PROCESS CONTROL AND INSTRUMENTATION

CONTENTS

Special Supplement to
HYDROCARBON PROCESSING®

Originally appeared in:
August 2010, pgs 67- 70.
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Process control and instrumentation trends and spending forecasts

LES KANE, Editor

According to the *2010 HPI Market Data Book*, worldwide hydrocarbon processing industry (HPI) spending for process control systems and instrumentation is forecast to be nearly $10 billion in 2010. This is about 20% of all HPI equipment spending and is the largest equipment spending category.

Table 1 shows the percentage of expenditures for various instrumentation categories.

HPI process control and instrumentation requirements are so large because of the industries size and the many automation levels implemented (Fig. 1).

These include:
- Frontline instrumentation
- Advanced regulatory control
- Advanced process control
- Real-time optimization
- Planning and scheduling
- Business information systems.

TABLE 1. HPI process control instrumentation spending, % dollars

Item	Percent
Process control systems	25
Control valves and actuators	27
Purchased application software	15
Online process analyzers and sample systems	10
Flow transmitters and elements	6
Pressure transmitters	5
Temperature transmitters	5
Level transmitters	4
Miscellaneous (tubing, fittings, gauges, etc.)	3

Note: *Spending does not include control rooms, laboratory and portable analyzers, plant information/management computer systems, and engineering and installation costs. Process control system spending includes hybrid DCSs, operator displays, I/O systems and instrument cable.*

TABLE 2. Five pillars of fieldbus justification

- Superior return on assets
- Reduced maintenance cost
- Reduced unplanned downtime
- Abnormal situation avoidance
- Knowledge workforce creation

Source: O'Brien, L., *Hydrocarbon Processing*, April 2005

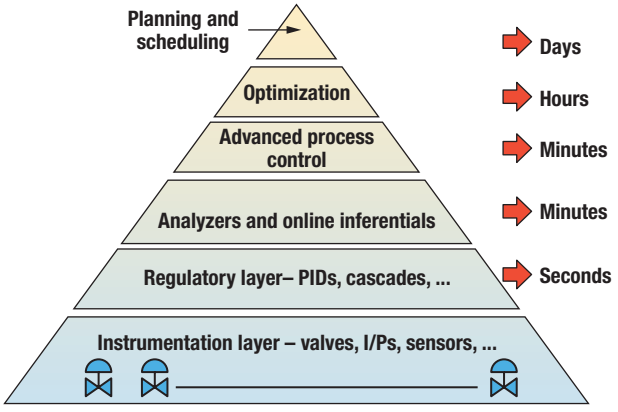

FIG. 1. Typical plant process control hierarchy showing differences in timing requirements.
Source: Mitchell, M. P., and Shook, D. P., 2003 ERTC Computing Conference

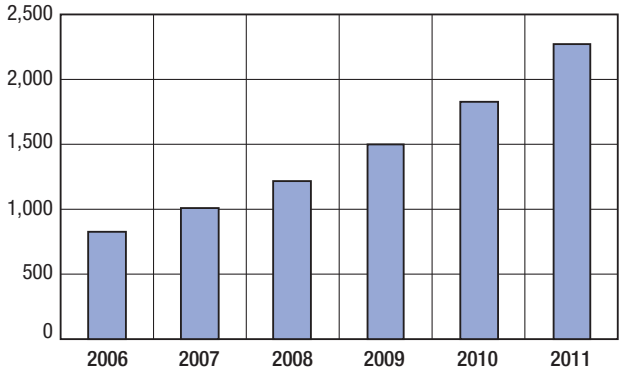

FIG. 2. Worldwide market for fieldbus solutions in the process industries (millions of dollars).
Source: O'Brien, L., *Hydrocarbon Processing*, May 2007

Fieldbus. One of the main focus areas is fieldbus, which is an all-digital communications protocol that enables microprocessor-based field instruments to communicate with each other and the control systems via a single network bus. The information provided includes not only the condition of the instrumentation and valves, but also the status of the monitored process equipment. This enables potential failures to be detected early so actions can be taken to avoid shutdowns and safety and environmental issues. Fieldbus is also enabling better asset management. Table 2 shows some of the benefits of implementing fieldbus.

According to ARC Advisory Group (Dedham, Massachusetts), fieldbus adoption in the process industries is growing rapidly (Fig. 2).

Alarm management. Alarm management practices are also attracting a lot of attention as HPI companies strive to improve safety. It is easy and cheap to include alarms in modern distributed control systems, so many alarms are included that are not critical. This results in operator alarm overload and confusion. Thus, HPI companies are rethinking their alarm strategies and including only those alarms that are crucial to plant safety and operation. Table 3 shows some of the benefits of implementing better alarm management strategies.

Wireless sensors. The use of wireless instrumentation is also starting to take off. Because there is no need to run wires to the instruments, measurements that were too expensive to obtain before can now be obtained cost-effectively. Table 4 and Fig. 3 show some of the applications for wireless sensors in the process industries.

More details are available. More details on process control and instrumentation use in the hydrocarbon processing industry are provided in our *2010 HPI Market Data Book*.

