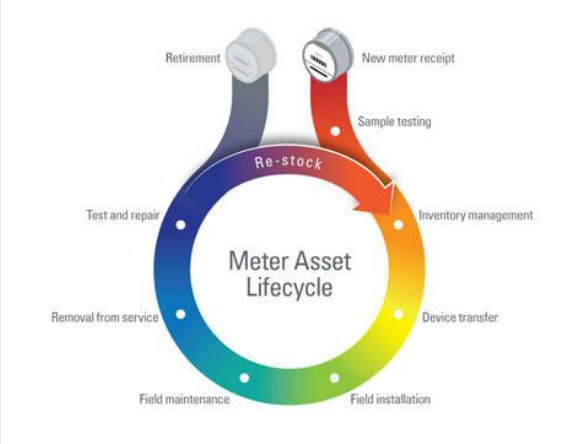
Smart Devices & Asset Management

The Smartest Instruments Still Need Smart Humans

Automation suppliers have been building microprocessors and digital communications capabilities into process control instruments for more than 20 years. By 2010, process industries had installed an estimated 69.2 million field devices, according to a study by the ARC Advisory Group, more than 60 percent of them microprocessor-based. Despite that massive investment in intelligent instrumentation, the promised new world of lower maintenance costs and significantly lower risk of process failures has not yet arrived.



Blame that, say the experts, on the difficulty of changing human behavior and long-accepted practices. Others point to a lack of sustained management support for following best practices. Though nearly all of the instruments shipped today have built-in intelligence, companies continue to follow the traditional inspect and test practices they used with analog devices. The lack of links from process instruments to digital communications networks also means workers can access little of the information available from smart field devices, and even less is actually used as intended to improve diagnostics and process control.

The result is hundreds of thousands of man-hours wasted every year on routine and unnecessary maintenance, and processes that are no more efficient or safer than they ever were. In a perverse way, the cost cutting and workforce downsizing in the process industries is finally leading many companies to a tipping point for change. Lacking the number of workers required to control processes and inspect and test devices manually, they're being forced to find ways to make better use of the information provided by their intelligent instruments.

Defining Standards

An industry-wide effort has been underway for several years to define standards and best practices for smart field device management, make intelligent instruments easier to use, and train process engineers and maintenance workers on how to apply and benefit from them.

To that end, the ISA-108 committee on intelligent device management (www.isa.org) was formed in 2012. It is working to define standard templates of best practices and work processes for the design, development, installation and use of diagnostic and other information from intelligent field devices.

The first draft of the committee's initial report on models and terminology is scheduled for completion in the first quarter of 2014 and will then be presented as a proposed standard to an IEC technical committee. Part two, diagnostic work processes, is due in 2015, and part three, on configuration work processes and guideline templates, in 2016.

These devices don't come from the factory pre-set with the specific configurations needed for an application. There are a huge amount of options; you have to tell an instrument what you want it to do. Then you have to create a backup database to maintain configuration accuracy over the lifecycle of the device.

Although traditional test and inspect practices work well for production assets like pressure vessels and piping, which typically fail slowly over decades, automation assets such as transmitters and valves are more vulnerable and can degrade quickly. That's where self diagnostics are critical and where routine predictive and preventive maintenance practices are of less value.

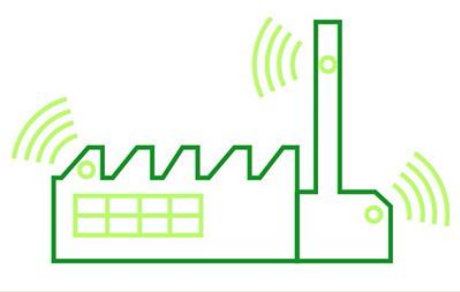
The goal is to refocus maintenance on early problem identification so that operational issues can be quickly resolved without all the expense and risk. The diagnostic information in intelligent instruments lets you anticipate problems and be proactive. It doesn't reduce the failure rate, it just reduces the impact of failures.

Condition-based monitoring and maintenance practices are starting to take hold in a number of industry segments, such as machinery and offshore oil drilling. But for most process industries, making better use of diagnostics is not part of the culture. People are focused on keeping things working, not managing assets well over time. A lot of things get deferred. While a plant may run nicely for a while, it's actually in decline.

