Condition monitoring, part of the scope of supply, helps detect problems at an early stage.

Lead times are reduced since the parts used are of an easily manageable size. For example, a drive system for a 6,600 kW mill with four drive modules of 1,650 kW each uses modules weighting only 22 tons. Compared with a conventional drive, these modules are much easier to handle.

Integration with Cemat

In a plant controlled with state-of-the-art equipment, only a few operators are responsible for smooth functioning of production. This means that they need a system at a higher level to collect general information from all existing sub-systems and to make it available to the operators.

Cemat, the leading Process Control System from Siemens for the cement industry, can be used to control the whole grinding process. Cemat is much more than just a database with a few cement-specific modules. It contains a complete philosophy on how to operate cement or grinding plants, and how to make diagnostics to keep downtimes to a minimum in the event of a plant problem. Special function blocks and faceplates are designed to manage all kinds of operation, interlocking and supervision functions that are typically required.

Condition monitoring included

Condition monitoring equipment is part of the scope of supply. Condition monitoring helps detect problems at an early stage. As a result, a problem can be solved before it has a detrimental effect on the operation of the mill. Motors, drives and mill support equipment are outfitted with sensors. Data derived from the sensors, such as temperature, speed, torque and vibration, are recorded and evaluated by the Siemens Siplus condition monitoring system (Figure 2). Aside from issuing alarms if admissible values are exceeded, the system also records the data continuously and establishes a trend analysis over time. These analyses help experts appraise developments that could result in failures and to recommend specific action. The data can be evaluated by on-site personnel as well as by a Siemens expert via an Internet connection.

The benefits of condition monitoring:

- Earlier failure detection
- Shorter repair times
- Planned spare parts procurement
- Prevention of unscheduled downtimes
- Improved planning and throughput
- Minimization of on-site visits
- Higher system availability
- Better utilization of the system potential

Concept of data flow, condition monitoring system for MultipleDrive

Fig. 2: Control concept of the complete system realized for the MultipleDrive project at the Holcim cement plant in Grand Couronne
Main functions in the Cemat system:
• Supervision and control of all components, such as hydraulic pumps, bucket elevators, blowers, conveyors, etc., and sub-control systems like CMS, frequency converters and weighing feeders
• Operator support during start-up and stop sequence as well as during regular operation, set points of control loops, etc.
• Optimized message functionality to reduce the operator load and to display only relevant information

All relevant sub-systems are covered with Cemat. The pre-processed signals from the CMS system or from the inverter PLC are all transferred to the Cemat process control system via Profibus DP or Ethernet communication. Within the Cemat system the data is pre-processed and archived, and it can be displayed in an operator-friendly way.

In the cement industry well-known “diagnosis pictures” from Cemat are specially adapted to the MultipleDrive functionality. The diagnostic dialog shows the inputs and outputs of the block, including status information, interlocking conditions and faults. It also permits the modification of process parameters. The operator receives comprehensive information about the MultipleDrive system in one picture and has all information at a glance. In the case of a problem with one drive module, the diagnostic picture allows a very fast pre-selection of the remaining modules. After pulling the drive module out of mesh, production can continue.

MultipleDrive functions of the diagnostic picture:
• Drive mode selection (all three, or two out of three)
• Welding mode selection (preselection of a very slow speed for maintenance)
• Status of all drives

• Status in general for start-up or operation
• Status of CMS
• Status of communication with the sub-systems

Other Cemat diagnostic pictures provide a compressed overview of the diagnostic properties of CMS and generate corresponding messages for the alarm system. This picture shows only a differential value of signal amplitudes between the commissioning status and present situation. This means that the operator can obtain a very fast overview, even without in-depth knowledge of the CMS system. Finally, for the operator there is no difference in regard to how many drive modules are connected to the mill. There is no additional work to do because it is handled by the Cemat control system. The complete system increases plant performance, reduces downtime and saves costs.

Integration into the process control system provides plant-wide information and documents the status of the entire equipment.

Operating experience
Since 2009 a MultipleDrive with three modules has been in operation on an MPS 4750 BC Pfeiffer mill at the Holcim cement plant in Grand Couronne, France. Each of the three modules is driven by Siemens motors 1LA4504-4CM00-Z with 1,450 kW. Load distribution and speed are controlled by Siemens Sinamics S120 frequency inverters. Grinding media at the plant is cement and granulated blast furnace slag. For a MVR 5600 C-4 cement mill at the Balaji plant in India, a 6,600 kW MultipleDrive was supplied with four modules. Each module provides 1,650 kW (Figure 3).