**Introduction**
The cement industry is in constant motion. Ownership structures are changing and the market is becoming increasingly global. Furthermore, today fewer new plants are being built; instead, existing plants are being upgraded with state-of-the-art technology. Yet for all plants, wherever they may be in the world, operators have to focus on issues such as process optimisation, plant availability and energy efficiency to remain competitive. Any new solutions must keep engineering efforts to a minimum – after all, engineering can represent a veritable cost factor.

For the distributed control system in a cement plant, Cemat from Siemens provides a good solution when it comes to retaining a competitive

**Stefan Siegel and Thomas Walther, Siemens AG, Germany,** explain how the newest version of Siemens’ tried-and-tested distributed control system will help cement plants to remain competitive for the long-term.
edge. In essence, Cemat is more than a software library – it offers a complete philosophy on how to operate a cement plant based on advanced, proven engineering. Cemat was specifically designed for the cement sector and related industries. Due to its success, a version has since been brought to market just for mining operations. According to an ARC Advisory Group market analysis in 2012 on distributed control systems, Siemens is the leading supplier in the cement and glass industries.

A cement workhorse

Cemat was introduced to the market in 1976. At that time, it was based on Simatic S32. Over the years it has undergone a number of innovations in line with technical progress and to keep up with changing market requirements. The most recent updates took place in March 2010 to V7.1 and in February 2013 to V8.0. The latest update to be introduced to the market is V8.1, scheduled for the end of October 2014. Cemat V8.1 is based on the newly released version 8.1 of PCS 7, Siemens’ traditional distributed control system, and it makes wide use of Simatic S7 modular PLC controllers.

For Cemat V8.1, the possibilities that PCS 7 holds were exploited to the greatest extent possible, with particular focus on flexibility and efficiency so that cement producers can adjust to quickly changing market and industry conditions.

A core innovation is Feature Master, a central repository where selected and proven settings that are applicable within a factory are set once. Every module that is defined to be a ‘slave’ to the Feature Master inherits the selected bit pattern. This ensures the use of project-wide uniform settings, namely those that have been tested and approved for the plant. Furthermore, during a factory acceptance test, Feature Master saves a lot of work as it is not necessary to check each and every drive, analogue signal module or alarm module. Instead, the best setting for the customer is defined and tested once, and all the ‘followers’ have exactly the same characteristics. In a typical plant, approximately 95% of the settings are determined by Feature Master, which allows plant personnel more time to concentrate on the remaining 5%.

*Built-in efficiency*

In order to achieve a higher degree of efficiency in terms of engineering, final acceptance tests and plant operation, the new Cemat V8.1 makes even greater use of so-called structured connections. Compared to earlier versions, structure connections now extend to all parts...
of Cemat. Instead of drawing separate links for each and every bit, byte, word, etc., of data to be transferred between modules, a single ‘structure’ type connection transports it all. This integrated function lessens engineering efforts and helps to avoid mistakes. Moreover, Cemat comes with a built-in self-check for every module. Only when this self-test indicates ‘No error’ can the device be operated. This self-check is already active while the program is engineered offline to assist with fault-free program coding.

A further innovation in Cemat V8.1 is a central location for aspects such as text and colour definition. This is helpful as it ensures that the same abbreviations used in electrical drawings are also displayed in the standard faceplate diagnosis view on the operator’s station. This feature was made possible with version 8.0 of PCS 7 and it further enhances the customisable nature of Cemat V8.1.

The concept of efficiency also extends to daily operation. For example, a small maintenance information system that gives indications based on runtime or the number of starts and stops of an object has been improved even further since its introduction in Cemat V7.0.

Alarms can also be interlocked to avoid ‘alarm flushing’ so that plant operators are not overloaded with meaningless information that, in the worst case scenario, can result in extended downtime or unplanned stops. This leads to higher availability of the whole operation and increases the efficiency of the plant. Mechanisms for alarm reduction extend to situations where a device – such as a drive, damper or measurement instrument – registers a ‘faulty’ message while the group it belongs to is not in operation. Devices that are not in operation should not attract the operator’s attention. Operators can only handle a limited amount of alarms at a time, so all unnecessary alarms are avoided to ensure that the operator is free to concentrate on real problems.

Cemat V8.1 has a powerful object browser that is populated automatically, without any engineering at all.

European technology for Benin’s largest cement producer
A new cement line in Benin is one of the latest greenfield projects to include Cemat. The line belongs to Senegal-based Les Ciments du Sahel. The company in charge of its construction was Sinoma CBMI, China. A stipulation Les Ciments du Sahel placed on Sinoma CBMI was that European suppliers provide key technological components. The line operator chose Cemat based on the well-known Siemens PCS 7, as well as Siemens’ dedication to high quality and expert support.

