Highest reliability and quality.

Automation solutions for the Cement Industry.

totally integrated

automation

SIEMENS
Your partner in automation

Siemens – a name recognized all over the world. A name that stands for innovation, customer orientation and a global competitiveness. Not only for 400,000 employees and millions of customers, but also for hundreds of thousands of suppliers and partners in more than 190 countries. It also stands for a unique range of products, systems and solutions.

Siemens also embodies the timeless vision of its founder, Werner von Siemens: “Progress serving mankind”.

With more than 50,000 employees in 70 countries, Siemens Automation and Drives (A&D) is one of the largest groups within Siemens AG. As a technology and market leader in automation and drives technology, we are continually driving forward progress in this field – and setting new standards again and again.

Siemens A&D offers a unique, complete range of innovative products, systems and solutions. Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) form the backbone of our portfolio – and the basis for customer-specific solutions in the field of automation and energy distribution.

Already the great Roman builders knew how to mix together river and rock debris to create concrete. Its quality is undisputed to this day. In the renowned Roman Pantheon, for example, the material has already lasted for two millennia. Numerous structures – some of them monumental – with similar histories can be admired all throughout the rest of Europe as well. “Real” cement, however, was not invented until much later. In Germany, Hermann Bleibtreu (1824–1881) fired the starter’s gun as the first to conduct experiments in this field. He also founded two cement works.

www.siemens.com/totally-integrated-automation
Industry Suite Cement – the customized solution for you

In the Industry Suite Cement, the worlds of automation and power engineering merge into one comprehensive and modular offer for your needs – including the required services across the entire life cycle of your plant.

Totally Integrated Automation

Optimization of the complete workflow

With Totally Integrated Automation, Siemens is the only supplier of an integrated range of products and systems for automation of cement plants – from the crusher to the dispatch, from the field level and production control level to the enterprise level. Your benefit: considerably lower life cycle costs for the plant, shorter time-to-market and consequent improvement of your competitiveness.

Process know-how

On the basis of our comprehensive industry know-how, we implement solutions that guarantee maximum process transparency for your plant – while requiring a minimum of manpower.

Tailor-made energy concepts

With our solutions in the field of energy supply, we make a decisive contribution to the smooth, economical and environmentally friendly operation of your plant.

Process optimization by means of MES solutions

Our MES solutions are essential to enable you to optimize your processes throughout the plant. They ensure integrated data transfer – vertically from the field to the enterprise level and horizontally from the source to the consumer.
Our industry


Cement

Totally Integrated Power

Power management and distribution from a single source

On the basis of Totally Integrated Power (TIP), we implement integrated solutions for power distribution across all production units and industrial buildings, from the medium-voltage supply to the outlet. Equipped with the same communication standards as Totally Integrated Automation, all resources – for automation, power distribution, energy management and building automation – can be integrated and comprehensive solutions can be implemented in your plant.

Drive solutions

Innovative technology, precisely coordinated components and comprehensive engineering know-how are your guaranty that our drive solutions will meet even your highest requirements – in terms of performance, torque, dynamics, availability, diagnostics capability and cost-effectiveness.

Life cycle services

Our comprehensive range of services is an efficient lever ensuring continuous optimum performance of your plants. With our solutions we cover the entire life cycle of your plants – from planning and implementation to modernization and maintenance.

System integration

In addition to our own established competence and expertise in the field of system integration we work closely together with Siemens Solution Partners. The result: a global network of automation professionals that you can use to your advantage. Throughout the world, the quality seal of Siemens Solution Partners has long been a guarantee for world-class services.
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With Totally Integrated Automation (TIA), Siemens is the only supplier to offer an integrated portfolio of products and systems for the implementation of automation solutions. TIA combines Siemens technology and products with an impressive and unique level of integration into an automation system. This not only reduces the number of interfaces, but also ensures maximum data transparency across all levels – from the field, through the production level to the management level. From the quarry to the cement silos.

You benefit with TIA throughout the life cycle of your plant – from the first planning stages, through operation to modernization. We offer you a high security of investment with the unique transparency and interoperability of our products and systems – by avoiding unnecessary discontinuities in the system.

**Totally Integrated Automation in the Cement Industry**

On the basis of Totally Integrated Automation, we implement solutions that are perfectly tailored to your special requirements in the Cement Industry and which are characterized by their excellent integration. In this way, TIA makes an essential contribution to the optimization of your production processes.
The answer to growing demands

The Cement Industry is moving in a constant area of tension between optimum quality, lower costs and shorter time-to-market. Whether you are a plant operator, system integrator or plant and machine constructor: the solution to this problem is Totally Integrated Automation.

Advantages for plant operation

The growing global competition does not stop with the Cement Industry – quite the opposite. For you as a plant operator, this is expressed in a keenly fought price war and in the need to bring new products into the market in ever shorter cycles. At the same time, the legal obligations are increasing – as is the complexity within your plants.

Totally Integrated Automation is the foundation for:

- Automation solutions tailored perfectly to the specific requirements
- Optimized machine and process operation
- Protection of investment and intellectual capital
- Reduced expenditure on the construction and maintenance of plants.

Advantages for system integration

Growing pressure on the production side, ever shorter product life cycles, rising production demands and an ever greater complexity: The demands made on you as a system integrator are immense. The demand is for solutions with which you can process your customers orders more quickly, precisely and economically – from the design to commissioning.

Totally Integrated Automation is the foundation for:

- Shorter time-to-market from the planning to the delivery
- Higher system availability and flexibility
- Improved quality
- Less expense for development and commissioning
- Cost savings.

Advantages for the plant and machine construction

As a plant and machine constructor, you must respond to a continually rising pressure of competition. At the same time, more is being expected of your solutions all the time. The demands that you must meet are growing increasingly complex.

