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Fair weather now, some clouds on horizon

As one of the best years in memory ends for the automation industry, the near-term outlook remains promising. The economy faces the new year with record low unemployment, emerging nations are gobbling up consumer goods as quickly as they're produced, and technology continues cartwheeling forward with ever more dazzling, downright breathtaking tools.

But there's a whistling-past-the-graveyard sensibility about the optimism, because some long-neglected bills are about to fall due: America isn't producing the engineers and scientists needed to fill the holes that will be left when the demographic time bomb goes off and Boomers begin leaving the workforce for retirement condos in Florida; and increased offshoring of everything from production lines to design shops, with all of its economic and social dislocations, is a slam-bang certainty.

What is more, global energy supplies remain unstable. The Middle East, and its rich oil fields, is more volatile than ever, after more than three years of occupation of Iraq by the U.S., and Russia nationalized on 12 December a Shell Oil refinery worth $20 billion. That is a huge loss for the oil giant and a move that stands to leave all of Western Europe dependent for its oil on Russia. As *InTech* goes to press, Russia unveiled a sharp increase of the export duty charged to neighboring Belarus for crude oil, a move expected to raise costs throughout the region.

Exploiting technology

The pipe dreams of a few years ago have gone online and are paying their way.

Five years ago, *InTech* speculated wireless connectivity would soon make monitoring with real-time reporting, and control of, remote facilities a commonplace. The trials are over, and wireless has delivered. Jack Turner, a Unicco automation expert working with Cargill, makes a typical observation: "I believe our remote departments will all be wireless soon."

There's a further advantage, said David Rabon, an automation technician with Pfizer. "There's such a payoff with it for new installations or upgrades. It frees up a lot of I/O." He wondered, though, whether the globalization of automation technology is an unmixed blessing. Noting the wide range of standards that instrument makers are obliged to satisfy in order to serve worldwide markets, he speculated "it probably jacks the price-up for vendors."

It isn't only distant works that benefit from wireless connectivity, though. Radio waves can travel where wires can't because of heat or physical barriers, don't wear out or get accidentally cut, and can be powered by waste energy captured from the equipment to which the transmitter is attached. The applications range from straightforward reporting of the status of manufacturing operations to predictive maintenance of manufacturing components not ordinarily susceptible of monitoring using tethered devices.

Sensors attached to machinery, for instance, and powered by their vibrations or waste heat, wirelessly report when maintenance work is needed. "We're seeing a lot less downtime," Turner said. "Probably about 75%."

Indeed, according to an *InTech* Automation Outlook survey (see sidebar on page 20), readers anticipate that predictive maintenance will play an ever greater role in plant operations over the next several years as manufacturers strive to optimize the return on their investment in the face of increasingly fierce competition from the emerging nations. Unplanned downtime, they said, is unacceptable.

The open advantage

The philosophical shift toward open systems is yielding fruit, too, relieving dependence upon proprietary systems and, counter-intuitively perhaps, improving security.

"Open systems," said Eric Byres, founder of Byres Security, Inc., "are absolutely dominating the market. I'd say it's 90%." No wonder, either. Once a communications protocol reaches a critical mass of users, "the protocols take on lives of their own. You protect yourself from obsolescence." What is more, widespread use guarantees the protocols will be tested by a worldwide community of users determined to break them, like new encryption algorithms. When they discover a defect, the same worldwide community leaps to the defense.

Undoubtedly, the trend toward open communications that promote interoperability is going to continue.

As control system architectures open, a new generation of tools is appearing as well, chief among them the programmable automation controller, a PC-based analog to the familiar PLC. Though *InTech* readers indicated in our survey they expect them to grow in importance, Byres expects the PLC to remain vital for a long while to come and notes they have the advantage of simplicity. "I think the PLC is going to be here for a long time. We're moving as an industry and society toward embedded, special- and single-purpose controllers." He added, "You get a more robust design with single-purpose. It's cheaper, and it's more reliable."

Widespread use of HMI's, and other systems, on the familiar, all-purpose Windows operating system worries Byres: "We go into shop after shop and find the HMI running on Windows, right along with the media player that nobody ever uses." The problem? Media Player is a needless portal between the plant floor and the world outside. "IT departments often don't understand what a control system needs, so they just leave it alone."

New technologies create new job opportunities, and Byres reports a growing demand for engineers trained to navigate the often confusing, frequently testy terrain between the plant floor and the IT cubicles. "I get calls all the time from companies, from the executive level, looking for people who can do that."

Globalizing opportunity

The demand for talent grows every day and, increasingly, it is met offshore. And not merely because that is where it's cheapest, but because that is where it can be found.

According to a report issued in November by Duke University's Fuqua School of Business,*The Globalization of White-Collar Work*:

"No longer is offshoring all about moving jobs elsewhere; increasingly, it's about sourcing talent everywhere. What began with rules-based, 'follow the book,' codified tasks now encompasses procurement, HR, legal services, engineering services, R&D, and product design. And what used to be a tactical labor cost-saving exercise is now a strategic imperative of competing for talent globally. More important, a looming shortage of technically trained talent, such as engineers and computer scientists, in advanced economies will require the ability to source and manage such talent globally."

Meantime, it remains the case that American students are spurning careers in science and engineering. As the National Association of Manufacturers noted in a report issued in February, *U.S. Manufacturing Innovation at Risk*:

"The United States is not keeping up with other countries in insuring a supply of scientific personnel: The portion of doctoral degrees awarded to citizens and permanent residents in the United States in science and engineering is falling, while the combined number of science and engineering graduates in China and India (1 million) now dwarfs those in America (70,000)."

