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Your key to the latest industrial automation and process control information

Cover Story: The Paradox of Petrobras— what YOU must know about politics in Brasil by David W. Spitzer

Brasil is a country of paradoxes. Its people are overwhelmingly friendly and helpful --- yet crime is a problem. Individuals are creative --- yet they are often locked in a bureaucratic conundrum. Brazilians generally earn low wages and have little or no savings --- yet they are happy. People work hard --- yet things can move slowly. Banks often make it difficult to touch your own money --- yet the well-connected can walk off with billions of dollars.

Brasilia, the capital of Brasil

On a good day, understanding Brasil is not easy. Understanding Brasil in turmoil is downright difficult. Yet that is where Brasil finds itself today --- despite being the "Country of the Future."

Understand that I am partial to Brasil having lived there for a year during the 1970s. I speak fluent Portuguese (really) and still travel to Brasil often. The picture I paint may lead one to believe that the situation is hopeless. To the contrary, nothing could be farther from the truth --- yet another paradox. That said, a general introduction to recent political and economic events will be helpful to begin to understand the scandal surrounding Petrobras.

Let's start with some statistics. Brasil:

- is the 5th largest country in area behind Russia, Canada, China and the USA and is larger than the continental USA
- has the 5th largest population behind China, India, USA and Indonesia
- ranks 7th in natural resources behind Russia, USA, Saudi Arabia, Canada, Iran and China
- has the 7th largest GDP behind USA, China, Japan, Germany, UK and France
- ranks 90th in median age (30.5 years); For reference, Germany and Japan (2nd and 3rd) are 46.1 years while Uganda is last at 15 years
- ranks 60th in per capita income

Given its physical size, population and economic standing, it is no accident that I rarely use the English spelling of its name (Brazil).

These statistics show that the GDP of Brasil is reasonable given its size, population and natural resources. However the per capita income of its people and the average living standard is considerably lower than that of developed countries. The sizable amount of agricultural exports influences the relatively low per capita income. Further industrial development would increase GDP, increase the size of the middle class, and increase per capita income and living standards --- providing more potential purchasers with more buying power. In other words, economic activity (consumption) in Brasil still has room to grow.

Innovation tends to occur in locations that have critical mass and a favorable business

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environment. Innovation in instrumentation and control has primarily emanated from the USA, Europe and Japan where 5, 4 and 2 (respectively) major instrumentation companies are based. The USA, Europe and Japan have historically had large internal markets in which to sell their instruments, manufacturing cultures, and friendly business climates. The BRIC countries (Brasil, Russia, India and China) also have large internal markets that could support development. However development in the BRIC countries has historically been slower due to their less than friendly business climates. Companies located in smaller countries far from the larger markets tend to not develop instrumentation for lack of a ready internal market. Of course, there are exceptions to these generalizations but they are typically isolated.

Improved communication (Internet and telephone), transportation and shipping will enable focused companies far from major markets to design, manufacture and develop instrumentation hardware and software. Brasil is "off the beaten path" and was primarily an agricultural country prior to the late 1950s when President Juscelino Kubitschek shifted the focus of the country to economic development (manufacturing) and started building a new capital (Brasilia) in the middle of nowhere. Since then, Brasil has gradually progressed from only buying/reselling instruments to assembling instruments to manufacturing instruments to developing instruments --- albeit not to the extent of the USA, Europe and Japan.

Former Pres. Fernando Collor de Mello

Economic and political developments in Brasil have been tumultuous over the years since the military relinquished control of the country. In the late 1980s and early 1990s, inflation ravaged the country to the tune of 2-3 percent a **DAY** which resulted in misallocation of resources. President Fernando Collor de Mello shocked the Brazilian economy early in his term (with great pain and questionable results) but was removed from office in 1992 on influence peddling corruption charges involving tens of millions of US dollars. Collor was not convicted on criminal charges, had his political rights restored, and is now a federal Senator. The INSIDER believes that impunity of the well-connected appears to be an underlying theme in Brasil.

Pres. Fernando Henrique Cardoso

President Fernando Henrique Cardoso methodically addressed Brasil's economic problems from 1995 to 2002. A sociologist, professor and politician, President Cardoso attacked inflation, addressed human rights, and privatized major state-owned companies --- importantly including companies that perennially lost money. The INSIDER believes that President Cardoso put Brasil's house back in order to the extent that today (2015) there is an entire generation that has not experienced the ravages of inflation that played out in every day transactions and on the evening news during the 1980s and early 1990s. Further, the INSIDER believes that President Cardoso's accomplishments are not been fully appreciated.

Luiz Inacio Lula da Silva

President Luiz Inacio Lula da Silva took over the Presidency in 2003 having run on a platform of reversing most of President Cardoso's policies. Lula's election caused the Brazilian Real to be become devalued to almost 4 Reals per US dollar. Lula did not change President Cardoso's policies and by 2008 the Real appreciated to almost 1.50 per US dollar making Brasil one of the most expensive places in the world. For reference, the Real is now near 3.20 per US dollar and has not yet reached its 2002 "Lula Effect" peak. The INSIDER opines that Lula effectively rode on President Cardoso's coattails which enabled Brasil to maintain economic growth and prosperity until the 2008 USA financial crisis.

Dilma Rousseff

President Dilma Rousseff took office in 2011 as Lula's handpicked successor. Dilma lacks Lula's charisma and has not been popular to the extent that as many as 1 million people recently marched in the streets and later banged their pots and pans across Brasil to protest the Dilma government and demand decent schools and better health care. The INSIDER opines that Dilma's decision to not speak at the 2014 World Cup ceremonies was primarily due to the risk of being publically humiliated, embarrassed and otherwise ridiculed. You might be amused by the parody of Dilma's actual words in the following YouTube video (with subtitles) --- https://www.youtube.com/watch?v=ZMFX84cZpPM. More protests are planned in August 2015.