Totally Integrated Automation is the foundation for:

- Higher quality
- Improved system availability
- Lower production costs
- Shorter time-to-market – from planning to commissioning on the customer premises
- Greater flexibility.
The Cement Industry typically produces Portland cement – sometimes also masonry cement. Portland cement is a fine, typically gray powder comprised of calcium (from lime), silicates, aluminates (argillaceous), and ferrites, with addition of sulfates. Cement plants can operate continuously for long time periods (i.e., 6 months) with minimal shutdown time for maintenance. Air pollution problems related to the production, handling, and transportation of Portland cement are caused by the very fine particles in the product.

The main stages of cement production at a Portland cement plant are:

- Preparation of raw material
- Raw Milling – preparation of raw meal for the pyroprocessing system
- Pyroprocessing of raw meal to form cement clinker
- Cooling of cement clinker
- Storage of cement clinker
- Finish Milling
- Packing and loading.

Typical process flow of a cement plant

Raw material preparation

Limestone is the predominant raw material. That’s why most plants are situated near a limestone quarry in order to minimize the transportation cost, since one third of the limestone is converted to CO₂ during the pyroprocessing and is subsequently lost. The material is delivered to the crusher where it is reduced to chunks by crushing or pounding. Crushed limestone and the other raw materials are often stored under cover to protect them from the elements and to minimize dust. In most cases the quarry is distant from the cement plant. Therefore separate or stand-alone electrical supply equipment will be required.

Raw material grinding

In the raw mill, the material chunks are ground finer to allow high-quality blending. In this phase mainly vertical mills are used which grind the material through pressure exerted by rollers.

By far the greatest part of the electrical energy demanded for grinding is not exploited for comminution but rather converted into lost heat. It is therefore an economical demand to adjust the grinding plant so that energy losses are kept as low as possible.

A process automation system which optimizes mill process and electrical equipment with low energy consumption is essential. The raw meal is finally transported to the homogenization silo.
Clinker production

The pyroprocessing system involves three steps: drying or preheating, calcining (a heating process in which calcium oxide is formed), and burning (sintering).

Calcination is the core portion of this process. The raw meal is continuously weighed and fed into the top cyclone of the preheater. The material is heated by hot air rising from the kiln. Inside huge rotary kilns the raw material is transformed into clinker at 1,450°C.

From the kiln, the clinker goes to the clinker cooler. The cooled clinker is then transported by a pan conveyor to the clinker silo for storage. The clinker cooling can recover up to 30% of heat from the kiln system, preserves the ideal product qualities, and enables the cooled clinker to be transported by conveyors. Air sent through the clinker to cool it is directed to the rotary kiln where it nourishes fuel combustion. The fairly coarse dust collected from clinker coolers is comprised of cement minerals and is restored to the operation. The amount of gas to be cleaned can be reduced if – following the cooling process – a portion of the gas is used for other processes such as coal drying.

Equipment such as conveyors and bucket elevators is used to transfer the clinkers from coolers to storage areas and to the finish mill. Gravity drops and transfer points typically are vented to dust collectors.

The main requirement for low emission and low energy consumption is a highly uniform kiln operation. Therefore, the burning process must be monitored continuously using modern process control technology.

Storage and grinding

Clinker is extracted from the clinker storage and sent to feed bins for further proportioning with gypsum and additives before passing the finishing mill.

During finish milling, the clinker is ground with other materials (for special finished product characteristics) into a fine powder. Up to 5% gypsum and/or natural anhydrite is added to regulate the setting time of the cement, plus other chemicals, such as those which regulate flowability or air entrainment. Many plants use a roller press to achieve a preliminary size reduction of the clinker and gypsum. These materials are then sent through ball or tube mills which perform the remaining grinding. The grinding process occurs in a closed system with an air separator that divides the cement particles according to size. Material that has not been completely ground is sent through the system again.

This highly energy consuming process needs automation and optimization to ensure today’s quality demands.

Silos and dispatching

Finished cement is stored in large silos. It can be loaded directly into trucks or railroad cars in bulk for distribution to customers, or packaged in bags for delivery on standard pallets.

Among the functions required to run a cement plant, the processing of the deliveries represents one of the main tasks. As the dispatching facilities are usually also employed for the weighing and loading/unloading procedures of materials received from external supplies, these systems must also support the processing of feedstock deliveries.

Modern dispatching systems offer all-out logistical support and make the dispatching process transparent to the operators.
CEMAT: distributed control system tailored to the demands of the Cement Industry

Siemens automation solution with CEMAT based on SIMATIC PCS 7

CEMAT, the Siemens control system specifically designed for cement plants, has been well proven in this harsh environment over many years of service. The system is well accepted in the Cement Industry, and the number of CEMAT users is growing continuously. Siemens has designed the CEMAT control system from their extensive know-how in the field of cement production, established together with many cement manufacturers worldwide. The engineers who develop and support CEMAT can fall back on more than 35 years of experience in the cement industry. CEMAT is now based on the mainstream process control system by Siemens, SIMATIC® PCS 7, which offers a unique, open architecture for modern, future-proof and economic solutions for the cement industry. The system makes use of all features and functions of SIMATIC PCS 7 and adds further to the philosophy of plant operation, fault diagnosis including function blocks and interlocking as required in cement plants.

CEMAT features a number of valuable highlights:
- Easy and fast engineering with predefined CEMAT modules
- Proven software typical for specific requirements in the Cement Industry
- Strict guidance of the engineer during programming avoids patchwork of software
- Minimum risk of programming errors due to standardized interfaces between CEMAT modules
- Fast commissioning thanks to high quality of the user software
- Easy handling for the operator due to self-explaining standard faceplates
- Fast troubleshooting because of detailed fault indication with high-performance plausibility logic
- No unreasonable start of drives or drive groups because of detailed status report prior to any start.
Sophisticated fault diagnosis and annunciation
CEMAT features a number of improvements in fault diagnosis and annunciation to include:

Reduced downtimes: The number of electrical and mechanical technicians can be reduced over the middle term.

Displays faults prior to start: Trial starts can be avoided, saving energy and improving capacity utilization.

Shows all faults, without exception: Personnel can rely on information, ensuring system acceptance.

Informs control room and management personnel: Operators and shift manager can identify faults rapidly, as well as coordinating repairs and starting sequence.

