

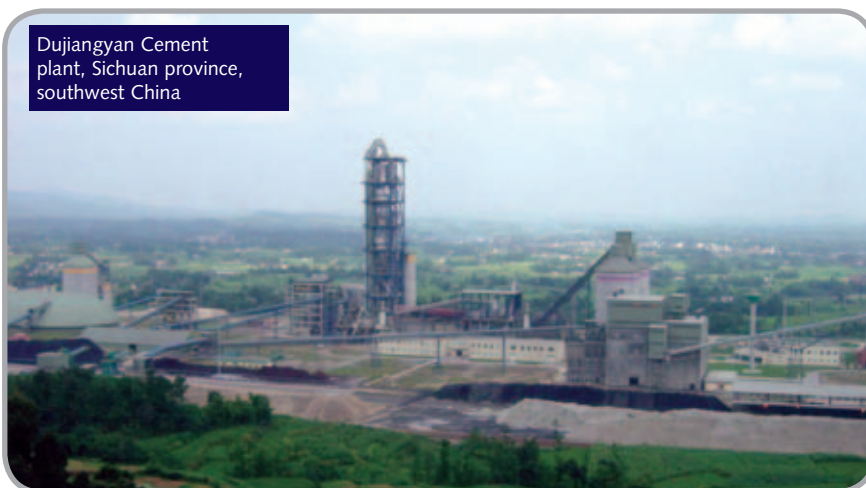
# Schneider optimises Dujiangyan

by **Sebastien de Peretti & Eric Vitte, Schneider Electric**

Limestone, silica, aluminium and iron-bearing raw materials arrive at the Dujiangyan plant via conveyors, trucks and railway wagons. The materials are ground in a roller mill that generates an output of 250tph and stored in the homogenising silo as raw mix. This raw mix is lifted 112m up to the top of the low NO<sub>x</sub>, five-stage cyclone preheater/precalciner system. Here it is heated in suspension, increasing in temperature from 30°C, at the top cyclone stage No1, to 860°C, at the bottom cyclone stage No5. The precalcined material is fed into a 66m long, 4.3m diameter rotating kiln where it is heated to approximately 1450°C. The clinker falls into a cooler to reduce its temperature to 80°C and is stored. The system produces 3500tpd of clinker. When it is needed, the clinker is transferred from storage to the cement grinding systems, where it is mixed with gypsum and ground to produce cement. The facility thus produces 6400tpd of cement.

The DJY site includes a whole range of complex process control systems – PID loops, analogue processing control,

*Lafarge Shui On's state-of-the-art Dujiangyan (DJY) cement plant boasts affordable, leading-edge technology with a tailored control system. The plant, located in Sichuan province, has an annual output of 3Mt of cement designed to feed China's fast-growing market. The company recently invested to modernise the DJY plant and double its capacity. This state-of-the-art clinker line has now been contracted by the Chinese EPC (Engineering, Procurement and Construction) company TCDRI, part of the SINOMA Group to supplement its existing line, which was built in 2000 to European standards. As a result, the investment has been dramatically reduced to fit Chinese ROI (Return on Investment) requirements, yet the same performance, reliability and security criteria continue to be met.*



Dujiangyan Cement plant, Sichuan province, southwest China

motor and discrete on/off valve control, temperature, flow and pressure control. Lafarge Shui On needed a distributed digital control system (also called a hybrid control system) to ensure that they were all properly managed. Which

meant that they required a vendor who could provide a control system with the following attributes:

- connectivity to all auxiliary systems – expert systems, MES (Manufacturing Execution System)
- total information system accessibility (dedicated data servers)
- distributed access for control and access to all information from many locations on the site by many people
- flexible data management
- excellent, proven reliability
- a Chinese manufacturing and support network
- strong local support in a remote area
- easy to use
- fast, modular and scalable
- fast, on-line programming changes
- no barrier between process and sequential control
- ability to process at least 15,000 I/O points
- easy to programme.



Mr Chang, SiYong, ATC electrical & automation engineer receives a warm welcome from Schneider Electric at Lafarge Shui On's Dujiangyan plant



Current cement production at Dujiangyan is 6400tpd

### **A Collaborative Control System thanks to Schneider Electric standards-based equipment**

Based on its latest worldwide engineering standards, Lafarge Shui On opted for the Open Process Control System from Schneider Electric. For Lafarge Shui On this system – which is composed of the tight integration of the Schneider Electric's standard automation products – allows it to handle a single database structure.

"The Schneider system helped us to dramatically reduce programming and implementation time, secure and control that phase and consequently shorten commissioning time," says Mr Chang SiYong, ATC electrical & automation engineer.

The development of this solution has been entirely led by Schneider Electric China and its project director Tony Macera, but the technical design was truly a joint effort between Schneider Electric and Lafarge Shui On, during the last seven years of cooperation in China, since the first project in Huaibei.