Nor is it only careers in science and engineering that students have rejected. Henrik Christianson, a chemical engineer with Total Petrochemicals, knows all about attempting to find qualified workers. "I was searching close to seven to eight months for an instrumentation engineer, and eventually found a guy in Africa who wanted to come home to this area."

A mining engineer on the West Coast said he's having difficulty filling a maintenance position. "My impression is that kids just aren't going into heavy industry."

"Why would they?" asked industry pundit Jim Pinto. "The factory is a very dull, nasty place." He told the story of a British acquaintance whose son rejected a family history of working at the local steel mill. "My dad works so many hours, he comes home dirty, and I visit his office, and it's awful."

Christianson added, "(young engineers) all want to sit behind a computer console and do nifty programming stuff."

The professional engineering societies, Pinto said, must take the lead to increase the prestige, pay, and working conditions of engineers if the trend is going to be reversed. Today, he said, "we're not motivated."

Demographic time bomb

American kids might not care for the prospect of a career in industry, but technically-minded graduates in the emerging nations aren't nearly so finicky. China and India have invested heavily in educating technicians, engineers, and scientists over the past two decades, with the result that they have legions of willing and able talent just as American students are choosing other careers-and the Boomers begin to clock-out.

The Economist estimated 50% of America's senior technical personnel in manufacturing will retire in the next five years, and 70% of America's manufacturing know-how will walk out the gate for the last time in the next seven years.

Traditional economics predicts how the market will react: The price of talent will be bid-up, inspiring engineers and scientists in fields where there is a surfeit of talent to follow the money. The economic reaction will be felt over the entire world.

Almost certainly, offshoring of engineering work and scientific research is going to continue, and intensify, for the next several years. Even Christianson said it is inevitable. While he would prefer not to offshore engineering work, he expects he'll have to within the foreseeable future.

Our global competition knows that and is pressing its advantages.

A few years ago, Singapore lured Edison Liu, director of Clinical Science at the National Cancer Institute, to its new Genome Institute with a research facility designed to his specifications, and a $25-million start-up budget.

Empire strikes back-sort of

President Bush answered the challenge in his 2006 State of the Union address, with the American Competitiveness Initiative.

"We need to encourage children to take more math and science, and to make sure those courses are rigorous enough to compete with other nations. Tonight, I propose to train 70,000 high school teachers to lead advanced-placement courses in math and science, bring 30,000 math and science professionals to teach in classrooms, and give early help to students who struggle with math, so they have a better chance at good, high-wage jobs."

The initiative contemplates increasing federal expenditures in basic research by $50 billion over the next decade, and providing another $86 billion in research-related tax credits over the same period-happy news for well-positioned scientists and engineers.

The commitment to education per se is much smaller, though, less than $1 billion in 2007, and $790 million of it will go toward grants to students already in college studying science, engineering, or a foreign language.

While acknowledging "the trends are quite bad," Jim Pinto remains upbeat. "America's salvation, benefit, strong point, is an eclectic population that is damned good at reacting when it gets into trouble. America must react, and will react."

Curse of "interesting times"

May you live, goes an ancient curse, in interesting times. We do indeed, and the world is changing in ways felt from the kitchen table to Fortune 500 boardrooms. The automation industry is proceeding along nicely just now, and there's no reason why it can't continue to-but changes are afoot in everything from the technology that shapes our jobs to the inner workings of the Kremlin and European energy stores, and vigilance and steady hands are, increasingly, of the essence.

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Fast Forward

- World oil supplies remain unstable.
- Wireless usage continues its ascendancy throughout the industry.
- Open-systems are taking control.
- Globalization moves forward.
- Boomers getting ready to punch out; who will take the reigns?

InTech survey: Predictive maintenance top technology challenge in 2007

By Gregory Hale

Knowledge is power, and getting ahead in the automation industry is all about knowing what trends are developing in the marketplace.

Along those lines, *InTech* magazine, the flagship publication of ISA, conducted an online survey to learn industry trends.

When it comes to what respondents felt was the biggest technology challenge for 2007, predictive maintenance led the pack with 21%, while 18% said wireless and enterprise interoperability were the next two top challenges.

Looking down the road, wireless weighs in with 25% of survey respondents saying it will be the biggest challenge. Enterprise interoperability came in second with 21%. Respondents must feel they will come up with an answer pretty quickly for predictive maintenance because only 9% said it will be a challenge in five years.

Along the lines of enterprise interoperability, 51% of respondents said they are currently able to communicate through the enterprise to the executive suite, while 49% said they could not.

When it comes to technology, respondents feel the next big technology area will be wireless at 38%, followed by nanotechnology at 33%, RFID at 15%, and biotechnology at 12%.

In terms of the popular PLC and DCS, the world of the programmable automation controller (PAC) seems to be getting larger as 44% of respondents said the PAC has the greatest future.

But the industry is not all about technology. It is also using the correct technology with the correct business plan.

In terms of business challenges for the coming year, the global economy and profitability came in first and third, at 24% and 17% respectively. The area respondents said was the second biggest challenge was the aging out of the work force at 18%.

What is interesting about the aging issue is respondents feel it is important now, but even more important down the road-29% said that would be the biggest business challenge in five years. The second and third challenges in five years are the global economy, 26%, and profitability, 18%.

Other areas that keep users and suppliers up at night are new rules, regulations, and laws.

In a question where respondents could give more than one answer, 56% said new federal regulations will affect them in 2007, 33% said new state regulations going into effect will present challenges, and 26% said officials enforcing older regulations will continue to creep into their lives.

Finally, the ever popular issue of outsourcing continues to be a trend, with 57% saying it will continue for them this coming year. Offshoring, though, will be a continuing trend at 38%, while 62% said it will not continue this year.