Enables fault analysis and statistics: Weak points can be analyzed and eliminated.

Continuity saves money
Because the life cycle of a cement plant is much longer than the service life of a single control system version, it is essential that the strategy behind the development of a control system stays innovative.

CEMAT for the Cement Industry is designed with the future in mind, to guarantee compatibility with ongoing innovation. Even older versions of CEMAT – from V1.8 to V5 – can either be connected to the latest version or upgraded to this and later versions without difficulty. This saves you money when investing in new plant equipment or during system upgrades.

More than thirty-five years of experience in meeting the needs of the Cement Industry along with the most advanced control technology available combine to make CEMAT a leader in delivering outstanding value for money.
Open DCS for the future
SIMATIC PCS 7 is based on modular SIMATIC hardware and software components. The innovative process control system is fully harmonized with TIA. It is flexible, expandable and open for future enhancements through the use of standard interfaces with long-term stability. CEMAT benefits one-to-one from the continuous further development of SIMATIC PCS 7.

SIMATIC PCS 7 consistently applies state-of-the-art, powerful technologies together with internationally established industrial standards such as IEC, XML, PROFIBUS, Ethernet, TCP/IP, OPC, @aGlance, ISA S88 and ISA S95, to mention just a few. The openness of SIMATIC PCS 7 covers all levels and applies equally to automation systems, process I/Os and field devices as to operator and engineering systems, industrial communication networks or the SIMATIC IT framework.

Common and integrated system
SIMATIC PCS 7 can be used on its own or in combination with Motion Control and SIMATIC components.

High performance, flexibility and ease-of-use, together with common data management, communication and configuration, guarantee that the typical demands placed on a process control system can be met and exceeded by SIMATIC PCS 7:

- Simple and safe process control
- Intuitive operation and visualization
- Powerful system engineering tools with a common interface simplify the engineering and save money throughout the entire plant life cycle.
- Online modifications possible throughout the system
- System openness at all levels makes plant enhancements easy
- Redundancy at all levels makes high availability scalable to your needs
- Flexibility and scalability simplify plant improvements
- Automation solutions avoid injury to humans and damage to equipment and provide high process availability at the same time
- Comprehensive fieldbus integration makes the connection of field devices easy and optimizes the handling
- Direct interfacing to the IT world opens the DCS.
Asset Management for systematic automation and maintenance of plants

Siemens offers an efficient solution for plant maintenance: SIMATIC PCS 7 Asset Management. The particular highlight here is that the new feature is simply integrated into the SIMATIC PCS 7 process control system. No additional hardware or software tools are required. Plant operators and maintenance engineers use the same SIMATIC PCS 7 tools and operator interfaces with information that has been filtered and prepared for the relevant application area.

Complete integration of field devices

SIMATIC PCS 7 is optimized for integration of distributed field systems into the process control systems, and is based on PROFIBUS technology. It supports redundancy and fail-safe architectures, in addition to online expansions, and can be used in standard environments or in hazardous areas. The plant can be equipped with conventional signal inputs/outputs on the SIMATIC ET 200 distributed I/O station, or with state-of-the-art, intelligent field devices.

SIMATIC PCS 7 Web: direct access to the process via Internet

The new OS Web functionality enables direct process control over the Internet/Intranet. The PCS 7 OS Web server can be accessed directly from any popular PC. Prerequisite is the Internet Explorer as browser. No special software must be installed on the PC.
SIMATIC IT: the basis for tailored MES solutions

SIMATIC IT is the premier Manufacturing Execution System (MES) for the Cement Industry. With Siemens SIMATIC IT, you can meet every optimization and process improvement requirement either at a single plant level or for collaborative manufacturing at company level. SIMATIC IT enables the Cement Industry to exploit new sources of productivity and manage the production life cycle by bridging the gap between enterprise business systems and the plant floor.

SIMATIC IT offers real-time information, optimized production workflows and efficiency, plant transparency and quality assurance, and comes with functionality tailored to the specific needs of the Cement Industry. SIMATIC IT is a modular platform enabling a step-by-step implementation, starting for instance with a SIMATIC IT Historian installation used in a single plant, up to a company-wide, multisite implementation including several components like SIMATIC IT Production Suite and Unilab.

SIMATIC IT for plant transparency

SIMATIC IT enables total plant transparency and the monitoring of life cycle costs by providing Key Performance Indicators (KPI) showing equipment performance, productive time and costs and providing this information on a timely basis to those who can best use it. SIMATIC IT Historian is the basic component for long-term archiving of process values, aggregated data and alarms. Data from PCS 7 and other sources can be joined. Based on this multiple functions are available like:

- Calculation of KPIs
- Reports (energy consumption, material consumption, production report, environmental data etc.)
- Data long-term analysis
- Analysis of downtime reasons, Overall Equipment Efficiency (OEE)
- Alarm statistics (“Top Ten Alarms”)

SIMATIC IT provides the necessary metrics to improve performance continuously. The Client Tools are easy to handle and allow the plant personnel to create or modify e.g. trends or Excel charts.
SIMATIC IT for integrated processes
SIMATIC IT provides a standard platform that integrates product and quality data and KPIs exceeding the plant execution level into the ERP system to report on, for example, costs to integrate KPI management in the control level. SIMATIC IT Report Manager enables flexible and ad hoc reporting and allows the company to standardize reporting across all of its plants. Standardized and integrated processes and information flows not only guarantee reliability, they also result in a lower Total Cost of Ownership of IT systems. As part of Totally Integrated Automation, SIMATIC IT can be seamlessly integrated to an existing CEMAT system based on PCS 7. Siemens also provides a migration solution based on SIMATIC IT Historian for existing legacy systems of CEMAT MIS (Manufacturing Information System). Furthermore, the standard communication interfaces allow the integration of non Siemens equipment.