Cover Story: The Paradox of Petrobras (continued)

About Petrobras

Petrobras is an oil exploration and production company that was founded by the government of Brasil in 1953. Petrobras ceased being a government-owned monopoly in 1997, expanded into other countries, and became the largest company in Brasil --- at one time (2010) reportedly having a higher market value than Microsoft.

Petrobras is no longer a Brasilian State Enterprise

Scandal embroiling Petrobras began to unravel in late 2012 when VEJA magazine published a report alleging that Petrobras overpaid to purchase an oil refinery in Pasadena, TX where approximately one billion US dollars may have been involved in backroom dealings. Petrobras' market capitalization, profitability and capital expansion plans have been adversely affected by the declining price of oil and the effects of scandal.

Petrobras refinery in Pasadena, TX

Investigation progressively revealed corruption and money laundering schemes where companies doing work for Petrobras would provide money to high-ranking Petrobras managers and politicians in Lula's / Dilma's political party. As best the INSIDER understands (it is complicated), construction companies bid for work at Petrobras with the understanding that a percentage of the money paid for certain portions of the project would be paid to certain people/organizations who would distribute funds to the Petrobras manager and political party. Petrobras managers appear to have pocketed their portion while the political party allegedly distributed their portion to politicians and their campaign organizations. It appears that most (if not all) transactions were in cash and no records were kept.

The complete effect of this on the large automation companies with millions of dollars of contracts with Petrobras is not yet known.

This scheme forced potential contractors to factor these costs into their bids --- effectively defrauding shareholders (including the Brazilian government). Testimony suggested that this practice existed under President Cardoso but became institutionalized under Lula and continued under Dilma. The INSIDER suggests that this scheme existed well prior to President Cardoso --- perhaps in different forms. The INSIDER found that people familiar with doing business in Brasil were not overly surprised about this arrangement. They were however surprised that the total corruption could amount to 10 billion US dollars --- especially in a country where internal movement of money and foreign currency transactions are regulated and monitored for irregularities.

A handful of people testified publically about the corruption but most people involved denied anything ever happened. Of particular interest to the INSIDER is the testimony by a Petrobras manager who felt guilty because he did not really need much money to support his lifestyle. He agreed to give a complete accounting of events and return approximately USD 100 million to the Brazilian government from his foreign accounts. In contemporaneous testimony, the people that allegedly gave him the money denied giving him anything at all. This begs the question --- How did the Petrobras manager accumulate so much money if nothing happened? As such, the INSIDER has about 100 million reasons to believe the testimony of the Petrobras manager.

A number of high-ranking Petrobras managers, politicians and owners of several construction firms (among the largest companies in Brasil) have been arrested. Several politicians have been accused of accepting money. Somehow it does not surprise the INSIDER that the Brazilian government accused Collor (now a Senator) of involvement and confiscated his Ferrari, Lamborghini and Porsche.

In 2005, Dilma was appointed the Minister of Energy after the Mensalão scandal exposed monthly payments to deputies in return for votes favorable to Lula's (and Dilma's) political party. As Minister of Energy, Dilma was a Petrobras director at the time of the Pasadena, TX refinery purchase, voted to approve same, and has denied having any knowledge or involvement in the overpayment. Dilma also denies knowledge or involvement with the scandal involving contractor payments to Petrobras managers and politicians. Lula makes similar denials with his trademark -- *Não sei de nada* (I know nothing). No evidence of their direct involvement has yet surfaced. Accepting their words at face value, the INSIDER questions whether Lula and Dilma are admitting incompetence by not noticing billions of dollars flowing into their

Cover Story: The Paradox of Petrobras (continued)

political coffers, or whether they knew and turned a blind eye, or whether they have not been caught yet.

This story only scratches the surface of the Petrobras scandal. You would "need a scorecard" to keep track of this investigation and its more than a dozen phases (with more to come). What does all of this mean?

One day strike on July 25

Petrobras's unions have been conducting strikes in protest of sales of assets, and especially the legislation to deprive Petrobras of its unique position as sole driller in Brasil's offshore reserves. Some see this as offshore multinationals taking advantage of the crisis to move into Brazil's reserves.

A few months ago, Petrobras stopped and then slowed payments for services after the scandal broke. This caused acute cash flow issues in engineering and construction companies who opted to lay off engineers and other support staff to cut expenses. All of a sudden, droves of good engineers became unemployed. The resultant low demand for engineers is especially frustrating for instrumentation engineers whose services have been in high demand for the last decade or so.

Petrobras rig in the port of Agra, Brasil

What does this mean for automation companies?

The details may be juicy but they (in and of themselves) are not really that important. Brasil is a country of paradoxes --- what seems good may be bad and vice versa. Brasil has always been a country with potential but right now Brasil appears to be experiencing a perfect storm.

A few months ago, Petrobras stopped and then slowed payments for services after the scandal broke. This caused acute cash flow issues in engineering and construction companies who opted to lay off engineers and other support staff to cut expenses.

Past high commodity prices and increased internal consumption resulted in relative economic prosperity, a bloated government budget, and high public worker employment. Now, commodity prices have fallen, Petrobras profits are low, Petrobras capital projects are being delayed or cancelled (adversely affecting purchases and employment), and the government is trying to tighten its belt.

Petrobras is so large and pervasive in Brasil that the already low overall confidence level of the country (due to falling commodity prices and a subsequent economic slowdown) sunk even lower as everyday people now focus on buying necessities, seeing prices rise due to inflation, and watching the unfolding chapters of the Petrobras corruption scandal on the nightly news.

The complete effect of this on the large automation companies with millions of dollars of contracts with Petrobras is not yet known.

