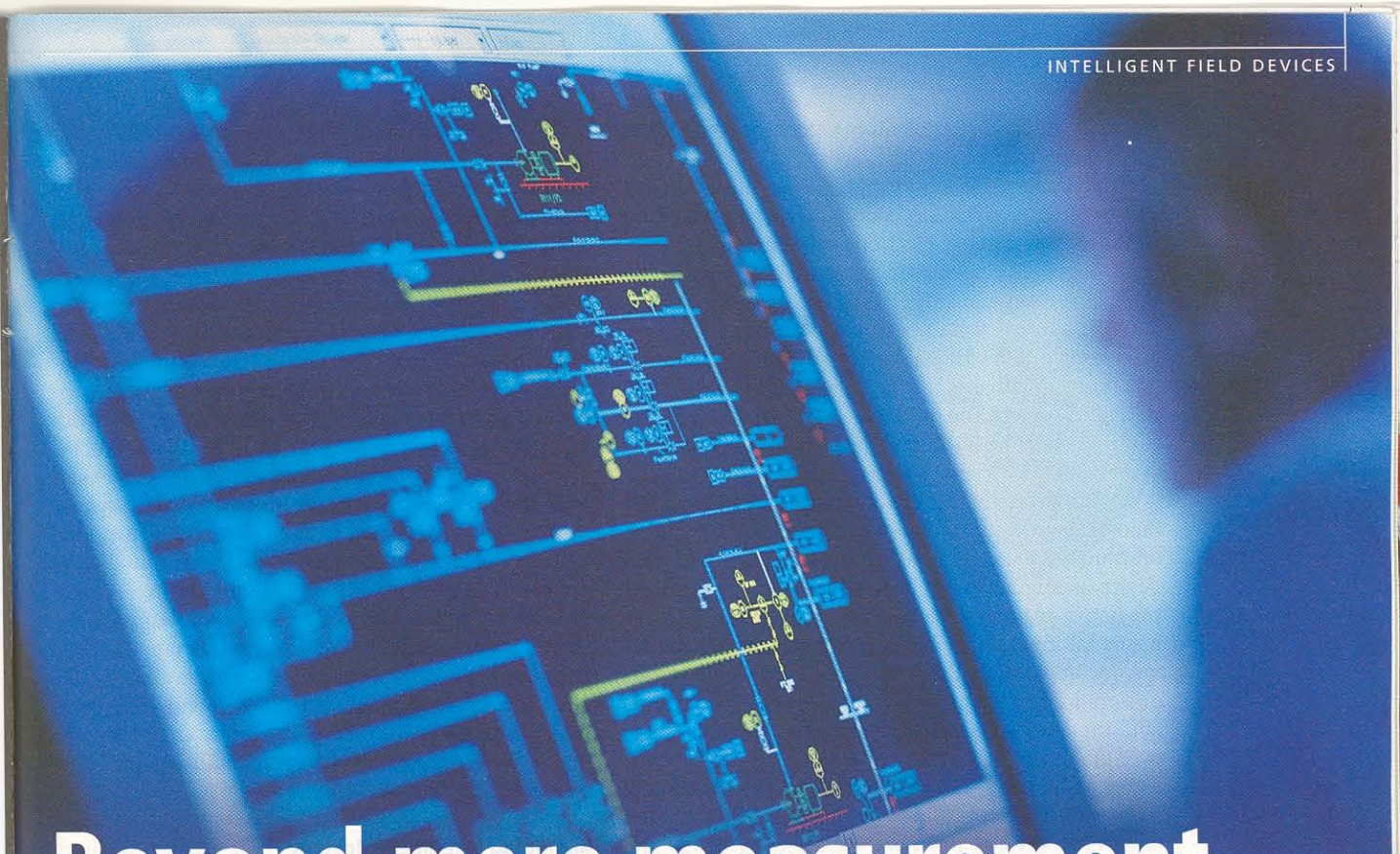


Beyond mere measurement

Devices featuring such diagnostics are synonymous to data servers.

By Brian LaBelle

Downtime reduction and cost containment are persistent objectives for operations, engineering, and maintenance professionals in the power industry.

Corrosion and deposition cost this industry billions of dollars every year in reduced efficiency and equipment failures. Effective utilization of sophisticated analyzers and control systems is necessary for avoiding unplanned outages and for otherwise meeting profitability and process control responsibilities.

The more popular recent adoptions are the combination of intelligent field devices and asset management software. Cost-saving advantages from system start-up to fault diagnoses are setting new standards for what can be expected and accomplished from the control room.

Devices are data servers

Instrumentation and automation engineers, plant chemists, and other technical professionals in the power industry have for years appreciated the advantages of control systems that provide simple access to a wide variety of intelligent field devices for the purposes of configuration and commissioning, diagnostics and monitoring, calibration management, and automated documentation.

Worldwide the number of plants implementing such technology is increasing, and the trend will accelerate, driven primarily by operations professionals recognizing broad opportunities for output improvements and cost reductions. We'll look at the field devices and asset management software and emphasize the benefits of using them in tandem.

The control system consists very generally of a controller unit, workstations, and various field devices. Advanced control systems capable of delivering the benefits described possess a number of differentiating features including intelligent field devices and asset management software implemented at the workstation level.

