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Driving profitability in Oil & Gas through effective motor management

Throughout the oil and gas industry, electric motors perform countless critical tasks. Siemens can help keep them, and your plant, running effectively and efficiently.

Executive summary

As oil and gas producers seek areas where there are still costs that can be reduced, electric motor management has emerged as one of the last major opportunities. While motors are intrinsically very efficient, the ways they are used and maintained are not. Effective motor management using condition-based maintenance can cut costs significantly. SIMOCODE provides critical tools to make this a reality.

During this downturn in the oil and gas industry, prices remain depressed due to oversupply but producers have no choice but to keep operating to maintain cash flow. The only way to remain profitable or reduce losses is to control costs. Inefficiencies tolerated when oil was at $100 become problematic when it remains below $50.

All phases of oil and gas production depend on electric motors. Wellheads, platforms, pipeline pumping stations

and refineries all have countless motor-driven pumps, compressors and other installations. In spite of their importance, motors are often treated as run-to-failure assets. In many facilities, only the most critical installations are monitored to determine the condition of the equipment and for potential problems. This approach forces many applications to be outfitted with costly redundant installations so they can be switched over from one motor to another when one fails.

In and of themselves, today's motors are highly efficient and durable. A motor now costs less to operate than one from just 10 years ago. Unfortunately, the way they are deployed and controlled in many locations does not take full advantage of that efficiency. Motors can be managed in ways designed to maximize performance and minimize maintenance costs while delivering the highest possible degree of availability and dependability.

Condition-based maintenance

Companies that enjoy high plant availability levels generally use condition-based maintenance programs. They deploy smart devices with diagnostic functions to monitor the performance of valves, field instrumentation, turbines and other equipment to keep systems running at peak efficiency. Knowing where problems are developing allows them to concentrate maintenance efforts and resources where they are truly needed. Profitability improves through higher production and lower maintenance costs.

However, many companies, even those with sophisticated maintenance programs, don't always extend those efforts to electric motors. A technician may take a vibration reading or listen to the bearings once or twice each year, but much can happen to a motor over a few months and many might fail between visits. When costs are cut, diagnostic checks become less frequent or may stop entirely. Sensors able to monitor motor performance continuously can be added, but the costs involved keep most companies from doing this to most of the motors at a facility. Users recognize the problem, but the solution is considered too costly.

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Motor control to motor management

Motor starters and motor control centers handle basic switching functions to turn motors on and off while protecting them during an overload. Siemens has gone much farther, adding a higher level of functionality and sophistication with SIMOCODE pro. In addition to normal overload functionality, it provides a vast array of control and monitoring capabilities that can be added to any existing motor starter or Motor Control Center. In order to stay competitive, manufacturers will have to develop strategies to conserve energy. However, the challenge in achieving this goal is to do without disrupting production. This is where the integration of SIMOCODE in a Smart Motor Control Center can play a vital role. SIMOCODE pro is a critical tool to improve motor performance while reducing operational costs and increasing efficiency.

This type of device is like having a PLC or RTU attached to every motor. It acts as a maintenance technician continuously measuring voltage and current, and looking for signs of problems. If there are power anomalies, they are identified immediately and reported to the larger control system to trigger alarms if desired. If there are subtle changes in performance, such as a slow increase in current draw over time, they can be identified.

Motor performance can be quantified and characterized. The aspects that affect efficiency can be controlled and optimized. The facility moves from simply running motors to managing them as critical assets, realizing a higher level of efficiency and lower costs. Adding SIMOCODE can provide the kind of immediate payback required for investments in these financially stressed times. The cost of a SIMOCODE pro basic unit is far less than replacing most motors, it's less than the cost of pulling out most motors for bearing renewal, and less than the value of an hour of production at a facility of any size. Avoiding any of these situations, even once, will cover its cost.

Diagnostics for condition monitoring

SIMOCODE pro offers inputs for a variety of external sensors, either directly to the unit or through expansion modules. Thermistors can be added to monitor bearings or winding temperatures to detect nascent failures before they cause an outage. Vibration monitors can diagnose many forms of equipment deterioration, and alarms can be tripped when strategic thresholds are crossed.

The SIMOCODE can display this data locally using a simple HMI, and it can also be configured to process the information and report it to the larger control system or maintenance area as desired. It comes over the SIMOCODE's main communication channel, so no additional wiring is necessary. In this way, it serves as an RTU gathering and processing information locally, simplifying communication.

Higher process functions and integrated safety

SIMOCODE isn't just about condition monitoring. It can perform a variety of process and safety functions independently. For example, it can interface with a level switch on a tank and turn a pump on or off to maintain a specific level. At the same time it can check whether the strainer basket ahead of the pump is getting too full while also monitoring pressure in the tank. If there is a high-temperature or overpressure function, it can shut down a pump and trigger an alarm. It can be configured to perform these kinds of basic functions and execute those tasks independently, even without the host control system if necessary.

Add-on safety modules can extend its function to protect people, your plant, its surrounding environment and machinery with fail-safe disconnection of motors. SIMOCODE allows integration of machine safety and control functions requiring a fail-safe disconnection of motor loads, such as an emergency stop. Local and network fail-safe operation can be achieved, compliant with IEC 61508/62061 and ISO 13849-1 safety standards for functional safety up to SIL 3 or PL e.

Simplicity or sophistication from one device

In most situations, doing all these diagnostic and process tasks would require a variety of devices. The functions already mentioned could call for an overload relay, data acquisition system, current and voltage analyzers, power meters for energy consumption, a safety relay and small local controller. Adding SIMOCODE pro to a motor can do all these and more at a much lower price.

A basic SIMOCODE pro provides the main functions for motor management with simple configuration. Using SIMOCODE ES software or Siemens TIA Portal, configuration follows an intuitive series of steps. All settings are preserved in the system and a memory module so if a unit needs to be replaced, it can be given all the same settings as its predecessor with a simple download or transfer of the module. Configurations and parameters can be stored in libraries and transferred to new devices whenever needed. Multiple units that require the same settings can replicated in one step.

Connectivity and extended I/O

For complex applications that require a variety of external sensors or call for sophisticated functionality, various modules can be added to increase the number and variety of I/O types.

All the data collected and processed can be sent to the larger control system using a selection of protocols as needed. PROFINET and PROFIBUS are typical, but MODBUS is also supported.

When used in an environment with Siemens controllers driving the process, such as the SIMATIC PCS 7, exchanging functionality and configuration information from device to device is effortless. PROFINET and PROFIBUS support this capability optimally, but as mentioned, other communication protocols also work. Devices self identify themselves to a controller, establishing links so that a new SIMOCODE pro added to a system can appear on an HMI with minimal effort. Control program writing and editing functions use consistent graphic presentations to make tasks simple and fast.

These functions also support a high level of remote access, reducing the need for on-site maintenance technicians. If a problem is developing, an engineer can troubleshoot the situation from any location because all the information from the SIMOCODE is available using a secured communication link. Are the bearings failing? Why are the windings getting hotter? Do we need to change the overload current setting? Those questions are easy to answer because all the recent and historical data necessary to make an accurate evaluation is right there, and can be accessed at the device, in the control room, or central engineering department, four time-zones away.

Insight into your operation

Gaining greater insight into your facility is a key step to reducing costs and increasing efficiency. Motors can be a key part of that effort, and SIMOCODE is the tool to make it happen.

SIMOCODE along with all the products using Siemens TIA Portal are designed to help you concentrate on the process and your business rather than fixing things after they break. As the oil and gas industry struggles in this difficult environment, creating this path to improved efficiency can be a big step to increased profitability.