The overall Brasilian economy has been flat to shrinking for the last three years. The INSIDER expects more of the same in 2015 and into 2016 which suggests a rise in the hiring of instrumentation engineers in late 2016 which should increase spending for instrumentation in 2017.

Despite its problems, Brasil is weathering the storm and is not a basket case --- even though it is called "The Crisis" on the evening news.

The economy will eventually recover, more people will find employment, and the economy will grow. Given its size, population, raw material wealth, and potential for growth, developing and maintaining a presence and/or investment in the Brasilian market is still a good idea. Brasil just may take a while to rebound.

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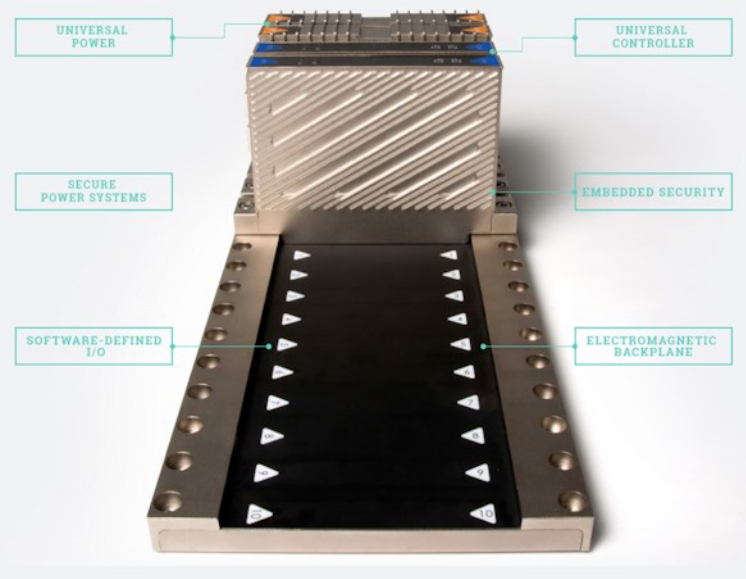
Bedrock Automation Ships First Bedrocks

"PLCs haven't changed much in 20 years," says Dee Brown of Brown Engineers in Little Rock, Ark. "Sure there are a few new communications ports and some programming features, but most of the change has been in driving the prices down. This has created a commodity market in the hardware space and frankly hasn't been too interesting. Bedrock's Open Secure Automation controller changes everything about the PLC space. With the system designed around cyber security from the ground up, that's a game changer." Brown is a system integrator and one of the beta testers for the Bedrock Automation controller, the "Bedrock™".



Bedrock's controller looks very different from other PLC/DCS controllers.

About a year ago, the *INSIDER* started writing about a totally new controller concept that had come from outside the automation industry…from a group of Silicon Valley engineers at Maxim Integrated, a large semiconductor manufacturing firm. It turned out that several of the team had some automation background, particularly Albert Rooyakkers, CTO of Bedrock, who was one of the developers of the IA-Mesh at Foxboro a generation ago. Rooyakkers has been working on the mesh concepts he pioneered ever since.

Bedrock CTO Albert Rooyakkers

Like Inductive Automation and several other "new" automation companies, Bedrock Automation is a destabilizing actor. Their intent is to shake up the market, and if the reaction to their first set of products is any example, they've done their job well.

Bedrock's controller is the first new control system to be completely designed from the blank sheet of paper out.

Chris McLaughlin, Vertech

"Bedrock is the first unique platform to enter the control market in the last 15 years. It diverges radically from the typical platforms and is superior in terms of processing power, redundancy, scalability, security and cost efficiency. We plan to use it as a point of differentiation for our business," says Chris McLaughlin at CSIA integrator firm Vertech Industrial Systems.

Just how radical is the divergence? It starts with the backplane. Drawing on Rooyakkers' years of mesh networking expertise, Bedrock delivers I/O, power and communications across the pin-less electromagnetic backplane with a parallel architecture that supports ultra fast scan times regardless of I/O count. The removal of I/O pins improves reliability and increases cyber security while forming a galvanic isolation barrier for every I/O channel. This massively innovative backplane also allows installation of I/O modules in any orientation and location for unprecedented flexibility in I/O and cable management. Additional cyber security layers include:

- A real-time operating system with the highest safety (SIL 4) and security (EAL6+) rating of any RTOS available today
- Cyber secure microcontrollers with encrypted keys and TRNG embedded in all system modules, including the controller, power supply, and I/O
- All modules encased in anti-tamper metal that is impenetrable without metal cutting tools

Authentication extending throughout the supply chain, including third party software and applications

Even the power supply is encrypted for cyber security.

Dee Brown, Brown Engineers

Okay, so it is cool. But what do the users say?

Dee Brown, who has started to use the Bedrock in his proposals, says, "My first conversation was from a manager of a city-owned utility of electric, water, and sewer service and he said, 'Yes, we need that. The government is only going to get more stringent with regulations to protect the grid.' So we are budgeting Bedrock controllers for all of his substations right now. Every utility manager and board member is

Bedrock Ships Bedrocks (continued)

going to want this product so they can assure the citizens that they have taken every precaution to protect their infrastructure; water, sewer, electric grid, industrial, and so on."

According to Kris Grindstaff, a senior integrator with Vertech, the most important features of the Bedrock are, "The Black Fabric connection between the IO cards and the backplane. No connectors or pins to get bent or damaged is a real plus. I also was interested to see the built in security and encryption in the system. It was built with security in mind instead of added later."

ARC's O'Brien

According to ARC's Larry O'Brien, "Adding so many layers of protection to a conventional DCS, SCADA RTU, PAC, or PLC would add cost and complexity and degrade performance. With Bedrock, they were built in from the start."

