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Let Technology Improve Your Maintenance Efficiency

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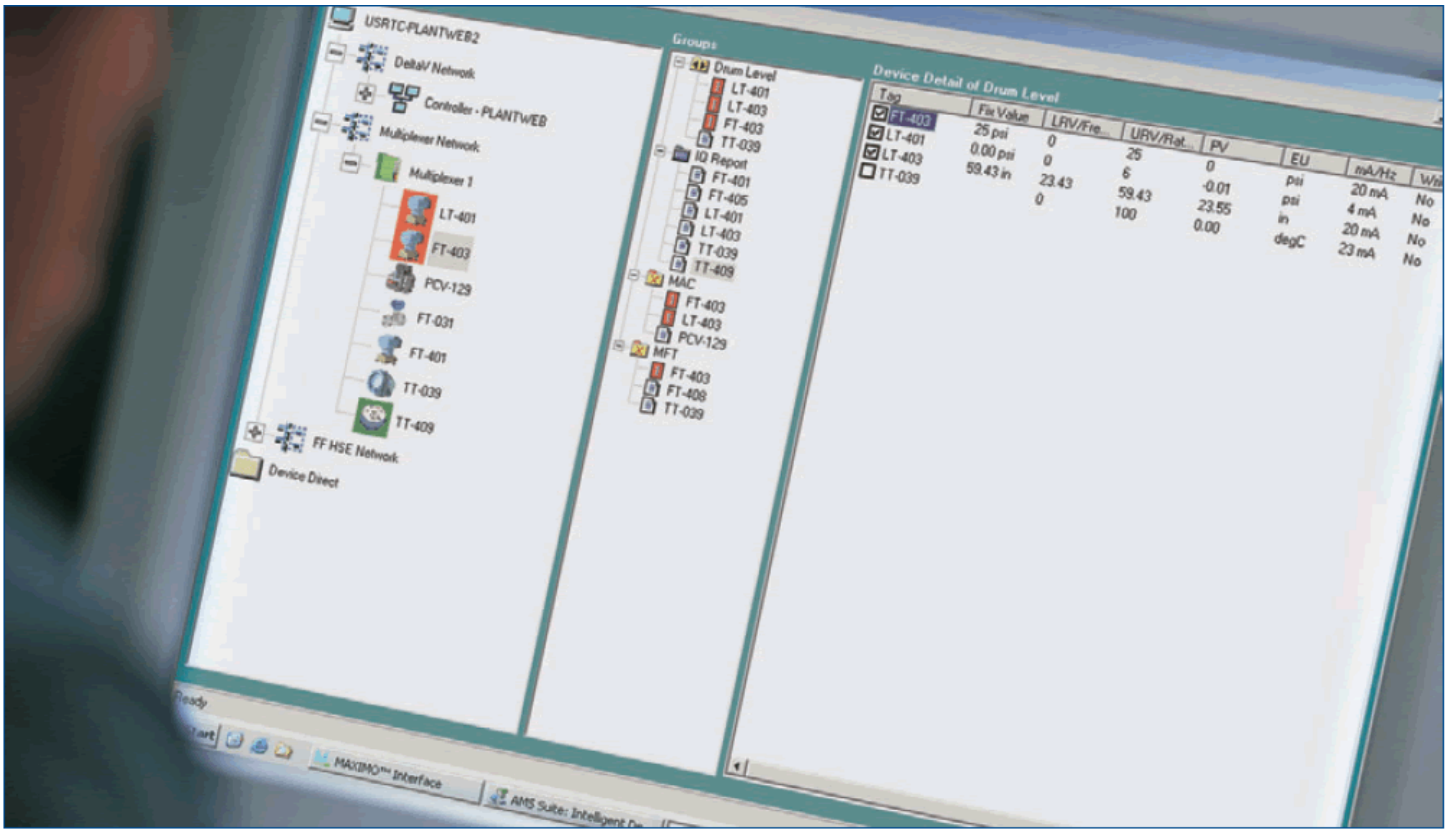
While automation has greatly increased operating efficiency in the process industries over the past 30 years, resulting in greater productivity, higher quality, and safer plants, the same level of efficiency has not rippled down to the maintenance function. As a result:

- plant commissioning and start-ups take too long
- outage planning and execution are generally mediocre and expensive
- meeting the demands of regulatory agencies is time consuming
- workers spend too much time "fighting fires" just trying to keep plants running
- unscheduled downtime is too frequent

Why isn't technology applied more often to correct these inefficiencies? There's no one simple answer, but in many cases, high maintenance costs are accepted as part of the business. Despite the severity of these issues, management often does not realize that technology can be applied to make improvements. Many companies simply do not take advantage of the value inherent in the smart field instrumentation serving their automation systems. While maintenance is frequently asked to do more work with less manpower, technology-based tools capable of increasing efficiency are not provided, or they go unused!

For example, the handheld field communicator is a staple in nearly every maintenance department. Every day, technicians around the world carry these handy devices into plants and connect them to instruments that may or may not be performing well. They often communicate with a second person in a control room as part of a commissioning, loop verification, safety interlock check, or troubleshooting routine. Field communicators are useful tools, but using them for many time-consuming two-tech-tasks is outmoded. One person at a computer can gather vastly more information in a short time, enabling better supervision of plant assets like field instruments, control valves, and mechanical equipment.

We call this data management—the ability to mine valuable data from the field and use it to help people be more productive day after day. That ability transcends into faster



Interlock checkout is streamlined by grouping, monitoring, and fixing the output of HART transmitters from the convenience of an AMS device manager workstation.

commissioning and start-ups, better outage planning and execution, easier regulatory compliance, and cost saving predictive maintenance.

Asset Management

Data-based solutions, which have been available for ten years or more, are getting more sophisticated and user friendly. For example, technicians using Emerson's AMS Suite predictive maintenance software have long been able to obtain diagnostic data directly from smart field instruments, digital valve controllers, and other kinds of production machinery using standard communications protocols. This data is extremely useful in determining the health of production equipment and predicting the best time for repair or replacement. Now, recently introduced Device Dashboards present the field-generated information most wanted by maintenance technicians on a single, easily recognized screen with more detail available by following on-screen instructions.

The AMS Alert Monitor is another significant advancement that is intended to complement the alarm capabilities of control systems. Technicians are able to dig deeper into the sources of the device alerts, getting detailed descriptions of each problem. An alert list provides the means for them to spot patterns that might otherwise be missed. Alerts are color coded by severity and can be sorted to reveal patterns. Alerts stay on this list until acknowledged and evaluated by the user or the alert is cancelled.

The AMS Audit Trail ties everything together by automatically documenting occurrences with every field device and piece of production equipment associated with the control system. Whether it is a changed configuration, calibration, or diagnostic alert, each event is automatically logged, creating a valuable historic record that is useful for maintenance and provides needed documentation for regulatory agencies.

SNAP-ON Applications

Advanced compatible applications provide mechanisms for further increases in reliability and productivity while reducing costs. The AMS ValveLink™ SNAP-ON™, for example, enables workers to obtain valuable information regarding control valve operation, including the identification of poorly functioning valves that hurt process efficiency. The actual condition of critical valves can be used to determine which valves do or do not need to be overhauled during an outage, which can result in a substantial savings.

SNAP-ON applications may also execute specific functions, relieving technicians of much repetitive work. They just load up certain tasks, start the process, and go off to do other things, returning later to retrieve the results. For example, the QuickCheck™ application is very useful for testing multiple control loops during commissioning and interlock validation. One technician using the QuickCheck software can simulate process conditions no matter how complex the interlock system may be, so personnel are rarely required to venture into the plant with handheld communicators to check one device at time. Each instrument can be placed in "loop test mode" from the control room or maintenance shop, and the output of many transmitters fixed simultaneously. Communication with the field devices

is through AMS Suite, so all wiring from the field to the control room can be checked at the same time as the DCS logic. As the output of each device is fixed and released to normal operation, the action is automatically documented, providing a complete history of the checkout for maintenance or regulatory purposes.

This non-intrusive testing methodology, which does not require a technician to break into the loop wiring, is preferred when working in regulated industries and is an advantage in all process industries.

