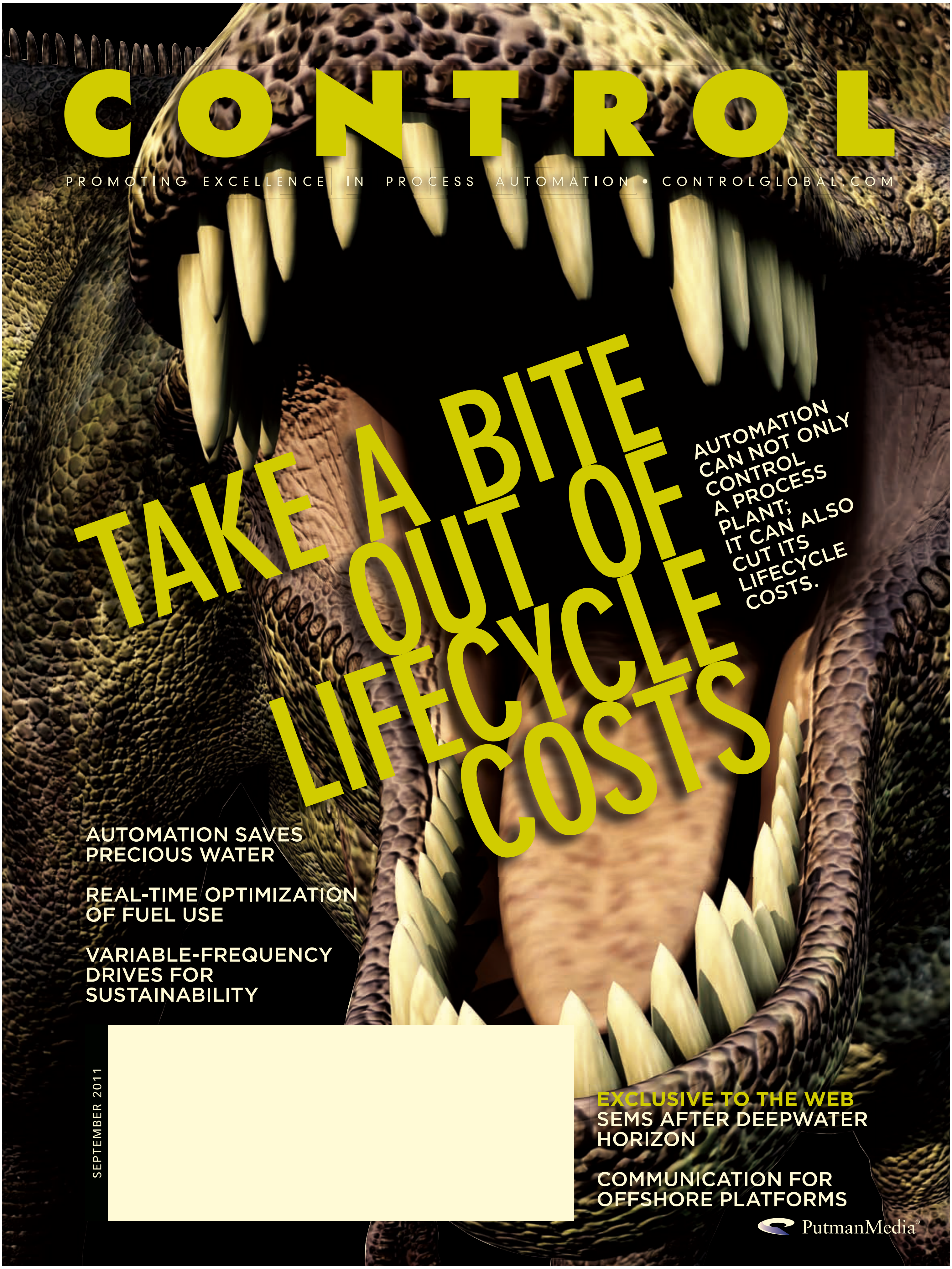

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FEATURES

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DEPARTMENTS

CIRCULATION AUDITED JUNE 2010

Chemicals & Allied Products	12,548	Rubber and Miscellaneous Plastic Products	4,403
Food & Kindred Products	12,638	Stone, Clay, Glass & Concrete products	2,057
Paper & Allied Products	3,470	Textile Mill Products	1,361
Primary Metal Industries	5,445	Petroleum Refining & Related Industries	3,877
Electric, Gas & Sanitary Services	3,116	Tobacco Products	115
System Integrators & Engineering Design Firms	8,912	Total circulation	63,006

For process plant components and equipment, lifecycle costs can dwarf up-front purchase costs. This is particularly true nowadays because of rising energy prices, higher labor costs and the increasing need for uptime. But automation can help monitor, control and cut lifecycle costs.