> "The weakest feature is the lack of a 20-year installation base. I guess all the major controllers had to be new at some point. I am comforted by the 3 years of testing that Bedrock has done, and by the robust quality of the product." — Chris McLaughlin

O'Brien goes on to say that Bedrock supplies, "A secure universal controller reportedly is so powerful it can run virtually every conceivable application independent of size or control task: discrete, batch, continuous, or multivariable control from one device that supports as few as ten, to as many as thousands of I/O points. No longer are separate programmable logic controllers (PLC) and distributed control systems (DCS) required."

Talk about destabilizing! It was fascinating to watch, at the ARC Conference in Orlando this past February, as the M&A executives from all of the major automation companies walked by, drooling on the Bedrock designs. There have been some negative comments in some forums, but the system exhibits such excellent design values that there really hasn't been a lot to complain about, and there won't be until after there are some Bedrock systems installed for a while.

Does the actual controller once received match the marketing hype? Chris McLaughlin says yes. "The product is real, and I don't believe that it has been overhyped. The Black Fabric backplane, virtual marshalling, universal power supplies, and integrated OPC-UA server are all revolutionary features. The product is built rock-solid and you can feel the quality of the manufacturing. All of our engineers were impressed by the processing speed. Well done Bedrock."

Grindstaff notes, "I would say the strongest feature would be the processing power and built in security. I also like that the processor itself can be an OPC UA server. Without actually using the controller in a real project it is hard to say what the weakest feature would be. I would say of the entire system I find the programming software to be the weakest."

McLaughlin says, "The weakest feature is the lack of a 20-year installation base. I guess all the major controllers had to be new at some point. I am comforted by the 3 years of testing that Bedrock has done, and by the robust quality of the product."

Bedrock says their pricing is competitive with other systems of the same quality and specifications. The controller is selling for approximately $20,000.00. Dee Brown notes, "The only complaint people might make is the initial price, but that all depends on your perspective and what kind of hardware you have been purchasing. If you look at a comparable controller for speed, I/O, and control power, you will find that the price is very competitive. But the best part is you get the cyber security features as well."

The biggest negative, according to the users, is the programming software. In order to get the product to market, and operate in a standards-based framework, Rooyakkers and his team decided early on that they would use standard, commercially available programming software (CoDeSys) and a commercially available HMI/SCADA package (Inductive Automation's *Ignition* product). McLaughlin says, "Our engineers are comparing the CoDeSys programming software to programming environments that have gone through 20 years of updates and improvements. Everyone on our staff agreed that CoDeSys is fine and they will not have problems completing a project. On the other hand, there are some bells and whistles that they would like to see added to the software."

What makes Bedrock important, beyond just the product itself, is the fact that a company was able to move into the automation industry and in three years become a force to be reckoned with. This is not the only time we should expect to see this in the future.
We can expect many more such destabilizing actors to enter the market, and we can expect them to produce significant changes, and to force the major automation players to make changes, in design, in construction, in quality, in service— in short, in just about every area. Customers can really expect to see suppliers turning backflips as the destabilizing actors affect their business.

Smart Manufacturing Picks Up Steam

During the Smart Manufacturing Leadership Coalition Board Meeting (disclosure, Spitzer and Boyes LLC is a member company of the Coalition, and Walt Boyes sits on the Board), it became clear that the concepts the SMLC has been working on are becoming mainstream in the manufacturing enterprises.

General Mills' Jim Wetzel

Chair Jim Wetzel, of General Mills, hosted the meeting, and presented a clear discussion of why General Mills wants to make smart manufacturing work, and why they've loaned Wetzel to SMLC. "We have to do this in order to stay competitive," he said. His presentation was, "Smart Manufacturing and Why Do I Care?" His comment was, "How we got here, won't get us there."

UT's Edgar

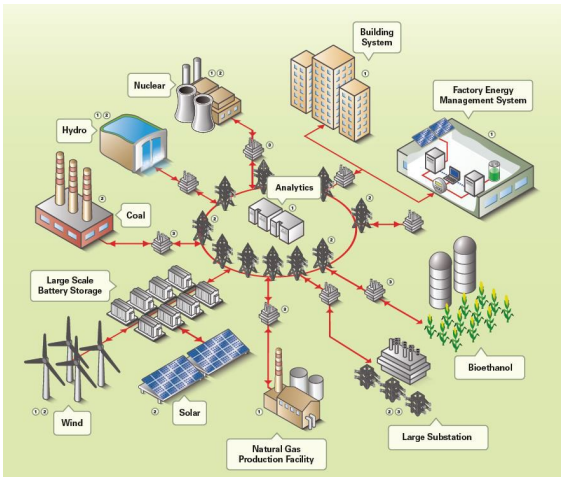
UCLA's Davis

There were discussions of all the activities SMLC is involved in, from the Smart Manufacturing Leadership Act, pending in Congress, to an update on the DOE project SMLC is working on with DOE's Advanced Manufacturing Office. This is a project where Praxair and General Dynamics have provided test beds to work with smart manufacturing concepts. Dr. Tom Edgar, of the University of Texas, provided the update on the peer review of the project, and Larry Megan of Praxair and Steve Cannizzaro of General Dynamics reported on their results at their test beds. Dr. Jim Davis, CTO of UCLA, and Robert Graybill of Nimbis Services reported on the design of the smart manufacturing platform itself.

Several SMLC member companies reported on their test bed use case development work. Michelle Pastel of Corning spoke about *Extending our Capabilities and Competitive Advantage with Smart Manufacturing."* From Pfizer, Mojgan Moshgbar spoke about an *"Intelligent Dryer App in Single Chip"* while Phil Nixon, also from Pfizer, talked about *"Modernizing Pharma Design through Commercial Manufacturing: Computational & Data Infrastructure,"* Chad Farshman of Owens Corning talked of their need to *"Perform & Control Visual Quality Inspections Online and in Real-Time,"* and Alcoa's Anne Clawson talked about their work in *"Workflow Based Advanced Analytics."* PDFs of Powerpoint slides are available to SMLC members.

