More efficiency for maintenance

Availability requirements higher than 99% are hardly rare in today’s world of demanding productivity targets. Maintenance measures must guarantee this availability. Maintenance costs frequently account for a large proportion of the operating costs in practice, so maximum efficiency is also essential for maintenance.

Devices with inbuilt intelligence that can signal their maintenance requirement based on their service time, the number of switching cycles, or their condition support the work of the maintenance engineer. In the case of large plants in particular, however, this can generate an avalanche of information that makes it difficult to obtain an overview. This is compounded by the fact that system alarms are normally displayed together with process data on the same visualization system.

Totally Integrated Automation provides the basis here for greater efficiency:

- The data for process management on the one hand and maintenance on the other hand is collected for the various target groups, conditioned and displayed – automatically, without any additional engineering outlay.
- Continuous condition monitoring and the acquisition of energy data forms the basis for further process optimization.

Plant-oriented asset management

A software option available for the SCADA system SIMATIC WinCC and the process control system SIMATIC PCS 7 performs automatic data conditioning and display for maintenance purposes. Information relevant to maintenance concerning all devices and equipment units (assets) is presented on a common user interface. A Maintenance Station is created for this purpose in parallel with the Operator Station.

Benefits:
- Uniform, vendor-independent, standardized symbols support quick and intuitive fault detection and rectification.
- A multi-layered, uniform alarm concept enables the optimum time to be determined for a maintenance job, so that the service life of the assets can be fully exploited.

Uniform symbols for the condition of components and devices

Different views of the plant optimally interacting via a shared user interface
Condition monitoring for accurate planning of the optimum maintenance point

In almost every production environment in which processes are automated, certain components have strategic importance for the availability of the plant. These components are normally expensive and replacements can take a long time to procure. Particularly careful monitoring is necessary to ensure that maintenance can be performed before any fault can arise.

New condition monitoring systems make the continuous monitoring of all the important plant components to determine the optimum maintenance point an economical proposition. Different measured variables can be acquired as indicators for corrosion, wear or contamination.

Energy management as a maintenance task

In electrically controlled equipment units, the effects of wear frequently result in increased electricity consumption. In this context, measuring energy consumption plays an important part in the overall maintenance task.

With Totally Integrated Automation, it is possible to display maintenance-related information and energy consumption values using the same visualization system. This increases efficiency for maintenance and makes process optimization easier. The solution is modular and cost-effective. It can also be gradually integrated into existing plants without causing reactions.

Components for efficient maintenance

- **SIMATIC Maintenance Station**
  - For bundled, vendor-independent, standardized and hierarchically organized display of maintenance-related information.
  - Software option for the SCADA system SIMATIC WinCC or the process control system SIMATIC PCS 7.
  - Easy integration of external systems via open interfaces.

- **SIPLUS CMS Condition Monitoring**
  - Modular system for continuous condition monitoring, e.g. by means of vibration analysis of machines and processes.
  - Standardized interfaces for easy retrofitting and connection of many different signal sources.
  - High sampling rates, synchronous data recording and standard analysis blocks ensure detailed analysis and diagnosis of the signals.
  - Easy configuration of the display of relevant limits in the Maintenance Station.

- **SIMATIC powerrate**
  - For recording and evaluating energy consumption values and energy costs, complete with energy reports.
  - Software option for the SCADA system SIMATIC WinCC or the process control system SIMATIC PCS 7.
  - Standardized measuring instruments: A solution with an optimized price/performance ratio for every application.
  - Devices can be retrofitted at any time in the future.

Savings potential of the SIMATIC Maintenance Station in the different phases of the project
Centralized, vendor-independent visualization

It is appropriate to separate process control alarms from maintenance alarms in all large plants, to prevent an avalanche of information and to increase the efficiency of operation and maintenance. The benefits of uniform and standardized visualization of maintenance data are particularly noticeable in plants that contain machines from different manufacturers or plant sections that are distributed over a wide area.