The publication also covers energy, refining, petrochemicals, gas processing, alternative fuels, biofuels, environment health and safety, maintenance and retrofitting, and construction trends. In addition, capital and maintenance spending, and spending for various types of equipment and services, are forecast.

The *Market Data Book* also includes a CD ROM that shows over 10 years of construction activity, includes a worldwide plant directory and selected articles from *Hydrocarbon Processing*. To purchase a copy contact Bill Wageneck, publisher at e-mail: bill.wageneck@gulfpub.com. ■

TABLE 3. Key areas of alarm management justification

Area	Benefits
Safety	Reduced risk of human injury and incidents
Unplanned downtime	Avoid plant shutdown, lost product and associated costs
Information management	Avoid nuisance alarms, improved fault tracing
Role of the operator	Give operator more time to focus on the process, creating knowledge workforce

Source: O'Brien, L., *Hydrocarbon Processing*, April 2008

TABLE 4. Applications for wireless sensors

- Process measurements can be taken from wireless transmitters.
- Wireless video cameras can be used for perimeter security.
- Radio frequency identification can be used for plant inventory or asset tracking.
- Sensors can be used for real-time monitoring of equipment deterioration.
- Wireless networks can enable technicians and engineers to process in-field work immediately rather than manually later back at their desks.

Source: McPherson, *Hydrocarbon Processing*, October 2007

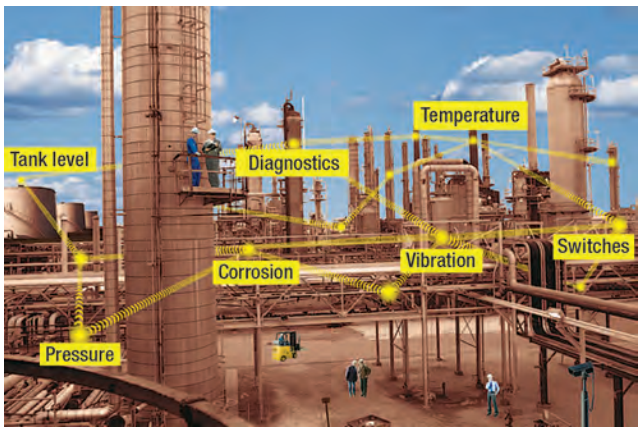

FIG. 3. A self-organizing field network.
Source: Marin, G., *Hydrocarbon Processing*, March 2009

Pump failures can be predicted and avoided

TIM OLSEN, Emerson Process Management

When a process pump fails in a refinery, the impact can range from an operational slowdown to a catastrophic shutdown of the entire plant. If flammable or hazardous fluids are involved, the health and safety of employees may be at risk – as well as the ensuing environmental reporting and potential fines. Having a spare inline pump may not help when the failure is sudden and unexpected. Warning signs almost always exist, but they must be recognized and the right people informed in time to act. In short, an automated monitoring program is essential for critical process equipment.

For example, a few years ago the inboard bearing of a high-speed centrifugal pump at a large overseas refinery suddenly seized, leading to significant lost production and expensive repairs. The evidence indicated extreme overheating in the bearing housing due to a lack of bearing lubrication.

The failure that followed could easily have been predicted and avoided, since one of Emerson's Machinery Health™ Transmitters had been installed on this very pump four months earlier. When a series of alerts were issued by this automated motor-pump train monitoring and analysis system, they were overlooked by plant operators. The pump was at risk of failing, but several days passed before the actual failure – plenty of time for action to prevent the disaster that followed. Finally, the health value trend deteriorated rapidly from about 60 to 0 in just 10 minutes, at which point it was too late to prevent the failure.

Motor-pump train defects tend to have similar failure patterns across a variety of pump installations, and these patterns are used as the basis for automated vibration analysis. Each machine is continually scanned for indications of common malfunctions like bearing misalignment, pump cavitation, or motor electrical faults. With Emerson's Smart Machinery Health Management, continuous vibration monitoring is combined with the diagnostic and communication capabilities of smart, microprocessor-based instrumentation and advanced software to automatically determine the condition of rotating machinery.

For essential pumps that are not being automatically monitored and considered not economically justified for a wired solution, accurate vibration data can be obtained using the CSI 9420 Wireless Vibration Transmitter and Emerson's Smart Wireless network. Emerson's wireless solutions extend the PlantWeb digital plant architecture to enable new information access and mobility for improved decision-making and plant performance.

The Smart Wireless field solutions integrate smart monitoring instruments wirelessly in a self-organizing network that delivers greater than 99 percent reliability by automatically adapting as devices are added or removed, or obstructions

encountered. Smart Wireless products are supported and fully compliant with the IEC 62591 (*Wireless*HART) standard.

Automated monitoring of critical and essential process pumps provides timely information to both control room operators and maintenance, thus allowing the opportunity to take action before a pump fails. Operation, safety, and environmental incidents can be avoided, thus increasing the reliability of the refinery and profitability through the use of automated pump monitoring.

Learn more at www2.emersonprocess.com/en-US/brands/csitechnologies/vt.

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You weren't really sleeping, were you?

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