The SMLC Board was given a presentation by Dr. Richard Mark Sloley, executive director of the Industrial Internet Consortium, a group of more than 75 companies who have banded together to make the vision of the Industrial Internet of Things a reality. Sloley said, "I want to make clear how much IIC wants to work with SMLC." Sloley has been in the forefront of all the computing revolutions in the past thirty or so years, and while he's not afraid to name-drop shamelessly, he has the chops to get away with it. Quite a few of the SMLC member companies are also members of the Industrial Internet Consortium, and it looks like SMLC and IIC fit well together.

IIC's Sloley



IIC's Communication and Control Testbed

The IIC has just issued a Reference Architecture document, and a Vocabulary and Technical Report, which are available from the IIC. They are also working, with Cisco, RTI and National Instruments, on a communication and control testbed.

Smart manufacturing and SMLC are definitely picking up steam.

Nick Denbow's Roundup:

Krohne has new pressure transmitters

Krohne from Germany has expanded its sensor offering by introducing a complete range of pressure and DP measurement transmitters, to be known as the Optibar range.

New Krohne Optibar

Krohne has been working on developing its own pressure portfolio since 2012, which is when they launched their first compact pressure transmitter. Launched this summer at the ACHEMA exhibition in Europe, the complete range was introduced, including a capacitive measuring cell with a ceramic face for up to 100 bar, and a metallic measuring cell with fully welded process connections for up to 1000 bar. For high temperature (over 450C) or highly corrosive applications, diaphragm seal systems are available. The differential pressure (DP) transmitter uses a completely newly developed piezo-resistive DP measuring device, to provide not only the exact differential pressure, but also simultaneously measuring the static pressure in the process line (it also monitors the temperature). The sensor can be used for either flow, level or process pressure applications, up to 420 bar/6091 psi. The smallest measuring span is 10mbar, and a fast response time of below 85msec is standard. Krohne is also offering a portfolio of primary flow elements such as averaging Pitot tubes, and wet calibrated meter runs.

Returning to the Krohne interest in tank level measurement, pressure sensors for hydrostatic pressure monitoring include submersible types, as well as a large portfolio of process connections, including those for hygienic applications. Despite the different technologies, Krohne says the units are modular in concept and share interchangeable housings (plastic, aluminium, stainless steel and hygienic electro-polished stainless steel), electronics, display and adjustment modules. Communications options include Hart 7 / Hart SIL2 or 3; Foundation fieldbus, or Profibus PA; intrinsically safe or explosion-proof models are quoted. There was no mention of any wireless interfaces, or any Profinet communications, in the initial press information.

Bauer IE4 motors for hazardous duty

Bauer Gear Motor GmbH have replaced some ATEX approved explosion-proof gear motors on mixing vessels in a Zone 1 hazardous area with new IE4-rated Permanent Magnet Synchronous Motors (PMSM), operated via inverters, to provide improved energy efficiency, and better control. The new Bauer units, supplied to an oleochemical processor, resulted in significant savings in the initial purchase price of the gear motors, as well as greatly reduced running costs.

The success of this project demonstrates how by offering their competent engineering expertise, Bauer managed to offer a significantly new system using a more modern approach. Markus Kutny, Product Manager for Energy Efficiency Solutions at Bauer Gear Motor, explains: "In today's market energy efficiency has to be one of the key determining factors when specifying geared motor solutions. Energy prices are only going to go one way so it is important that a drive's lifelong running costs are considered; rather than simply the cost of procurement. We have developed the new motor range in anticipation of the new IE4 classification and to offer our customers the very best in terms of efficiency."

Bauer motor installed on plant

"It is well known that electrical motors use 65% of the energy used in industry, but a lesser known fact is that 96% of the lifetime costs of an electric motor is associated with the energy consumption. This shows the importance of the overall efficiency compared to the initial purchase cost in the terms of the total cost of ownership. The design of modern drive trains requires specialist knowledge and expertise in order to produce a product which will deliver efficiency, smoothness and low noise qualities as well as excellent reliability. However, further benefits of a good design can be gained by ensuring the drive train is properly integrated into the application."

The original asynchronous motors (ASM) installed in the oleochemical process were designated as Exd (explosion-proof) and suitable for operation in Zone 1. A detailed survey by Bauer engineers concluded that the new equipment could be rated to the modern Exe (increased-safety) level, while still meeting the necessary requirements for Zone 1 operation.

Cutaway of Bauer PMSM motor

PMSM motors employ a highly efficient rotor design that integrates embedded rare-earth permanent magnets, in place of the squirrel-cage rotor found in most low voltage induction motors. The PMSM offers a number of key benefits, including reduced heat losses from the rotor (by 100%), re-

Nick Denbow's Roundup (continued)

duced total losses by approximately 25%, and increased total efficiency by 10% or more, compared to the most efficient conventional motors. The BG series helical geared motors offer torque values of up to 18,500 Nm with high output speeds, and can easily be integrated with an inverter, such as the Danfoss FC-302, to give speed control through the mixing process.

Bauer expertise enabled their chemical processing industry customer to avoid the price premiums and operating costs normally associated with motors designed to operate in ATEX Zoned environments, and avoided any need for them to compromise on energy efficiency.