Packaging lines:
Different machines – Different automation concepts – Uniform diagnostics

Packaging lines often comprise a number of special machines. Scales, dosing units, counters and palletizers can be implemented in addition to the actual filling and packing machines. If the spectrum of products to be packed is expanded, or market demands change, these machines must be redesigned, replaced or supplemented. Machines from different manufacturers frequently have different automation concepts and different system interfaces, which makes maintenance difficult.

Benefits of centralized, standardized visualization of diagnostic alarms via the Maintenance Station

- Rapid access to detailed information starting from the plant overview screen: Faults can be localized and rectified much more quickly.
- Easy, intuitive operation without the need for costly training of the maintenance personnel.
- Multi-layered alarm concept gives planning certainty for the optimum maintenance point.
- Diagnostic alarms and symbols are automatically generated.
- Energy data as a component part of centralized visualization: Correlation with machine status can indicate a maintenance requirement.
- Harmonized visualization of all assets.

Line visualization with the SIMATIC Maintenance Station

1) In this case, suitable protective measures (including IT security such as network segmentation) should be taken in order to ensure safe operation of the plant. For more information on the topic of industrial security, go to www.siemens.com/industrialsecurity.

2) Support for international standards such as OMAC, Weihenstephan or PROFINET makes line integration considerably faster and easier. www.siemens.com/automation/omac

3) Modular automation architectures and software blocks are based on powerful hardware and software components. OPL creates the conditions for fast, easy and economical realization of machine solutions with a high potential for innovation. www.siemens.com/packaging
The Optimized Packaging Line concept, abbreviated to “OPL”, reduces complexity through the use of uniform automation and communication standards. It creates the basis for exploiting the potential for optimization of productivity, flexibility, reliability, maintenance and energy efficiency to the fullest.

Filling plant

In filling plants, OMAC-standardized interfaces for the transmission of machine information are well-proven. A central line controller collects the information from the lower-level machines. SIMATIC WinCC is responsible for visualization at a higher level. The SIMATIC Maintenance Station displays the maintenance-related information centrally for the whole line.

Water industry:

Waterworks and waste water treatment plants typically have central control rooms for fully-automated monitoring and visualization of substations which can be distributed over a wide area and normally also operate fully automatically.

The Maintenance Station supports the maintenance of the devices and valves that are sometimes difficult to access:

- Automatic generation of device identification and maintenance data reduces the engineering costs.
- Vendor-independent standardization of the data formats by PROFIBUS and PROFINET International saves time and reduces the probability of errors.
- The alarm archive of the lower-level process control or visualization system enables maintenance events and operator responses to be traced.
- The well-proven WinCC Client/Server and web applications make remote access to data possible and ensure that the maintenance staff is informed in time, even when no-one is directly present on site.

Positive feedback from different sectors

The Maintenance Station has already proved its worth in the drying of sewerage sludge. An English plant operator has measured a significant increase in maintenance efficiency thanks to simultaneous visualization of the incoming pipeline and the actual plant.

Gas caverns require a large initial investment. To a greater extent than many other types of plant, availability decides efficiency here. For a quick and reliable response to supply and demand from the energy market, it is essential to prevent disruptions. A large energy supplier relies on SIMATIC PCS 7 and the Maintenance Station (plant-oriented asset management) for this.

1) For more information on the topic of industrial security, go to www.siemens.com/industrialsecurity.
Condition monitoring for increased availability requirements

Continuous monitoring of devices and equipment units, e.g. for vibration, overheating or increased power consumption supports improvements in the planning and coordination of maintenance measures. Potential for savings results from the integrated display of all the maintenance-related information in a system as well as from better exploitation of the service life of continuously monitored components. The modularity and retrofit capability of the measuring, evaluation and visualization systems ensure an optimum price/performance ratio for procurement, inventories and normal operation.

Food industry – Stringent requirements for quality, availability, flexibility and traceability

Edible oil is a basic foodstuff that is consumed in large quantities worldwide. The yield and quality of the oilseed used strongly depend on the climate and growing conditions. But the processing of the seed into oil also has an important effect on quality. The challenge here is to supply a homogenous, high-quality product in the quantities that the market requires under these conditions. Apart from maximum availability of the plant, transparency and flexibility is required to enable optimizations to be implemented at any time and their effects to be evaluated.