SIMATIC IT for synchronized production
SIMATIC IT coordinates and synchronizes business and production processes through a seamless and complete information exchange between IT systems and the manufacturing systems – including the staff in production, quality and ERP departments. SIMATIC IT Production Suite enables the design, implementation, execution, synchronization and control of all operations through a uniquely flexible modeling environment with automated workflows. It enables the easy modification of manufacturing procedures according to new processes and product needs. Production suite can e.g. manage the milling process starting with the import of production orders from a ERP System, provide the order management by the operators and send back the order results to the ERP system. The SIMATIC IT Client Application Builder (CAB) provides a uniform easy-to-use and easy-to-maintain web-based tool as a graphic user interface (GUI), providing the right customized and transparent view of all components.

SIMATIC IT for quality and operational excellence
SIMATIC IT Unilab enables the integration of production, quality and supply chain and provides an infrastructure to easily determine the tests to be performed inside the laboratory or at the production floor. It provides the necessary feedback of lab results for the process control optimization by the operators.
SIMATIC IT centralizes all quality information, can model a test plan, record the test results, and store them for later analysis and reporting. All activities are coordinated and recorded, available for other plants or labs, offering extensive decision support in case of noncompliant results.
SIMATIC S7: the comprehensive range of controllers – highly reliable and powerful

SIMATIC S7 controllers provide powerful control, network communication, IT service functionality among other functions. That is why SIMATIC S7 controllers have become the PLC product with the highest global market share.

SIMATIC S7 controllers can be installed and operated in different environmental conditions, such as dry tropical, low temperature, humid tropical etc.

As part of Totally Integrated Automation, a long product life is insured. SIMATIC S7 controllers meet the following standards: DIN, EN, IEC, UL certification, CSA certification, Class FM1 Sec.2; group A, B, C, D, temperature group T4 (< 135°C) and marine classification certifications.

SIMATIC S7-400: powerful for system solutions in large-scale installations

Large memory, high quantity of I/O and with an extremely high speed, they ensure high tech combined with economical benefits for any automation solution.

SIMATIC S7-400H: high-availability processes without process stops

Controllers that keep your process running with hardware redundancy (hot standby). Redundant I/O and PROFIBUS complete the high-availability functionality.

SIMATIC S7-400 and SIMATIC S7-400H are the basic systems for CEMAT.

SIMATIC S7-300: modular and versatile for high-performance processes

A controller that increases productivity by reducing runtime cycles by 25–33%. Easy to use with an enhanced memory, the complete STEP® 7 package with comprehensive engineering tools, like SCL, simplifies operation, maintenance and documentation. Cost reduction is the major benefit. Reduced cabinet space requirements save money due to the smaller CPUs (reduced from 80 mm to 40 mm). High flexibility using the micro memory card, enabling quick maintenance. Program updates are easy to perform and a battery is no longer required.
SIMATIC ET 200: decentralized field devices for all demands

SIMATIC ET 200 distributed I/O modules can all be connected to PROFIBUS DP, some like ET 200S can be connected to PROFINET. They are used to connect various field devices in the industrial control system, such as drives, switches, sensors, push buttons, indicator lamps or valve positioners.

SIMATIC ET 200 offers a complete product range for any application needs – ET 200M with multichannel design, ET 200S for bit granular I/Os and function modules, ET 200pro for high protection in IP65/67 and ET 200eco in a cost-effective design with IP65 protection.

Advantages
Powerful functional modules provide capabilities far beyond simple I/Os, including
- Motor starters
- Frequency converters
- Standard and safety I/Os
- Communication interfaces
- CPUs and intelligent coprocessors.

Modules are designed for quick maintenance to keep operator costs to a minimum.

Powerful system diagnostics offer troubleshooting information at several levels depending on the modules used:
- At the I/O station level including bus communication
- At the module level
- At the channel level for the sensor circuit.

This means that faults are immediately detected and can be solved easily, resulting in lower service and maintenance costs.

SIMATIC ET 200S motor starters: for simple configuration and detailed diagnostics
The communication-capable motor starters of the distributed I/O system ET 200S offer integrated safety and diagnostic functions in one device. The motor starter is a prewired and remote-parameterized unit consisting of a circuit breaker, an electronic overload relay and a contactor or soft-starter, switching the motors up to 7.5 kW. By means of PROFIBUS the motor starter reports all diagnoses, for example short circuit, phase asymmetry, operating current or overload, to the control system. "High-Feature" motor starters are deployed wherever failures of systems cause high downtime costs.

SIMATIC ET 200S frequency converter: completely integrated with distributed I/Os
With the ET 200S FC a completely integrated frequency converter (up to 4 kW) is available for the distributed I/O system in a standard and fail-safe version. The converter controls the speed of asynchronous motors steplessly, solves drive tasks ranging from simple frequency control through to stringent vector control.
The business drivers in industrial communication are improved efficiency and safe data transfer in the plant. These demands can only be met if the process in your plant works perfectly. This can be achieved by using open, transparent communication – from the process level through MES up to the ERP level.

The SIMATIC NET industrial communication products provide the technology you need to:
- Realize true distributed automation
- Enable data transparency from the field level through to the management level
- Integrate IT technologies.

**Industrial Ethernet**

Across all applications, Ethernet is number one worldwide in today’s LAN landscape. Ethernet provides important features and performance characteristics which can provide many important benefits for your application:
- Virtually unlimited communication capabilities and scalable performance
- Company-wide communication thanks to Wide Area Network (WAN) technologies.

SIMATIC NET provides important additions to traditional Ethernet technology for use in industrial environments:
- Network components designed for use in rugged industrial environments
- High-availability networks using redundancy
- Constant monitoring and diagnostics of network components
- Fast on-site industrial cable assembly.

**SIMATIC NET communications processors:**

**connecting controllers, computers and notebooks to Industrial Ethernet**

- Use Industrial Ethernet for programming, monitoring, peer-to-peer communication, connection to IT
- Ability to function as Web and FTP server and client for communication of production information
- OPC server included with the communications processor.