InnoRobo in Lyon

The European international robotics conference, InnoRobo, was held for the 5th time in Lyon, France, from 1-3 July: over 350 speakers from around the world came to showcase their technologies, and see new developments. The press report said that the July date had the effect of reducing the number of general public visitors, so that total numbers were reduced from 15,000 to 10,000, but that next year the event would be rescheduled for May/June. From an editor's point of view, attracting 50% more general public visitors would not seem to be particularly useful, although it might increase the organizer's revenue. A report on InnoRobo 2014, held in March, was given in the INSIDER of April 2014 – the visitors plus the internet controlled robots wandering around the narrow alleyways and even talking to each other made any progress around the 2014 show difficult!

InnoRobo 2015 in Lyon France

However, one aspect of the show is an interesting initiative, and presumably very relevant in such a mushrooming industry. InnoRobo gives prominence to start-ups, as they "bring the innovations destined to upend traditional markets and need industrial partners and funding providers to deliver on their promise". In advance of the meeting, a call for start-up companies encourages young companies from all over the world to send in their ideas and proposals for a robot business development. The best five chosen by a panel of relevant robotics business 'experts' then are given time to present their project or prototype to the audience plus an international panel of high-tech investors who are visiting InnoRobo. In fact they received 59 proposals, from 21 countries: 25 of these were chosen to be presented to the first vetting panel, and then 5 finalists chosen. Of these five, one involved a novel strain gauge system being used on robot joints, and another was for the development of drones which bounce off obstructions, mimicking the behaviour of a fly. A listing of all the other proposals can be seen on the start-up section of the InnoRobo website. InnoRobo also endeavours to present visionary experts as speakers, to invite the audience to take part in workshops on the potential social transformations this technological progress holds in store, and to create the

Display at InnoRobo

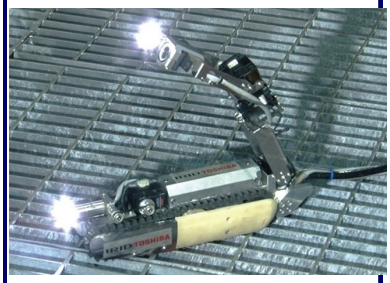
Exhauss's Exoskeleton "sort of like Iron Man."

A Scorpion for Fukushima

A recent report in the UK journal "The Engineer" described a robot developed by Toshiba from off-the-shelf type components to make the first visual inspection of the inside of the stricken Fukushima Daiichi nuclear plant.

It is designed like a scorpion, having lights and a camera on the top of a tail that can be raised up, once the robot has been inserted down a 10cms diameter pipe inserted into the interior of the primary containment vessel (PCV) of Unit 2 of the plant, which was damaged by a hydrogen explosion during the initial crisis.

The robot will be used to determine the location and positioning of fallen objects and fuel debris, if any, and conditions along access routes to the PCV base, in preparation for further investigations.



The unit has a radiation dosimeter and a thermometer, and will be powered via the trailing communications cable.

Once the robot reaches a point near the centre of the PCV, the operator will raise the rear section, like the tail of a scorpion, and video the interior. The robot is designed to be self righting, and to operate for 10 hours in an environment with a radiation dose rate of 100 Sv/h.

Nick Denbow's Roundup (continued)

opportunity for informal meetings that will lead to collaboration and discussions on a longer-term vision. Within this there were representatives from the world's foremost national federations and robotics clusters, of which there are many, in attendance at InnoRobo, who presented analyses of their strengths and weaknesses in robotics.

Profibus and Profinet

Procentec is an independent company, which started twenty years ago in The Netherlands, and then quickly established a major sales/ support office in Germany. Recently they have moved their HQ into a new, larger facility in Wateringen (in The Netherlands). It is perhaps necessary to explain their background, as a "knowledge partner in the field of Profibus and Profinet", which has to be extracted from their website:

"Procentec concentrates all its products and services on Profibus and Profinet technology, developing products and services aimed at optimising industrial automation networks for industrial customers. In addition, Procentec is the internationally accredited Competence and Training Centre for Profibus and Profinet, organizing training courses that help employees to optimally deploy these technical systems for their operational objectives. In addition, Procentec offers end users the necessary technical and field support during implementation, certification, audits and technical faults.

With ProfiTrace, they claim to be the leading manufacturer of mobile Profibus troubleshooting and maintenance tools. Another product, the ProfiHub, provides the most reliable network infrastructure on the market today, alongside their ComBricks interface modules. The combination of these products has enabled them to become the primary manufacturer of network components with integrated capabilities for remote monitoring and asset management."

So that is their profile: it should also be said that like Profibus and Profinet, they have adopted the annoying habit of always using their name written in capital letters, which makes a nightmare when trying to create a readable report.

Company activity

Procentec have been ever-present at Profibus meetings and training courses in Europe, and are always available for field support and investigations to sort out customer networks that might not be working properly. This is why they have developed several network monitoring tools, to identify performance problems. They also supply these tools to other trained independent Profibus consultants, which are usually members of individual Profibus country associations.

Pieter Barendrecht, new MD

Last month Procentec promoted Pieter Barendrecht from COO to Managing Director. Barendrecht confirmed the company direction as: "Procentec will continue to innovate and develop without losing focus on the reason of our existence: our customers" - based on their product portfolio, training and support services.

A recent application story at Barwon Water in Victoria, Australia, illustrates what is probably a common profile for Procentec operations. The Barwon sludge drying facility uses Profibus for the entire production process, with a combination of Profibus DP and PA, fibre optics and DP-DP couplers. After a few years of operation, interruptions to control had become common, and to get the system back to top performance Barwon called in the Procentec local agent, Pentair PICC. After a few hours monitoring with ProfiTrace, the problem area was identified. To recover the system, Procentec ProfiHubs were installed on the Profibus DP network, with critical devices isolated on separate segments to achieve galvanic power surge isolation, isolated spur lines maintenance, and reduced potential junction failure: some damaged connections were replaced. Also the network baud rate was decreased to 500kb/sec, to allow for the increased cable lengths in use. The network performance is now significantly improved: in fact it is robust and stable.