Intelligent field devices provide critical information on their own health, the health of the process, and the health of the equipment around them. This diagnostic functionality works through digital communications such as HART and Foundation fieldbus. Valuable diagnostic capabilities that exist in some devices today include:

Control valves: plugging of I/P, travel deviation, insufficient air supply, stuck valve, calibration changes, failed diaphragm, diaphragm leaks, and O-ring failures in piston actuator

Pressure: electronics failure, sensor failure, process condition, configuration warning, and plugged impulse lines

Temperature: electronics failure, sensor failure, process condition, configuration warning, RTD drift, and RTD life estimation

Flow: electronics failure, high process noise, ground-

ing fault, electrode fault, empty pipe, reverse flow, and calibration error

Analytical: pH electrode aging, glass electrode failure, reference electrode failure, reference electrode coating, and reference electrode poisoning

Devices featuring such diagnostics are synonymous to data servers because they do much more than simply measure process variables like pH, pressure, temperature, level, or flow. They provide the basis for abnormal situation management, process optimization and advanced control. The full value of this capability is only realized when the intelligent field devices are utilized in combination with asset management software.

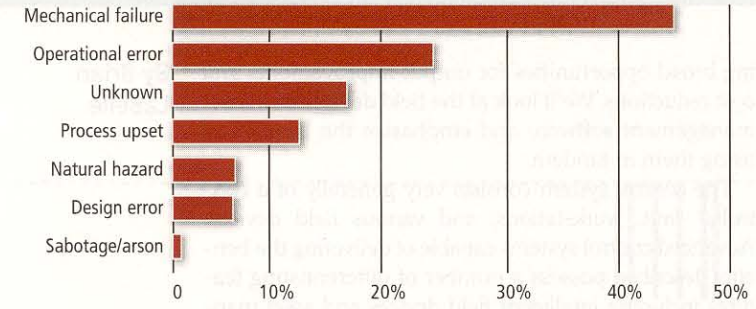
Asset management software, particularly the variety tailored specifically for control valves, instrumentation, and analytical equipment, facilitates quick and easy device configuration at commissioning and enables predictive maintenance by providing access to diagnostic information, calibration routines, and automating documentation. Successful implementation results in significantly lower start-up and maintenance costs and improves asset performance and process stability over time.

The sheer volume of device configuration and initial calibration tasks necessary to a capital project often represents savings potential sufficient to justify the relatively modest incremental costs of intelligent devices and asset management software. Checking the configuration of every transmitter and valve takes place a number of times before startup and calibration verification happen at least once. These necessary activities can take place more quickly and easily and with fewer errors from a workstation with asset management software than by physically visiting and revisiting each device in the plant, pushing buttons to navigate sometimes-extensive menu structures in sometimes-cryptic text on small local displays. Additionally, all commissioning activities including calibrations, and all subsequent changes made through asset management software can be automatically documented without the extra labor and risk of errors associated with manual reporting.

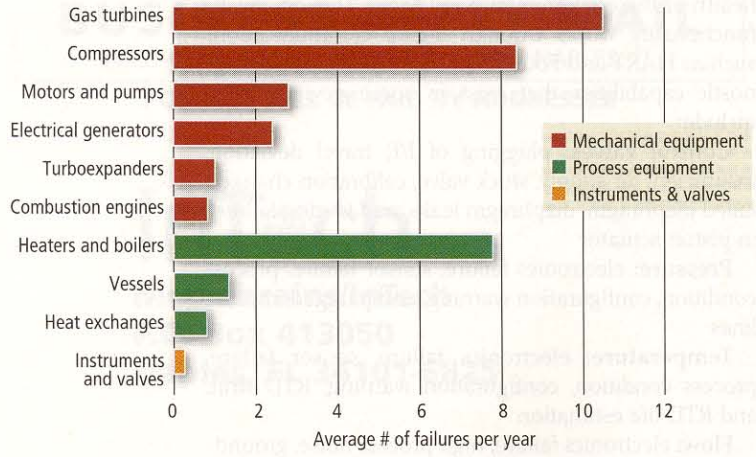
The ways in which the combination of intelligent field devices and asset management software pays for itself in faster commissioning at the end of a capital project are clear and almost always realized due to project management oversight. More allusive are the productivity improvements achievable throughout the lifecycle of the plant.

Generally, this requires an appreciation that intelligent devices need management and that work practices prevalent in the heavy industries today need to evolve from routine and reactive maintenance to a culture of predictive maintenance.

Causes of production losses in refineries.



Sources of unscheduled shutdowns in oil and gas.



Managing intelligent devices

Saving time at plant commissioning and system startup and keeping production lines up and running to sustain the overall availability of the plant is imperative. Control system assets and other plant equipment must see regular maintenance and must be in good health.

Strong and sustainable financial performance is necessary in an increasingly competitive global market, requiring the optimization of maintenance practices as well as optimization of the processes of production themselves.

Understanding the costs of routine and reactionary maintenance exposes the need to manage intelligent field devices and provides strong motivation for developing and implementing predictive maintenance plans.

Page one of *An Introduction to Predictive Maintenance* by R. Keith Mobley says in the U.S. alone, more than $200 billion/year goes to the maintenance of industrial plant equipment and facilities, and the result of ineffective maintenance management represents a loss of more than $60 billion/year. It also states maintenance can represent from 15% to 60% of the cost of goods produced, depending upon the specific industry.

Maintenance in food-related industries averages approximately 15% of the cost of goods produced, while in the pulp and paper, iron and steel, and other heavy industries maintenance can approach 60% of total production cost.

Countries in the west at present are spending approximately five times more on maintaining existing assets than on expansions and new facilities. Over 50% of all electricity generated in the U.S. comes from plants 25 years of age or older and 30% of U.S. refineries have had some of the same instrumentation and automation equipment for more than 16 years.

According to Shell Oil Company, a 1% decrease in