**SCALANCE W: industrial mobile communication**

Install a plant-wide Ethernet network without running any wires
- Wireless flexibility with the reliability of a wired network
- Eliminate wireless “dead zones” with active antenna diversity – the strongest signal is constantly used
- Deterministic data transmission allows time-critical connections to be realized
- Industrial WLAN adheres to the specifications defined in IEEE 802.11 and Wi-Fi 802.11 in order to enable a high degree of interoperability
- Security wizard enables Wi-Fi Protected Access (WPA) with encryption for maximum security
- Designed for industrial applications with enhanced resistance to vibration, shock, and environment (IP65, temperatures from –20 to +60° C) with options for redundant power supply.

**SCALANCE X: switches for Industrial Ethernet**

This product family provides a graduated portfolio of industrial switches, some of which feature comprehensive diagnostic functions via PROFINET, SNMP and the Web, for a variety of requirements (e.g. network structure, data rate, degree of protection, number of ports). These network components are optimally tuned to one another. They have been designed for a rough industrial environment and facilitate consistent, flexible and safe structuring of high-performance networks.
PROFIBUS: the world’s leading fieldbus

PROFIBUS network technology provides rich benefits for almost any application in industrial automation. Devices such as remote I/O, drives, controllers, identification systems, motor starters, weighing & dosing systems, human machine interfaces, etc. are connected via a single cable.

PROFIBUS is primarily used at the field level with interfacing capabilities downward to the sensor/actuator level as well as upwards to the production and enterprise levels.

PROFIBUS PA was explicitly specified for process automation. It meets the demands of the Cement Industry for:

- Use in explosive areas
- Use in areas where both power and communication are available over the bus
- Plug & Play instruments even in potentially explosive areas
- Use of the FISCO model so that intrinsically safe networks can be created and extended without time-consuming calculations.

Siemens communications product range supporting PROFIBUS includes the network interfaces and communication software you need to implement your system architecture.

SIMATIC communications processors: connecting controllers to PROFIBUS

- Use PROFIBUS for connecting distributed devices, peer-to-peer communication, and programming
- Independent communications coprocessor ensures consistent scanning of distributed devices regardless of controller scan
- Multiple communication processors can be used to segment distributed devices
- Support for redundant I/O in conjunction with redundant controller
- OPC server included with the communications processor.

AS-Interface: communication for sensors and actuators

Sensors and actuators play an important role in automated processes. Whether it concerns the registration of valve states or the right level: sensors are the heart of the process control. AS-Interface provides you with a bus system that implements the connection of all automation nodes in the field to the higher-level controller – simply, securely and cost-effectively.
Siemens offers a comprehensive portfolio of process instruments and analytics — products that fulfill the required certifications for the Cement Industry.

**Positioners**

**SIPART PS2: electro-pneumatic valve positioner**
The number 1 electro-pneumatic positioner in its field by a long margin. Offers easy integration, on-board diagnostic functions and minimum loss of process air by only using air when required. Enables operators to get cost-effective and accurate control over typical applications such as product flow out of storage silos.

**Flow measurement devices**

**SITRANS F M: magnetic-inductive flowmeters**
Siemens manufactures a wide range of magnetic-inductive flowmeters, designed to cover the whole array of flow measurement needs within the cement process, such as measurement of slurry flow or scrubber performance.

**Level measurement devices**

**SITRANS LU: ultrasonic level monitoring**
A comprehensive range of ultrasonic level measurement devices are available, ranging from the MultiRanger — used for applications such as crusher control — through to the SITRANS LU 10, which allows up to 10 ultrasonic measurement points to be connected to one device. This reduces the cost per measurement point, ideal for monitoring the levels within multiple raw meal silos.

**SITRANS LR400: high-performance radar level measurement**
Thanks to its use of 24-GHz FMCW technology, the LR400 is ideal for more difficult long-range solids and liquid level measurement situations — such as applications with high dust levels or low dielectric liquids. The LR400 provides reliable results even in the most difficult environments and has a number of applications across the cement plant such as level measurement within homogenization silos.

**Continuous weighing systems**

**Siemens MSI belt scale**
The Siemens MSI is a heavy-duty, high-accuracy single-idler belt scale, ideal for cement applications such as the tracking of daily production and grinding mill feed rates.

**Siemens weighfeeders**
The Siemens weighfeeder range enhances profitability by ensuring accuracy, enhancing blend consistency, reducing downtime, and improving accountability and record keeping across all dosing applications within the cement process.

**Gas analysis devices**

**LDS 6: in-situ laser spectrometer**
High-performance, in-situ process gas analysis with a unique design concept. One LDS 6 unit offers laser spectrometry at up to three measuring points, delivering extremely high levels of accuracy and speed. The unit delivers great results even in high-temperature and dusty environments — making the LDS 6 perfect for applications such as safety monitoring inside the ESP, baghouse or coal silo.

**Ultramat/Oxymat series 6: continuous gas analyzer**
The Ultramat/Oxymat series 6 analyzer is a practical combination of the Ultramat and Oxymat 6 analyzers in a single enclosure. The Ultramat channel is able to measure CO, CO₂, NO, SO₂, NH₃, as well as CH₄ and other hydrocarbons. The Oxymat channel is able to measure oxygen in gases. The unit features cleanable sample cells and corrosion-resistant materials in the gas path (option) making measurement of highly corrosive sample gases possible.
SITRANS LR400: ensuring optimum clinker cooler bed depth

Maintaining an optimum clinker bed depth within the clinker cooler has a number of benefits for the cement production process, as it helps safeguard product quality and at the same time, reduces the amount of cooling air and energy required to cool the cement clinker. Clinker bed depth can be measured by mounting a SITRANS LR400 directly in front of the kiln, above the clinker cooler grate. As the product comes to rest on the clinker cooler, the SITRANS LR400 provides an accurate picture of the clinker bed depth, allowing the operator (or DCS) to change the speed of the clinker cooler if necessary.

Thanks to its robust design, the SITRANS LR400 effortlessly deals with the heat radiating from the cement kiln and the dust generated by the cement clinker helping cement operators increase energy efficiency at this stage of the cement production process.