Procentec in Italy

In July, Procentec announced plans to develop operations in Italy, which were initiated by the growth of the Italian industrial automation market, the second largest in Europe at Euro4Bn, growing at 5% pa. "From the new office, located in Brescia, in Northern Italy, Procentec will offer its Italian customers innovative, tailor-made solutions to allow them to operate successfully in the field of industrial automation", commented Evelyn Mario, the new MD of Procentec Srl.

PI Chair Karsten Schneider

UK Profibus and Profinet Conference

In June the UK Profibus and Profinet user's conference was held at Stratford-on-Avon, and conference organizer Bob Squirrell reported it as another success, despite his being taken ill for the actu-

Nick Denbow's Roundup (continued)

al event! Karsten Schneider, PI Chairman, in his comments reported in the April *INSIDER*, laid great emphasis on the growth and potential for Profinet. This was reflected in the papers presented at the UK conference. Bob Squirrell comments:

"The conference was very much a success with a wide range of presentations covering Profibus and Profinet in depth, with Profinet very much to the forefront with presentations covering Profinet for machine builders, Profinet and Proficloud for Industry 4.0 and the Industrial Internet of Things (IIoT), and 'Profibus and Profinet a Perfect Match made in Karlsruhe' presented by James Powell, author of the instructive book 'Catching the Process Fieldbus'. The Profinet and process industry theme was also present in the hands-on workshops that ran alongside the main conference, where one stream of lectures addressed how to use Profinet in the process industries."

James Powell

James Powell, from Siemens Canada, gave a presentation that highlighted the parallels between how an engineer works with a device, and adds it to a Profibus network, and how the engineer would add a similar device to a Profinet network. Because the two are being developed from the same PI organization, the two protocols have been brought together with similar procedures, communication priorities, data maps, grounding rules and troubleshooting. A subsequent press release from PI has announced that the Profibus PA Profile V3.02 is to be usable in Profinet systems as well as in Profibus systems. The revised profile version is thus being specified independent of the physical layer, thereby producing a device profile that can be used uniformly in Profibus and Profinet systems. The press release goes on to say "As the final step, it is now important to develop a solution so that Profinet devices can also be made available for use in hazardous areas and in two-wire technology for power supply via the cable. In the planning stage for this is a physical layer for Ethernet-based communication that will enable integrated Ethernet communication on an individual protocol."

From Profibus to Profinet

Interestingly, the Siemens website has a page that encourages all their Profibus customers to consider changing to Profinet now – as most of them are not in hazardous areas, presumably. They comment that "Profibus has been established for years as the fieldbus for machines and plants. Based on serial bus technology, it revolutionized the automation world in the 80s, and created for the first time the foundation for the distributed concepts common today. In the 90s, Ethernet spread into IT and industry. Today, manufacturing is inconceivable without both systems. But would it not be more efficient to combine the advantages of both systems? ..... The answer to this question is Profinet. It merges the industrial experience of Profibus with the openness and flexible options of Ethernet".

Roger Marlow, WIMES

Just out of interest, let's go back to the UK Profibus and Profinet conference. There was another presentation, from Roger Marlow, of WIMES (Water Industry Mechanical & Electrical Specifications – in the UK that is), explaining "The specification and use of Profibus networks in the UK water industry". The WIMES project is a Pump Centre technical project, whose main objective is to generate and manage mechanical and electrical specifications for the UK water industry. It has been running for almost 20 years and there are now around 65 WIMES available, covering a wide range of equipment, from relatively simple machinery items, such as pumps and motors, to complex items of packaged plant. A comprehensive list of the WIMES and associated resources can be found on the Pump Centre website (www.pumpcentre.com).

Basically the WIMES users decided en bloc that they wanted Intelligent Motor Control Centres to control their pumping systems, all with a similar architecture, using Ethernet TCP/IP optical fibre networks between PLCs and PLCs and HMIs, plus Profibus DP/PA or DeviceNet networks between PLCs and devices. Profibus was then chosen as the majority preferred solution, as it was established, and "future-proof". Then the preferred type of intelligent motor starter was the Siemens Simocode or Simocode Pro-V. Most of the users follow this, which uses Profibus. Maybe all these sewage plants and pumping stations will upgrade to Profinet now!

Schneider and Aveva

Presumably now having interrogated and part digested Invensys, Schneider Electric continues to expand in industrial software with a new deal with the UK-based Aveva Group. According to Schneider Electric, Schneider has reached a 'non-binding agreement' on the key terms and conditions for a combination of selected Schneider Electric software assets and the Aveva company, to form an 'Enlarged Aveva Group' – of which Schneider will have a 53.5% majority stake. This will be as a result of a cash payment by Schneider, in exchange for new shares to be issued in the enlarged Aveva Group.

The Schneider aim is said to be to create a global leader in industrial software, with a portfolio of asset management solutions, from design and build to operations, with both scale and a distinct market position - to address critical customer require-

Nick Denbow's Roundup (continued)

ments along the full asset life cycle in key industrial and infrastructure markets.

Aveva CEO Richard Longdon

The Schneider/Invensys business areas involved in this deal are quoted as SimSci, Wonderware, and Avantis: the relevant Aveva brands are listed as PDMS, Everything3D, and Aveva.NET.

This is then quoted to potentially "enable the enlarged Aveva Group to better navigate specific cycles by the digital asset lifecycle through process simulation, detailed 3D design, asset data management, operations management and asset performance management for large, complex engineering projects in the process and plant industries".

The Aveva view

In the conference call by Aveva, the only info available from them, CEO Richard Longdon said the deal was an acquisition by Aveva of the Schneider Electric industrial software assets, plus those of the original Invensys Group, to create a global leader, doubling the size of Aveva to GBP534m (£830m) sales, and covering all aspects of the digital asset lifecycle. EBITA would be around GBP130m ($200m).

