on improving energy efficiency and lowering energy costs. Electric motors can be a major consumer of electrical energy in bigger plants, and a cement plant requires a large number of motors for driving mills, fans, conveyors, etc. It has been estimated that QCC has some 2000 electrical motors in its facilities, with the majority supplied by ABB.

Production line 3

Production line 3 comprises:

- Crusher for limestone, red shale and iron ore.



Figure 2. Drive system for conveyor.



Figure 3. Main station MV switchgear.



Figure 4. Cement mill.

- Preblending.
- Raw material grinding.
- Homogenising.
- Pyroprocessing.
- Clinker silo and cement silo.
- Cement additive handling.
- Packing plant.
- Dust collectors.
- Conveyor band.

ABB's scope of supply included the following products:

- 33 kV switchgear for the main station.
- 6.3 kV medium voltage switchgear for the substations.
- Distribution and drive transformers.
- Power factor compensation and filtering system on MV level.
- MNS low voltage distribution and MCC.
- Emergency power supply system.
- Electrical motors and drive systems, including low and medium voltage drives.
- Instrumentation for flow, level, pressure, temperature measurement, etc.
- Gas analysing systems.
- Industrial IT control system based on AC800xA automation system with AC800M controllers for the process control.
- Knowledge manager system.
- Expert optimiser system.
- Lighting system.
- Erection material and cables.

Upgrading line 1 from 50 Hz to 60 Hz

Line 1 was built as 50 Hz and driven by a 50 Hz diesel rotating frequency converter. The main task was to upgrade the main equipment to 60 Hz, while a portion of the equipment remained on 50 Hz. This was achieved in various steps.

New 33 kV main station

ABB took responsibility as the main contractor, including the civil engineering aspects. The main station included the 33 kV switchgear type ZX1 double bus bar (four incoming lines) and 18 feeders. For the remaining 6.6/50 Hz substations, ABB installed a 5.4 MVA static converter.

Upgrading the drive systems from 50 to 60 Hz

In order to achieve the correct speed with a 60 Hz supply, all major drives were equipped with frequency converters.

- The 6.6 kV fix speed raw mill drives and cement mill drives with ACS1000 Multidrive.
- All major drives on 400 V level with ACS800 Multidrive.

Upgrading MCCs

All MCCs were divided into the remaining 50 Hz MCC and the upgraded 60 Hz MCC.

Upgrading 400 V motors to 50 Hz

Motors with belts were upgraded by exchanging the pulley wheel.



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Figure 5. Control room.

The remaining 50 Hz

Small motors and package units remained on 50 Hz. For this, each substation was upgraded and divided into a 50 Hz and a 60 Hz part.

Revamp of the control system for production lines 1 and 2

The existing DP800 control system had worked reliably for over 20 years; despite this, it was time to replace the system. The distributed S800 I/O units were installed in place of the old boards; consequently, minimal effort was required for cabling and signal testing.

The existing Mimic operator desks and the OS500 operator workplaces were replaced by 800xA operator workplaces.

New central control room

The existing CCR was upgraded and renovated, with ABB providing the new design for room, lighting, and furnishings. All of the work was carried out while the process was still in operation with the old equipment.

Short outage time

The most critical factor was the limited downtime for the raw mill, kiln and cement mills. The downtime for upgrading was limited to a four week period and a two week period. This was very challenging and demanded precise preparation and coordination, therefore special designs and procedures were implemented.

Erection, cabling and commissioning

The overall erection and cable installation of the electrical part was also part of ABB's responsibility; supervision, site management and coordination was essential. The company also supplied its commissioning services to the site.

Training

Operators and maintenance engineers supplied by the client were trained during commissioning at the site. The client also

attended special courses for the control system, drive system and switchgear at ABB's training centre in Switzerland.

Process control system

ABB's 800xA system seamlessly links plant automation, asset optimisation and collaborative business process in real time. It can be adapted to suit applications ranging from small, low-level units and area automation solutions, to extremely large, vertically integrated plantwide and multiplant management and control applications. It addresses the requirements of both multiplant economic and production control, as well as the more traditional process plant regulatory control and safety-related applications. The architecture of the control system is organised into four functional groups, from filed-orientated controls and supervision, through to fully integrated engineering tools.

Area management and control

Providing a comprehensive set of traditional process, regulatory and sequence control services and I/O interfaces.

Plant management and control

Providing a powerful suite of products and services for plant management and control, communication networking and network management.

Human system interface

Providing a multiple operating environment, a range of products for viewing and accessing data from process control, to plant and enterprise information.

System engineering and maintenance tools

Providing an integrated set of engineering, implementation and maintenance tools designed to support the total automation project, including planning, configuration management, commissioning and system documentation. The hardware structure of the process control system can be divided into the following levels.

- Level 1: process control.

The process control system has been configured in such a way that the entire plant can be operated from the central control room.

- Level 2: operator workplaces.
- Level 3: management and optimisation.

Control system configuration

The process control system has been configured in such a way that the entire plant can be operated from the central control room. For the crusher, port and packing plant, additional local control rooms with fast Ethernet links over a fibre optic connection were installed with local process control functionalities also available.

The AC 800M process controllers are located in cabinets in the electrical rooms. Each controller is connected over a PROFIBUS-DP fibre optic link with the respective remote I/O panels in different electrical rooms.

The platform communications are based on two independent networks for optimised availability. The control network connects all the controllers and the connectivity server; the plant network connects all the operator stations, the connectivity and the aspect server. The data transfer between the control network and the plant network is made via the connectivity servers.

For the operator workplaces, the Operate IT Human Interface Portal for Windows 2000 has been installed.

Operate IT, which supervises and controls the process and is embedded in the client server environment, consists of different packages for workplace management, graphical presentation, alarm and event handling, trend presentation, system status and reporting.

The Aspect Object technology allows the user to connect different kinds of information to every type of object in the production process, be it a sensor, control loop, motor, drive, transformer or substation. With this concept, access to information for maintenance, system status, logical diagrams and more are made available extremely quickly and easily.

Conclusion

Qassim Cement benefited from ABB's experience in executing large automation and electrification projects, and with the delivered products mostly coming from ABB, the interfaces, which are a critical element, have been reduced to a minimum. 🌐

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