Features and benefits:
- 4-wire, 24-GHz FMCW Radar
- Noncontacting and maintenance-free
- Robust construction
- Narrow beam angle
- Digital communications
- Flexible networking options with DCS/PLC
- Advanced diagnostic features
- Easy setup.

The FLK Probe: kiln exhaust gas analysis

Only continuous analysis of kiln gases can give an exact picture of the burning process. However, temperatures of up to 1400° C, high dust and alkaline levels, plus the sulphur and chloride content limit the effectiveness of conventional gas analysis equipment. The FLK Probe coupled with an Ultramat gas analyzer allows a precise and reliant analysis of kiln gases, enabling efficient and safe cement production, and helping to protect the environment. Thanks to its synthetic liquid coolant and pressurized air cleaning systems, the FLK probe withstands the rigors of the cement kiln, offering low maintenance and operation costs and excellent reliability.

Features and benefits:
- Probe designed for temperatures up to 1400° C and high dust environments (up to 2000 g/m³)
- Sturdy oval probe design
- Self-cleaning system
- Environmentally safe liquid coolant.
To an increasing extent, the data of the motor feeders is also integrated into the control system. Intelligent motor management systems, communication-capable motor starters and circuit breakers support this trend and make all relevant data available to the control system via PROFIBUS. This increases the transparency of your process and ensures a significantly greater density of information in the control system – at no extra cost. On the basis of Totally Integrated Automation all data is integrated uniformly and consistently. Standardized motor function blocks, for example, simplify the integration and the engineering.

**SIMOCODE pro: the flexible and modular motor management system**

SIRIUS motor management and control devices (SIMOCODE pro) are the first choice for constant-speed motors in the low-voltage range. SIMOCODE pro optimizes the connection between control system and motor feeder, increases the plant availability and, at the same time, achieves considerable savings in the construction, commissioning, operation and maintenance of a plant.

It also involves an extremely compact design, a straightforward and efficient service and maintenance as well as a range of graduated functions. In addition, SIMOCODE pro meets all requirements for futureproof energy management and offers advantages in all areas: in process management, operations management or in switchboards.

Some extensive features:

- Multifunctional, electronic full motor protection, independent of the automation system
- Flexible software instead of hardware for the motor control
- Detailed operating, service and diagnostics data
- Open communication via PROFIBUS DP
- Integration and monitoring of additional process values
- Detection and monitoring of power-related measurements
- ATEX-certified (overload protection of explosion-protected motors).

**SIVACON systems: for customized switchboard solutions**

SIVACON – Siemens low-voltage switchboards are communication-capable, flexible, have a high degree of availability and are able to be seamlessly integrated into the automation environment.

SIVACON switchboards and busbar trunking systems are fully integrated into the communication architecture of Totally Integrated Automation. Using switchgear and switching devices we offer a universal, integrated communication concept for customized solutions: e.g. with SENTRON circuit breakers and SIVACON busbar trunking systems integrated in SIVACON switchboards or with SIMOCODE motor management system and SIMATIC – the world’s leading PLC in SIVACON switchboards.

Now, using the new SIMOCODE pro with SIVACON, up to 40 communications-capable motor feeders can be integrated in a control cubicle.

So SIMOCODE pro is likely to be used in SIVACON low-voltage master control centers (MCC) and allows load feeders to be configured. Load feeders that have a higher performance and at the same time are extremely compact and able to communicate.

The high degree of modularity allows all of the communication components to be simply retrofitted. Innovative software products offer user-friendly parameterization, diagnostics, operator control and visualization locally via PROFIBUS DP or Ethernet/Internet.
SENTRON: power distribution

With only a few modular components, you have the possibility of thousands of different combinations for all of your energy distribution applications. The products in the SENTRON circuit protection system tie into your automation architecture giving you the power to increase production system availability. In addition, you can further optimize the energy distribution process with a networked power management solution. Never before have circuit breakers been so versatile and so simple.

SENTRON: optimized energy solutions

SENTRON circuit breakers address your critical needs for less installation space, reduced operating costs, and optimized energy usage from 16 A up to 1600 A or from 630 A up to 6300 A, connectable to the PROFIBUS DP. The Breaker Data Adapter (BDA) is the first circuit breaker communication device with an integrated web server to parameterize, operate and monitor SENTRON circuit breakers. Circuit breaker data can be accessed from any device supporting an Internet browser with Java Virtual Machine. The BDA Plus incorporates an Ethernet interface for direct connection to Ethernet/Intranet/Internet. Switch ES Power, a configuration software, offers complete integration into the automation engineering environment.

The parameterization, operation and monitoring of the SENTRON circuit breakers can be handled over the PROFIBUS DP network. SENTRON circuit breakers are completely integrated into the SIMATIC world and the STEP 7 engineering software. Data management, configuration and programming are integrated into the automation project SIMARIS manager – Power Management Software to manage energy distribution systems.

This modular and integrated power management software is based on SENTRON circuit protection devices and Totally Integrated Automation products (i.e. controllers, network components, etc.). This not only facilitates efficient diagnosis, alarm and maintenance of SENTRON circuit protection devices as part of a Totally Integrated Power solution, but also optimizes laboratory, investment, and energy supply costs through continuous analysis of energy data.

Siemens offers you a comprehensive range of proximity switches for the contactless recording, counting, measuring, monitoring or positioning of solid, fluid or powdery objects. A wide variety of designs and recording principles – optical, inductive, capacitive or sonar – offer solutions for every task.

For example, sonar proximity switches are the first choice for the reliable recording of levels or heights or measuring distances. Special versions are also available for pump control, for applications with automatic filling or emptying. The robust design up to degree of protection IP69 and ranges of up to 10 m permit a wide range of applications.

Using the IQ-Sense technology, proximity switches from SIMATIC Sensors are integrated directly into Totally Integrated Automation. The intelligent communication between sensor and SIMATIC controller takes place on a low-cost two-wire cable. Other advantages: sensor parameterization via the controller, system diagnosis down to the individual sensors and sensor replacement during operation without reparameterizing. These features reduce the engineering and commissioning times as well as standstills.

