

Dyckerhoff-owned VolynCement OJSC recently installed a new control system at its cement works in Zdolbunov, western Ukraine. Supplied by Votum Ltd, the new system is expected to provide long-term benefits as staff are able to better monitor the plant and take effective action when required, thereby avoiding costly unscheduled shutdowns.

VolynCement control room staff now have a better overview of cement plant operations and are able to take action quickly and efficiently

- As previously noted, the system's functions are distributed between two levels. The lower level includes the signals from the sensors, actuator control, warning alarms, protection and local management. Meanwhile, the top level enables process visualisation, control, recording, archiving, remote management and the collaboration units in groups.



The new process control system covers key plant equipment such as the cement mill (above) and the kilns (right)



Process Bus

The lower level, Process Bus is a management station automation system (controller SIMATIC S7-400) connected to a Profibus network which includes decentralised peripheral stations ET200M, ET200S, variable-frequency converter, flowmeter and other equipment.

Terminal Bus

Meanwhile, the upper-level, Terminal Bus is based on servers with a redundant function (Siemens Rack PC), industrial-scale computers (clients) with two monitors on each and an engineering station.

The OS Server offers station management and process visualisation rather than direct process control.

Currently a WinnCC system collects data, archives, and records alarms and values. Communication with the controller is carried out via a SR1613 communication processor.

The OS Client is an operating unit with two monitors designed to control and monitor the process. It receives control process data from the OS Server and transmits information back to this server.

The engineering station is designed to develop control programs and visualisation (Step7, WinCC). It supports communication with the programmable controller and server but is not intended for direct process control.

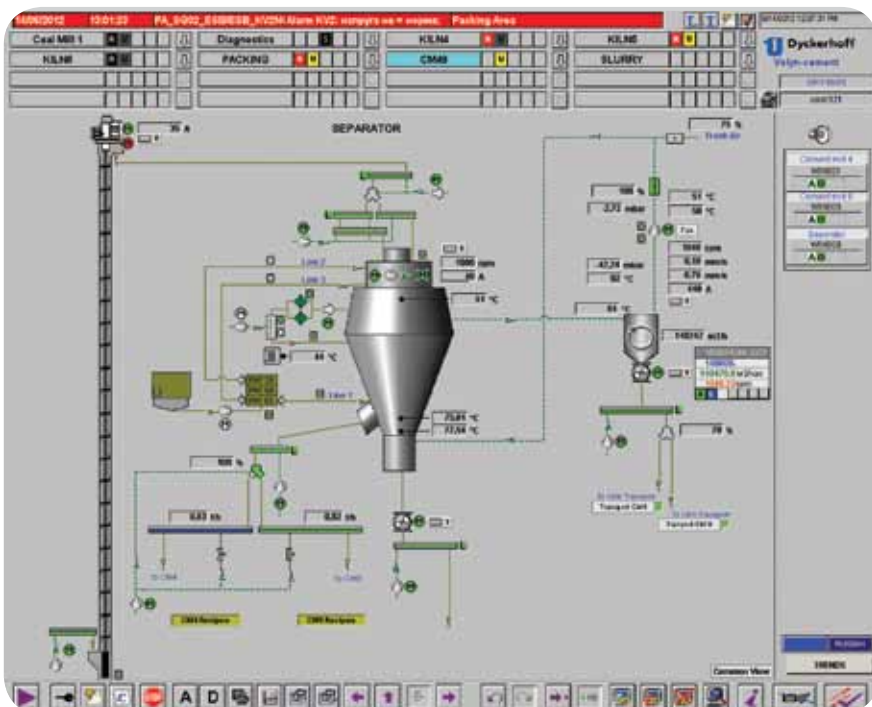
The Process Bus and Terminal Bus are connected via an optical ring Fast Ethernet (1Gb) topology with the help of Siemens Scalance 308-1 network equipment.

Comprehensive plant control

The new process control system covers all key parts of the cement production process, with each department controlled by PLC Simatic S7-400 modular process controllers.

Slurry preparation and laboratory

The ACS controls the grinding mills, vertical and horizontal basins, pumps, flowmeters and slurry transport.



The plant's TSV-3200 separator is controlled by a PLC S7-400 modular process controller as is each individual plant department

Votum scope of supply

Votum Ltd supplied the following ACS equipment to VolynCement :

- cabinets with PLC – S7-416-3 from Siemens
- cabinets with distributed control – ET200M, ET200S with I/O-modules from Siemens for connect digital and analogue input/output signals
- operator station, server – Rack IPC547C from Siemens
- motor control centre (MCC)
- low-voltage main distribution (LVD)
- transformer GEAFOL 2000 kVA, 6kV
- flowmeters Sitrans F
- frequency converter FC Sinamics for motor
- cables and cables rack.



Volyn Cement's new motor control centre

Moreover, it stabilises the chemical and physical characteristics of the raw mixture that is fed into the kiln, helping to normalise the formation of clinker.

The system operates via an algorithm that calculates the value of all raw materials (including clinker additives, coal ash and slag additions in kiln) and the percentage of oxides in the raw sludge, which must meet the performance requirements defined in the lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR).

Coal mill

Since the commissioning of the new ACS, Volyn Cement has been able to substitute 93 per cent of its natural gas usage with coal dust.

Kilns 4, 5 and 6

In the kiln, the ACS controls the main motor, burner, electrostatic filter and transporters, positively impacting kiln

Since its commissioning in 2012, the new process control system has delivered plant-wide benefits. The system's ability to control operating modes and enable plant personnel to carry out routine maintenance on time has helped prevent the failure of equipment.

operations. With the help of a flowmeter and frequency converters, accurate dosing of raw meal components has resulted in improved kiln operations.

In addition, the time between kiln repairs has increased by 1.5 times.

Cement mills 4 and 9 plus separator

A TSV-3200 separator is connected to the plant's FM4 and FM9 ball mills. It consists of an additional air duct system,

fan and cyclone which are switched between the mills' outlet and the existing process air systems of the mill fans and filters (aspiration). Transport systems bring material from the mill outlets to the separator and move separator reject material to the mill inlets, as well as convey the finished materials to pneumatic transport.

In terms of the cement mills at the works, Volyn Cement now benefits from lower energy costs.

ACS implementation

During ACS implementation Votum assessed the different parts of the plant in terms of automation requirements and then recommended a suitable ACS. In addition, the company developed the ACS, a general functional specification (GFS), a detailed functional specification (DFS), and software for the PLC and the operator stations. Votum also designed the sensor and consumer lists, P&ID – piping and instrumentation diagram, electric circuits, cabling track, manuals and all other documentation required for a smooth system operation.

Following the purchase, production and delivery of all equipment needed for the automated systems, Votum supervised the installation and commissioning of the new equipment as well as provided training.

Conclusion

Since its commissioning in 2012, the new process control system has delivered plant-wide benefits. The system's ability to control operating modes and enable plant personnel to carry out routine maintenance on time has helped prevent the failure of equipment. Remote WebServer-based monitoring has also served the plant well as specialists in other locations can view real-time plant operation conditions.

Moreover, the system has not only reduced equipment downtime but also improved quality control, eliminating human error. With this increased reliability, the plant has been able to reduce the number of operator and service personnel. For system operators, it has brought improved working conditions, including a new air-conditioned control room.

In addition, material flows are better accounted for and with all data included in the MES plant system, overall efficiency at the works has increased.



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