Lifecycle costs represent the total cost of ownership of an asset, such as a control valve, reactor vessel, boiler or any other piece of equipment. (For a more complete description, see the sidebar, "Lifecycle Cost Definitions.")

How can automation be used to monitor, control and cut lifecycle costs for process equipment and components? The "big three" are reducing stress on equipment, enabling proactive maintenance and cutting energy use.

First is eliminating process upsets. As an anonymous refinery engineer explains, "Improved automation reduces stress on equipment caused by process upsets and unplanned unit shutdowns." Reduced stress obviously leads to fewer equipment breakdowns and lower maintenance costs.

"Our installation of a modern DCS reduced the number of upsets and trips," he continues. "Our operations and maintenance managers noted considerable improvements in production rates and mean time between failure rates. None of these control systems had as their express purpose cutting lifecycle costs, but the net effect of screwing up less often was to reduce lifecycle costs. If you don't break it, it doesn't need to be fixed."

Kenneth Marse, control systems specialist at Galata Chemicals (www.galatachemicals.com) in Taft, La., says his facility reduced lifecycle costs by eliminating the need to shut down the process to perform maintenance or repairs. Fewer shutdowns and start-ups equated to smoother running plants and extended equipment life.

The Taft plant uses four separate DeltaV control systems from Emerson Process Management (www.emersonprocess.com). AMS Device Manager software monitors the smart devices continuously, and raises alarms if any preset operating limits are exceeded. Some parts of the monitoring system rely on wireless communication back to the AMS.

"Every morning I check the alert monitor in AMS," Marse reports. "In one example, AMS gave an alert on a level transmitter that operators thought was working properly. I ran diagnostics on the instrument and found the electronics were going bad. We were able to order new electronics and plan the work while switching production. The result was no unscheduled down time, which means no loss of production. Catching a potential problem before it occurs avoids a great deal of troubleshooting and eliminates downtime."

Energy savings is the third big key to cutting lifecycle costs. Glenn Givens, president of Givens Control Engineering in Burlington, Ontario, Canada (www.givenscontrol.com), has been involved in several projects that simultaneously cut energy costs and increased equipment life.

"We automated the screening process for stock pulp used to fill a large tank at a paper mill," Givens explains. "The whole system had to be ramped up to about 20 times the existing throughput." The concept was that the pump and screen motors could then be operated for approximately 5% of the time, saving energy and wear and tear." As an additional benefit, pump and motor life would be greatly extended.

"The two motors in question are 200-hp each, consuming 165 kW," Givens says. "Estimated savings were $30K to $40K annually." (See the sidebar, "Automating for Energy Savings," p 56, for more on this project.)

LIFECYCLE COST DEFINITIONS

Paul Avery, senior product training engineer with the Drives & Motion Division of Yaskawa America (www.yaskawa.com), explains commonly used lifecycle cost terminology:

- *Lifecycle Cost (LCC)* is the cost of using an item in its intended application over the entire time period of expected use. LCC typically takes into account lost production and corrective maintenance cost.
- *Total Cost of Acquisition (TCA)* is all the costs associated with buying goods, services or assets.
- *Total Cost of Ownership (TCO)* is LCC + TCA + operating cost + disposal cost.
- *Mean Time Between Failure (MTBF)* is the expected time between two consecutive failures for a repairable system. It's also the ratio of the cumulative operating time to the number of repairable failures for that item over the time that the failure rate is stabilized.