In the oil mill, centrifugal pumps, drives, motors, measuring instruments and controllers are used that require particularly careful maintenance, because failure can result in pollution of the cooking oil and consequently high costs for disposal, additional preparation and repair.

Altered drive behavior – Possible indication of imminent failure or variation in quality of the pressed product

Numerous drives are used in each oil mill. The spectrum ranges from 2 kW drives for conveyors through to motors of over 400 kW for the seed presses. Changes in the vibration response of the various devices – measured using the condition monitoring system SIPLUS CMS – can provide indications here for a maintenance requirement. The current consumption of the devices is also an important condition monitoring parameter. An unusual value – displayed by SIMATIC powerrate – may also be an indication of wear. In processing plants, such as the seed presses of the cooking oil industry, an atypical value could also indicate a fault in process control or defective raw materials. Valuable information can also be obtained from the value sequences and used for process optimization purposes.

SIMATIC controllers can be used to visualize process data and to archive it together with all the operator interventions.

Use in other sectors

The benefits of SIPLUS CMS have also been used in sheet steel working and in paper making, for retrospective analysis of the quality of production processes. Further fields of application include wind power plants, cement mills, crane management systems and metal working.
Fast and reliable identification of dangerous levels of wear in centrifugal pumps

Centrifugal pumps in refineries and other processing plants are usually redundantly configured, because a sudden failure can have fatal consequences. In the deodorizing system of an edible oil refinery, for example, the finished oil will flow back into the deodorizer under vacuum if the product pump fails. The entire process would come to a standstill.

One method for securing the functionality of the pump involves configuring it redundantly. In the context of plant-oriented asset management, however, SIMATIC PCS 7 offers a much more cost-effective solution: the PumpMon diagnostics block. PumpMon supports the condition monitoring and analysis of centrifugal pumps by evaluating the sensor signals that are already available in the I&C system, such as differential pressure, flowrate, power consumption and temperature. Violation of the limits of the rated operating range of the pump and deviations from the expected characteristic curves are reported to the operator. This data is presented at the outputs of the block for further processing. Statistical evaluation of the operating data also supports optimization of the pump design. PumpMon therefore also represents a cost-effective solution for the detection of energy-saving potential.

SIMATIC PCS 7 also offers the corresponding diagnostics blocks for other mechanical components, such as valves and heat exchangers.

Vibration analysis with the help of SIPLUS CMS can also be used for the diagnosis of wear effects on pumps.

Synergies due to greater transparency

The modular condition monitoring system SIPLUS CMS enables various parameters of motors, bearings, compressors, pumps and gear units, for example, to be continuously monitored.

- Continuous monitoring offers reliable protection against unexpected failures.
- Maintenance can then be planned better and performed more efficiently.
- The service life of expensive equipment units can be fully exploited.
- The maintenance strategies that evolve are normally more economical than redundantly configured devices.

The energy management system SIMATIC powerrate for the SCADA system SIMATIC WinCC and the process control system SIMATIC PCS 7 acquires energy data which it then evaluates and visualizes.

These different views of a plant (system diagnostics, maintenance indications, plant condition, energy consumption) optimally interact in Totally Integrated Automation and are visualized on a common user interface. This transparency ensures much more efficient maintenance, increases availability and makes process optimization easier, which leads to greater flexibility and more energy-efficient operation.
Get more information

Brochures:

Products and Functions for Efficient Maintenance in Process Automation; PDF
www.siemens.com/simatic/printmaterial

Products and Functions for Efficient Maintenance in Totally Integrated Automation; PDF
www.siemens.com/simatic/printmaterial

Efficient Condition Monitoring for Machines and Processes: SIPLUS CMS
www.siemens.com/simatic/printmaterial

More about this topic:

Maintenance Station for Totally Integrated Automation:
www.siemens.com/wincc

Maintenance Station in process instrumentation and control:
www.siemens.com/pcs7
(see System components)

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