Under a tight schedule, the crusher, cement mills and packing facility were commissioned in November 2013 and the rotary kiln was commissioned in July 2014. Sinoma CBMI noted Siemens’ professional and successful project execution in Benin.

Siemens’ scope of supply included:
- Around 80 automation cabinets.
- 8 x Simatic S7-400 control units with a redundant system bus.
- Over 1000 ET200 I/O cards for around 14 000 signals.
- Data archival and reporting with Sicement MIS.
- Kiln control system (KCS).
- Cemat software engineering for the entire plant.
- Comprehensive PCS 7 and Cemat training.
- Four-week factory acceptance test for software, including simulation.
- Commissioning over a period of eight months.
The object browser hosts a number of functions, for example operators or maintenance personnel can search across a plant to find all bypasses, all modules in ‘Simulation’ or ‘Out-of-Service’ mode, or simply any objects that have an operator’s note assigned to them.

As in previous Cemat versions, first-up fault information is available. However, in the new version an interlock module can be cascaded so that the operator can easily see which signal caused a trip, even if more than one interlock module had to be used within the program.

Naturally, all of the service and maintenance documents linked to the modules have also been updated for the new version. Multimedia information, such as short video clips, is available to support engineering and operator training. Online help is also available.

Cemat comprises more than a simple software library; changes and adaptations therefore also extend to the calculation tool, training concept, demo projects and engineering templates.

The list of new features also includes adjustable ‘off’ monitoring time, which is often necessary when using frequency converters. The ‘still faulty’ message generated when a start command is given to a faulty device now also carries information on the type of fault.

Further improvements have been made to Cemat Trend View, which can be configured online by clicking on the measurement to be added to the monitoring window. Using the newly available ‘O_Link’ connection, direct module-to-module communication is possible and a single connection is used to transmit the entire lot of information. This new programming style is useful, for example, when it comes to connecting all signals to a drive, such as status information, command word, etc.

Finally, with regard to dampers, it is now possible to define a safe position to which the damper should move, ignoring all other input when the request ‘move to safe position’ appears.

Q&A with Stefan Siegel, Cemat Development Manager

How do developments in Cemat come about?
Siemens is in constant dialogue with cement producers all over the world, and we follow market and industry trends closely. Therefore, we know what challenges the business is facing. The new Cemat V8.1 has exactly what is needed, with no extra frills that get in the way. At the heart of Cemat V8.1 is PCS 7, Siemens’ distributed control system, which is used in all types of process industries. Through exchange forums within the company, we also profit from experiences in other industry areas and adapt these experiences to benefit our customers.

Will users need a certain amount of time for engineering and to get accustomed to V8.1?
With every installation of Cemat V8.1 a migration strategy is worked out. When it comes to engineering, the investment is minimal because V8.1 is compatible with previous versions. Also, engineering efforts from the past can be taken over in V8.1. Those who are accustomed to using previous versions of Cemat will have no problem with the new version because it has a nearly identical structure. For new users, the predefined modules ensure simple and fast engineering and the rigorous guidance of the engineer avoids patchwork in software programming.

What would be the biggest argument for installing Cemat V8.1?
I can think of many. Cemat V8.1 is designed to run on Windows 7, an important consideration with the expiration of Windows XP. The user also gets the utmost flexibility to cover all requirements with just one standard and with less trial-and-error engineering. With our new Feature Master, operators have proven modules and settings at their disposal. Finally, and above all, cement plant owners can be assured that their facility is operating to the most up-to-date standards.

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Smooth transition
In addition to the innovations provided by Cemat V8.1, operating companies can also be assured of ease of migration. Cemat offers tools to expedite the migration from earlier versions to V8.1 as standard. This means that a lot of engineering work performed in the past can be ‘recycled’ – i.e. it does not need to be carried out again when a customer decides to upgrade to the most recent, state-of-the-art Cemat version. In pilot installations, “very efficient,” “rewarding” and “perfect” were among the phrases used by customers to describe the migration process.

Cement plant operators have come to expect flexibility and efficiency from Cemat, and V8.1 ensures that this tradition continues. For example, it is now easier than ever to deal with different local switches, to choose the operating mode granted to drives, aggregates, units, etc., and to adapt texts and colours without additional engineering. There is also no need to learn another standard, as it can all be archived within the same Cemat version. In this way, Cemat V8.1 has been designed to help cement plants keep up in an ever changing world.