SIMATIC Sensors: for noncontact detection
Siemens offers you tailor-made standard drive systems for the Cement Industry – with a performance ranging from a few kilowatts to double-digit megawatts. Our solutions contribute to the optimization of safety and quality in, for example, raw material grinding, cement mill or kiln section.

**Motors: the base of a high plant availability**

With its low- and high-voltage motors, Siemens has the optimum product for all cement applications. They set standards, when it comes to the overall envelope dimensions and weight for a particular power rating. This saves space and makes it easier to integrate the motors into the plant or system. Furthermore, these motors distinguish themselves as a result of the low noise level, vibration and operating costs. And last but not least, Siemens motors are characterized by the highest achievable availability. The Micalastic® insulation system ensures excellent corona shielding, is insensitive to environmental and ambient effects and stands for the absolutely highest endurance. All these features are complemented by monitoring devices – included as standard – for the bearings and windings. The high efficiency improves the energy balance sheet and thus reduces operating costs.

By using variable-speed motors with frequency converters, considerable energy savings can be made, because the drive only consumes the power that is actually required. On balance this means: the overall energy demand is considerably lower than for fixed-speed drives with airflow control through damper.

Using products such as SINAMICS G150, MICROMASTER or SINAMICS GM150 for the medium-voltage supply, Siemens offers you frequency converters that are designed for energy saving. Thanks to the energy savings and the many other advantages of a variable-speed operation, as well as the economical concept of our converters, the investment of variable-speed drives will often pay for itself within just a year.

**SINAMICS: the new drive family**

All members of the new SINAMICS drive generation profit from the same core technology and have the same “look & feel”. An example are the standard engineering tools – SIZER to engineer drives and STARTER to commission them. As well all high-power cabinet units of SINAMICS are equipped with an AOP 30 operator panel with its self-explanatory menu prompts, which are output in plain text via the user-friendly graphic display. This permits extremely simple operator control and diagnostics.
Specially for pumps, fans, mills, separators, graders and rotary ovens

SINAMICS G150 cabinet units are specially geared toward drive tasks without regenerative feedback in applications with quadratic torque characteristics, such as pumps and fans, but also constant-torque drives such as mills, separators, graders and rotary ovens.

SINAMICS G150 cabinet units cover voltage classes from 380 V to 690 V. Power ranges are from 75 kW to 1500 kW. The clear, well-structured design of SINAMICS G150 makes the unit rugged and reliable. In case of service, the modules can be replaced in just a few steps.

In addition to the simple engineering, commissioning and operation as a part of the SINAMICS concept, SINAMICS G150 cabinet units have a footprint that is up to 70 percent smaller than the footprint of conventional converters. Noise levels of 69 db(A) during full operation, even in the case of cabinet units with a power output of several 100 kW, make additional soundproofing measures unnecessary. Because a PROFIBUS interface and a variety of analog and digital interfaces are standard, the units can be easily integrated into CEMAT which allows the operator to look deep into the drives.

SINAMICS G150 covers the majority of high-power drive tasks in the Cement Industry. If required, the SINAMICS G130, a chassis unit with the same functionality and performance, is also available. SINAMICS S120 cabinet units and SINAMICS S120 chassis units represent a viable alternative when the energy supplier places particularly high demands on the network quality or in the case of weak networks. With these units, the active infeed technology reduces phase effects on the system to a minimum and protects the drive system against power dips.

For drive tasks requiring several megawatts SINAMICS GM150 medium-voltage converters are the most cost-effective solution.

Further advantages

Efficient and fast diagnosis will allow the service crew to keep the plant in service all year. Speed and torque feedback will allow expert systems to optimize the several processes in the cement production.

Clear and simple: operation, diagnosis and maintenance

If service is required, the modules can be replaced with a few simple operations. This shortens the downtimes. Fast commissioning with self-tuning feature and simple operation at the device itself or from a control center save time and money.
With regard to technology, many segments of the global market for industrial drives are characterized by the growing together of motors and converters with gear units and gear unit components. In response, Siemens Automation and Drives is expanding its portfolio to include mechanical drive technology from Flender, one of the world’s leading manufacturers of gear units. These solutions are developed by experts in close cooperation with customers, and are perfectly tailored to your sector’s demands, allowing us to make you a one-of-a-kind, all-inclusive offer covering everything from controllers, converters, motors and gear units.

**Crusher drives and roll presses**
For stationary or mobile pressure or impact crushers, we implement gear unit solutions based on modular Flender standard products. Here, quality drives such as PLANUREX® and Flender gear units are the first choice for every situation.

**Tube mills**
With a power range of up to 30 MW, tube mills belong to the largest processing machines in the cement industry. We offer models with a diameter of up to 15 meters and a length of up to 20 meters. Our portfolio includes different drive versions, among them highly innovative annular gear units with power branching (DMG2), single-pinion drives and axial drives.

**Vertical mills**
For driving vertical mills we offer special Flender bevel planetary gear units (KMP/KMPS). The particularly compact drive units with a power range of up to 6,000 kW are excellent for a number of tasks: they transmit power, generate the required mill speed and, most importantly, the positioning of the crushing trays.

**Cylindrical rotary kiln drives**
For rotary kilns we offer the most modern drive systems available: frequency-controlled electric motors, helical, bevel-helical or planetary gear units, auxiliary gear units with integrated override clutch and centrifugal brake, holding brake, auxiliary motor and clutches.

**Barley grader drives**
All over the world, gear units from Flender have proven their class for driving barley graders – in more than 1,000 plants. If necessary, barley graders can also be equipped with lubrication systems from Flender.

**Bucket elevators**
As in uphill belt conveyor systems, the drives for bucket elevators must also start up very gently. Rollback locks and auxiliary drives are part of the standard equipment. We operate the entire drive system of a bucket elevator with standard components distinguished by their high level of efficiency – for optimized cost effectiveness.