Another useful new SNAP-ON application is AlertTrack™, which generates alerts on HART® or FOUNDATION™ fieldbus devices where a device itself may not raise an alert. This could include high/low internal temperature alerts or rate-of-change alerts on valve cycles or travel. Some transmitters cannot generate alerts based on the internal head temperature sensor. Valve positioners often generate alerts on high cycle counts or travel accumulation, but if a valve is suddenly cycling more often than normal before a high cycle count is reached, immediate action by maintenance personnel might avoid a failure and unexpected downtime. For this reason, AlertTrack notifies the *right* people with the *right* data at the *right* time through a text pager, cell phone message, or email. All AlertTrack-generated alerts are also recorded by the AMS alert monitor.

Real Situations

These are not theoretical solutions. Diagnostic information generated by intelligent field devices and condition monitors connected to critical production assets can be of immense value. The use of technology, for example, to eliminate a second field technician during commissioning and interlock validation reduces maintenance costs substantially. Let's look at some other ways advanced software applications are used in common situations to increase the efficiency of plant personnel, saving the time and money in preparing for an outage and subsequent commissioning and start-up.

Every pre-outage plan should include an examination of records provided by the AMS Alert Monitor. One button sweeps can be used to identify poorly performing valves, and AlertTrack histories provide valve cycle performance data. Troublesome field instruments and machinery are easily identified and placed on the outage list, while equipment that is performing well is not touched.

Nowhere is this more apparent than in outage planning for control valves where large numbers of valves are often scheduled for overhaul as a protective measure. When valve diagnostics were used a few years ago to evaluate 188 valves scheduled for overhaul at a DuPont plant in Texas, only 14 of those valves actually needed that level of service.

A major Gulf Coast refinery has documented savings of more than $1 million annually through the work of an on-site asset manager who uses data in evaluating, diagnosing, and prioritizing control valves prior to turnarounds. No valve issues were encountered on the subsequent startup. In another documented case, a multi-plant petrochemical company in southern Africa has saved $200,000 to $300,000 by selectively overhauling control valves.

Commissioning of new equipment and loop-checkout following an outage are more efficient with the QuickCheck application. During a startup involving 250 newly installed instruments at the DuPont plant in Fayetteville, NC, the use of this technology saved an estimated 600 man hours on loop checkout alone. In addition, the plant was up and running 10 days earlier than predicted due to efficient safety interlock validation.

According to DuPont Control Systems Engineer Warren Way, "We set up groups of transmitters in loop-test mode with outputs equal to normal process variables. With the process in simulation mode, a technician systematically manipulated the output of each transmitter to exceed process conditions and then waited for a response from the plant indicating that the safety interlocks were working properly. This procedure took place in the control room alongside the control console. Technicians did not have to search for instrument data, (which) was right there in an organized manner. This saved a tremendous amount of time while effectively validating the interlocks."

At Syngenta, a multi-product agribusiness facility in Louisiana, the interlocks on some 20 sets of safety instrumented functions involving approximately 60 I/O must be validated before each new herbicide goes into production. By employing QuickCheck, the time for verification is cut by more than 50 percent, saving more than $13,000 with each change in production and increasing revenues by adding more days of production annually.

Summary And Benefits

AMS Suite and compatible advanced applications are very useful in generating reports for pre-outage planning, and well-planned outage activities allow technicians to focus on poorly operating field equipment and not waste time on healthy instruments and machinery. All activity is captured in an electronic record as tasks are completed. The data storage capability enables plant personnel to retrieve information in a fraction of the time required to access paper files, which may or may not be accurate. No data is lost, so everything is in order for regulatory purposes.

The benefits can be enormous, as the entire maintenance function is energized and efficient. Technician time is saved in many ways, allowing personnel to concentrate on "staying ahead of the game" through predictive maintenance. Costly failures and unscheduled downtime are anticipated and prevented. Dollars are saved by avoiding wasted effort and through trouble-free startups. Perhaps best of all, normal production is often resumed sooner than expected, resulting in greater productivity and added revenues.

1. Chemical Engineering, Feb., 1999
2. Uptime, June/July, 2009
3. Chemical Processing, April, 2005