MBTF must be determined based on a period of time when the failure rate has stabilized. In practice, this means eliminating failures due to the initial infant mortality and final wear-out portions of the bathtub failure rate curve (Figure 2, p. 62). This stabilized failure rate is sometimes referred to as an exponentially distributed failure rate. MTBF enters the picture as a factor in calculating LCC because it can be inferred that the greater the MTBF, the lower the LCC.

Operators Don't Always Buy In

Givens Control Engineering has done other projects that successfully saved energy. In one case, however, reluctant operators gummed up the works.

Refiners are high energy-consumption devices used in paper mills to cut fiber to shorter length. On a paper machine that had two refiners, operators could shut one down in some instances, saving 100 kW per hour.

Givens wrote a program to look at the tonnage, energy per ton and other factors, and display on the DCS when it was permissible to shut down one of the refiners. It couldn't be done automatically because it required manual closing and opening of valves.

Unfortunately, this program wasn't successful because operators didn't implement the shutdown sequence. "Some operators may have felt that quality would be higher running two refiners in parallel, or that there could be a risk of getting out of quality specs when doing so," says Givens. "Or it may have just been easier for operators to ignore it."

Givens recommended installing automatic open/close valves to automate the shutdown, but it never happened. Operators need to "buy in," to make such a system work. (See Table 2, p 60, for more difficulties in implementing lifecycle management systems.)

Management Has to Buy In Too

Equally important as operator buy-in is getting management to approve the concept and purchase the necessary equipment and services. "A critical success factor in implementing advanced automation is gaining acceptance of the approach across the organization," says Ann Feitel, director of planning for asset optimization at Emerson Process Management.

"The principle challenge is the change management necessary to ensure, not only a successful launch, but also sustained benefits over the full lifecycle," says Jerry Belanger, strategic marketing director for lifecycle services at Honeywell Process Solutions (http://hpsweb.honeywell.com). "Automation contributes the most when combined with the right work processes, training and on-going lifecycle management."

Paula Hollywood, senior analyst at ARC Advisory Group (www.arcweb.com), adds, "The greatest challenge is changing the corporate culture. People are inherently resistant to change. Clearly stated objectives help all the players understand their roles. Continuous monitoring and feedback need to be part of the process to keep people engaged."

Management bought into an automation plan at the Florida Keys Aqueduct Authority (FKAA, www.fkaa.com). The FKAA developed a 20-year strategic master plan to both improve its water processes, and to develop an automation system migration plan to replace its 20-year-old equipment that was expensive and difficult to maintain. The authority also wanted to expand and modernize the capabilities of the control system. The FKAA wanted a common communication platform, a common programming language and remote monitoring capabilities.

AUTOMATING FOR ENERGY SAVINGS

Increasing the flow rate by 20 times for stock preparation at a paper mill had several benefits, including saving energy at the rate of $30,000 to $40,000 per year. Achieving that savings took some clever automation by Givens Control Engineering.

The paper mill had purchased a pulp screen sized for 1200-1400 gpm, assuming that future paper grades would require it. But there were few grades that required even 350 gpm, and most used 70-100 gpm. "It occurred to people in the mill that a lot of energy could be saved by running the system at the max flow of 1400 gpm and having it fill a very large tank they were already using, and then have it stop for many hours," explains Glenn Givens.

Basically, the system had a fixed-speed pump followed by a pressure control valve, a rotating basket screen and an Accepts flow control implemented by a flowmeter and valve. It also had a Rejects flow control, a Rejects dilution flow control and an Accepts recirculation flow—each of which had their own flowmeter and valve. In total there were four flow control loops and one pressure control loop, all of which had to be well-tuned.

Two alarms had to be changed from low- to high-priority because operators were ignoring them when the screen was started automatically. The big problem, though, was that the existing shutdown sequence for the screen flushed the pipes, purging some pulp to the floor. The cost of the pulp was significant, so Givens had to rewrite the sequence to flush the pipes back to the source.

"When we first started the program, operators were certain that something catastrophic would happen because we were operating the screen at a far higher throughput than they had ever seen," says Givens. "But at that point, we were just over half the minimum design flow. During the implementation phase, we found that the screen's cleaning efficiency was improved at high flow rates. Needless to say, the project paid for itself quickly."