**Transport conveyors**
Thousands of units sold worldwide prove most impressively our extensive know-how in the field of conveying and handling systems, and underline the fact that our solutions are distinguished by the highest degree of availability and economic efficiency. Our portfolio covers the entire spectrum: electric motors, clutches and gear units. Optional equipment includes auxiliary drives, rollback locks and brakes.
In February 2005, Siemens completed a CEMAT project at Südbayerisches Portland-Zementwerk Gebr. Wiesböck & Co. GmbH. The company, established in 1930, belongs to the Rohrdorfer Zement Corporation, which owns 35 companies with 950 employees, manufacturing a variety of building materials in Germany and Austria.

**Energy-saving and low-emission production**

At the heart of the cement works in Rohrdorf, which has an annual capacity of one million tons, is the 110-meter long rotary kiln. In addition to the primary fuels as coal and heavy oil, secondary fuels are used in the combustion, including processed plastic, paper degasifying materials, tyres, and various liquid fuels. Using these secondary fuels, the cement works is able to reduce the plant’s overall carbon dioxide emissions and also the costs for fuels.

In order to meet the challenge of efficient use of secondary fuels, securing the installation’s fault-free operation, and minimizing emission of waste gases, Rohrdorfer Zement needed to install a modern instrumentation and control technology. Moreover, the plant had to comply with the strict environmental regulations of the German Clean Air Act.

**CEMAT ensures reliable, easy-to-handle operation**

Siemens implemented the automation of the rotary kiln with CEMAT process control system based on SIMATIC PCS 7, and four cement mills previously equipped with CEMAT were upgraded with the newest CEMAT Version 6. Additionally, Siemens also improved the operator control and HMI stations in the central control room by adding redundancy features, thus increasing plant safety and availability.

CEMAT Version 6 is based on the modern process control system SIMATIC PCS 7 and is specially dedicated to the Cement Industry. It offers features that facilitate easy operation of cement plants and provides an up-to-date architecture and highly reliable system, contributing to improved overall plant availability. With its tried-and-tested standard software, CEMAT enables fast commissioning for both new automation and upgrades of existing plants. CEMAT control system benefits could be demonstrated and the new plant performance in Rohrdorf meets the customer’s requirements. With CEMAT, the modernized cement plant can now continue to successfully produce cement for the European market with increased energy-savings and higher profitability while preserving the environment with reduced emissions.
Customer requirements
The cement terminal of Holcim (Vietnam) Ltd in Cat Lai near Ho Chi Minh City, Vietnam, supplies cement to the entire city area. In 1996, Siemens equipped the works with a comprehensive electrical and automation solution, including high- and low-voltage power supply as well as low-voltage switchgear including transformers, motor control centers, process instrumentation, and automation systems. The plant was automated with a CEMAT process control system Version 3. In 2005, most parts of the system still met the current requirements. Only the PC-based operator stations were out of date, and consequently the company decided to replace them.

Siemens solution
Interruptions in the production process had to be avoided, therefore a maximum downtime of eight hours was scheduled for the migration to the new process HMI. With CEMAT, such tight time frames are no problem, as the process control system offers integrated upgrade and migration options, facilitating the easy modernization of existing older systems. At Cat Lai, the existing automation systems were kept in place while the operator stations and operating software were migrated to the new CEMAT process control system Version 6. Using the effective and easy-to-use Siemens migration tool, a local system integrator, after only five days of training, was able to perform the entire migration. Preparation of the migration was done in the office and thus the switch over to the new CEMAT Version 6 HMI could be achieved on site with two hours plant shutdown only. Thus it was possible to realize the migration with virtually no production losses and to restart the system without any disturbances.

Customer benefits
With the new process control operator stations, users benefit now from the best of both worlds: the system has been updated with state-of-the-art PC technology without any new training for operators being necessary. User interfaces and operational procedures are very similar to what the operators have been used to, therefore the operators in the cement plant quickly adopted the new system. Moreover, by migrating only the operator systems, Cat Lai was able to keep the whole control level of the automation system in place – an effective way to protect the company’s previous investments.
Customer requirements
The Guangzhou Heidelberg cement plant is a new facility that was built to replace an old urban one in order to protect the city environment of Guangzhou. The plant has a production capacity of 6,000 tons per day. The general contractor for this huge project was CBMI Construction Co. Ltd., the biggest engineering & construction company for cement plants in China. For the design, implementation and commissioning of the new plant’s process control system, CBMI contracted Siemens Industrial Automation Shanghai (SIAS). With more than 17,000 I/O, the cement plant in Guangzhou is currently one of the largest in the Chinese Cement Industry.

Siemens solution
The heart of the control & instrumentation equipment is CEMAT based on the PCS 7 process control system. The system includes fourteen SIMATIC PCS 7 AS units (automation systems), three pairs of redundant servers, five operator stations, and one PCS 7 engineering station. In this project SIAS (Siemens Industrial Automation Shanghai) was responsible for the control system architecture design and engineering, on-site installation and commissioning services, as well as for the training of the Guangzhou staff.

CEMAT has a worldwide proven reputation in control & instrumentation of cement plants. In the new version based on SIMATIC PCS 7, CEMAT uses standard hardware and software components from the field-proven SIMATIC platform and fully exploits the benefits offered by Totally Integrated Automation (TIA). The seamless data management, communication, and configuration capabilities of TIA offer an open and flexible platform for advanced, future-oriented, and economical automation solutions for all automation tasks of a cement plant, not only for process control but also for inbound and outbound logistics and utilities. CEMAT combines these benefits with high-performance industry-specific software packages that address the specific tasks performed in lime and cement works, in order to optimize the operating procedures as well as plant information & reporting and maintenance and asset management.

Customer benefits
The new plant started production in early 2005. This project was the first application of the new CEMAT based on SIMATIC PCS 7 in the Chinese Cement Industry and since then the new plant has become quite famous in the Cement Industry in China.

One of the key factors of the project has been the SIAS’ expertise in DCS and project which resulted in a high customer satisfaction by Guangzhou Heidelberg and CBMI Construction Co. Ltd.
Further information:

www.siemens.com/cement
www.siemens.com/cemat

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