Industry has been doing inspect and test for years. Doing asset management in a different way requires a different culture, and the tools to do it well are poorly developed and Integrated. Standards, will finally help establish accountability for following good practices. It's not an instrument, an IT or a vendor problem; it's a management problem. Management engagement, accountability and metrics will drive behavior change.

Wireless a Catalyst

The adoption of wireless has been a spur to interest in intelligent instruments. Wireless technology has allowed intelligent devices to be more useful at a lower power budget. Once they get more digital information, users want more multi-variable data for troubleshooting and to gain insights into their process.



On the flip side, users are often overwhelmed with all the information they can get from their instruments. They don't know what to do with it. They're asking suppliers for help in accessing, managing and assessing the data. They want to know, 'What does it all mean?'

That's especially true with so much of the process industry workforce retiring. The younger people are more open to change and hungry for information because they believe it will help them solve problems. Younger people don't have the instincts honed by years of experience in a plant. Data is all they have.

Human-Centered Design

Instrument suppliers are working to make life easier for the process industry workforce. This includes making products that are easier to use and have device dashboards that make it easier to see data. Suppliers are spending a lot of time and money to learn how customers need to interact with data. Many include dashboards to display data with a similar look and feel across multiple devices, even though the devices might do different things. This human-centered design approach owes much to the model established by the consumer electronics industry. Its goal is to design human-technology interactions around how people learn, think and work.

In the past, there were fewer device types and simpler devices. That meant workers did the same things to the same device types many times, building expertise. Today there are more device types, and devices themselves are more complex. In addition, devices are more reliable, so worker-device interactions are less frequent but more varied. The result is unfamiliar human-device interactions and more human error. Studies show that up to 80 percent of abnormal situations are caused by human error. With process plants staffed with fewer and less experienced workers, the potential for both minor problems and major catastrophes rises exponentially. Consistent navigation and operation across multiple devices, the foundation for human-centered design, can improve the probability that the correct actions will be taken with fewer errors.

Modular Components, Multiple Variables

Many suppliers are redesigning their instrument lines to make products more modular. The redesigns frequently involve electronics, software and even mechanical components such as connectors, which facilitate simple plug-in modules, allowing replacements to be made easily in the field. Many have adopted a common platform across all instrument lines to make devices easier for customer to use. This means all have the same programming requirements, software interface and approach to diagnostics.

Another trend is the development of instruments that can measure multiple variables. End users in the oil and gas industry, for example, want multi-variable instruments that will reduce the number of pipe penetrations the company is required to make, as well as wiring, which will save on both installation and maintenance costs.

Driving Adoption

Intelligent transmitters are the most widely deployed intelligent instruments today, outnumbering analog transmitters by an estimated two to one in heavy process industries. Also popular are positioners for control valves and flow controllers, which are used in every industry where custody transfer is critical in controlling process input costs.
Positioners provide maintenance technicians with critical information on a valve's activity and can help proactively determine what a reasonable maintenance schedule should be in a process application. Industries that have been early to appreciate the value of intelligent field devices include oil and gas drilling, refining, chemical plants, food processing, and biotech and pharmaceutical companies.

Develop a Strategy for Asset Management

When beginning an asset management process, go slowly and deliberately with the understanding that it is a process rather than an event. Ensure, by free trial runs if possible or in-depth research or observation, that the software you purchase for tracking, generating work orders, inventory control and lifecycle costs are what you will actually use and not too much or too little.

After that hurdle has been crossed, you are just beginning a true asset management program. Reliability is related to predictive, proactive maintenance and knowing when and how to run to end of life. This understanding can rarely be obtained quickly or simply. Set yourself up for success by using the boots on the ground as a primary source of input for what works and doesn't work. Track, report and verify constantly and consistently. If the people who make the financial decisions are not onboard, your program will fail. Cost things correctly, comparing the cost of maintenance vs. the purchase of new equipment. Make sure to include all the factors, such as operator and maintenance training, ease of repair and usage of equipment, which will affect throughput of product, cost of product and cost of using the asset.

Develop a program to demonstrate that proper purchasing, operating and maintenance practices are a revenue-generating process. This will help management realize that ROI is much more than simply purchase price, labor and materials.