In addition to the existing 8000 I/O points controlled by eight Quantum Concept PLCs, the eight newly installed Quantum Unity PLCs control a total of 6000 I/O points with a dedicated OPC server to ensure full consistency with the existing installation. Each of the five operator stations controls the equipment lines during maintenance and access to an overview of the entire plant operations. This open process control system also makes troubleshooting analysis and local maintenance easier. Furthermore, it minimises equipment and operating costs, as PLCs are less costly than a conventional DCS.

"The built-in library of process control-oriented functions is full-featured, in line with all Lafarge specifications and methodology," adds Mr Chang. And, because the system complies with the ISA88 and IEC-1131 standards, many other standards-based software packages can be used. They help programmers to speed up and secure programme development.

Using the standard Lafarge software library – which is used to encapsulate and standardise complex routines and to streamline the program structure ("intelligent rules") – Schneider's system generates automatically the PLC program, the Scada screens and the communication exchanges between the different components of the system, minimising programming errors and debugging effort.

"The Schneider's Open Process Control System generates a lot of the PLC and HMI programming itself. That alone prevents most bugs and shortens development time," notes Mr Chang.

In addition the system was a perfect fit for the Chinese project management approach, since it enabled all stakeholders to work together in a constructive way.

**Dedicated Project Management for an on-time, low-cost, reliable, high-performance solution**

Besides the above state-of-the-art solution, Schneider Electric China also provided full project management, ensuring co-ordination between all the Chinese stakeholders (the EPC, system integrators, the Lafarge Shui On DJY plant and Lafarge Technical Centre) and the overall performance of the delivered system.

Schneider Electric China was thus able to provide the whole electrical package (MV Switchgear, capacitor banks, LV VSDs, MCCs, ACC, lighting etc) and numerous other services.

Once the collaborative control solution was validated against the Lafarge standards through a dedicated FAT (Factory Acceptance Test) in the presence of Mr Philippe Bachelet, project director China, Schneider Electric was able to deliver a complete, ready-to-use solution in less than four months.

Following the FAT the system was optimised, especially the HMI part, enabling Schneider Electric to deliver an I/O scan time of less than 100ms (300ms is the standard) and pop-up windows in HMI of under one second.

“It is through the dedication of all the stake holders that we have all been

able to have mutual success” concludes Peter Duffy, ATC electrical & automation engineer, mentioning the very strong professional relationship between TCDRI, Lafarge Shui On and Schneider Electric.

DJY II is now among the most reliable cement plants in the Lafarge Group worldwide.

**And the future?**

Thanks to the success of Dujiangyan II, following on from that of Dujiangyan I and Chongqing II, Lafarge and TCDRI have recently chosen the same control system and project management model for the new Sonadih line in India.

Besides this new project, Schneider Electric and Lafarge were able to take advantage of this success on several others projects, including the grinding plant and cement terminal at Lafarge



Job done at Dujiangyan Cement plant

Vietnam with CDI, and the cement terminal for PT Semen Andalas in Banda Aceh, Indonesia.

Due to Schneider Electric’s international deployment capability, local support and training for this solution can be made available anywhere in the world. The Indian and Indonesia Execution Centres have already been trained to deliver projects autonomously.

As this solution has been validated by every Lafarge Technical Centre in the World (Canada, France, Austria) it is ready to be implemented on any Lafarge plant.

By investing in its customers’ processes and methodology, Schneider Electric is now in a position to easily implement a new cement plant in any country, with the same level of performance and reliability and at an optimised cost. \_\_\_\_\_ |



With engineers, suppliers and plant staff working together Dujiangyan has become a very reliable plant

**Song dynasty at Dujiangyan plant**

On a December day in 1999, the construction site of the Dujiangyan plant was full of excitement. Hired to build the plant’s first cement production line, workers at the site had just unearthed an ancient porcelain kiln. The initial excitement later gave way to real interest: a team of 20 archeologists revealed a much larger complex dating from the end of the Song Dynasty (960–1279 AD). “33 kilns, 10 workshops, six refuse dumps containing porcelain debris, many highly innovative tools from the period (including an ancestor of the thermometer), 5000 ceramic objects, and several coffins were all found within a 9000m<sup>2</sup> area,” recounts Ge Guanjun, deputy general manager of Lafarge Dujiangyan Cement.

After six months of further excavations, it was decided to construct a museum on the plant’s grounds. Lafarge called on Qian Fang, a renowned Chinese architect who had previously designed several museums in China. The building’s red silhouette evokes a dragon, and resembles the shape of one of the ancient kilns.



Designed by architect Qian Fang, the Lafarge Shui On Jin Feng museum houses a remarkable archeological treasure dating from the Song Dynasty, which teaches us about techniques employed to manufacture ceramics 800 years ago. Source: Lafarge Crescendo magazine