For Aveva, the deal will open up US markets: currently their business is mainly focused on Europe and Asia.

The FT report says Aveva thinks that it is remaining independent, after the 53%+ acquisition of its shares by Schneider.

The analysts' views

Most analysts see the deal from the same perspective: the rumours had been that **Emerson, GE** and **Siemens** were measuring up Aveva for acquisition, and that this is a lifeline for - and reverse take-over of - Aveva, who have been hit hard by the current turndown in oil and gas industry spending, a sector that accounts for 45% of their sales. Demand for Aveva services has also softened in SE Asia and South Korea. So the shares were looking very low.

But because the deal is in the preliminary stages, it is possible the announcement just sets the base price, and there could still be a rival takeover bid made for Aveva: obviously this is without the benefit of the Invensys bits. The current shareholders would need some persuading, after such a pitch, and the resulting share price hike of 28%, with a deal offering a total of 57%.

For current management and shareholders the deal is good: Schneider will not make any further moves or sack the current board for two years. In addition they get a different UK software management group to try to make sense of the Invensys software businesses. Current shareholders will receive GBP8.55 ($13) per share in cash.

Bloomberg commented that "Aveva is one of Britain's digital-age success stories, which also include chipmakers CSR plc and ARM Holdings plc, that have their origins in Cambridge, home of the university that produced scientists from Charles Darwin to Stephen Hawking" (and Nick Denbow). Aveva was developed in a government-funded computer center in 1967, and introduced the world's first 3D plant design system in 1976.

The FT also reports that there will be an 18 month period in which Schneider cannot increase its shareholding in Aveva to above 75%, without board approval, or by making a general offer for the company worth more than 20% of the enlarged group's share price.

It is certainly not clear whether Aveva has absorbed Schneider's Industrial Software companies, or whether they have started to swallow Aveva. What IS clear is that this deal has taken all of them off the acquisition table for at least 18 months. Unless, of course, it hasn't.

Maybe the enlarged Aveva should be called something different – how about Invensys Software?

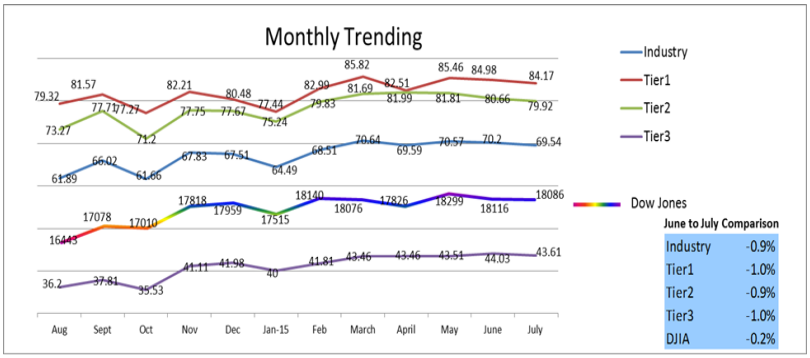
Nick Denbow is European Editor of the Industrial Automation and Process Control INSIDER. He has had a long career in PR and Marketing in the Automation Industry, and blogs regularly at "Nick Denbow's Industrial Automation Insider Blog" http://www.nickdenbow.com.

Is the Roller Coaster Ride Just About Over?

INSIDER
INDUSTRIAL AUTOMATION & PROCESS CONTROL

Health Watch

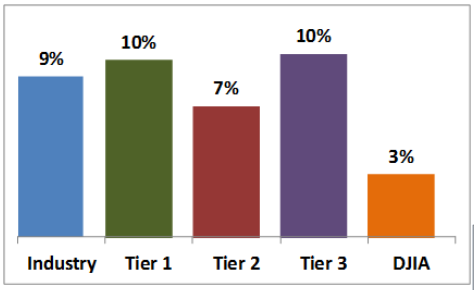
By Mary Samuelson



Like June, July numbers reflect minimal movement for the ACI Index or the Dow. While the month over month change is negative in all instances, the amount of change is again small. The industry as a whole dropped less than 1%, with individual Tiers showing a drop of .9% to 1%.

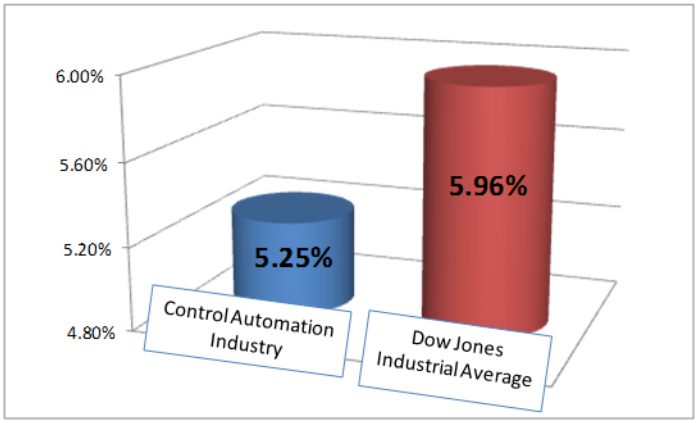
The Dow performed slightly better than the Index both overall and compared to individual Tiers, but again the difference is less than 1%. Dare we hope that the roller coaster ride is almost over?

Last month, we took a look at June compared to January, and saw that for that time period, the average stock price for all levels of the ACI had moved in a positive direction and all Tiers had outperformed the Dow by at least 4%.



The industry as a whole beat the Dow by 6% for that time period with Tier 1 and Tier 3 companies ahead by 7%. Good news and a positive sign of improvement, but full recovery, unfortunately, is still a ways away.

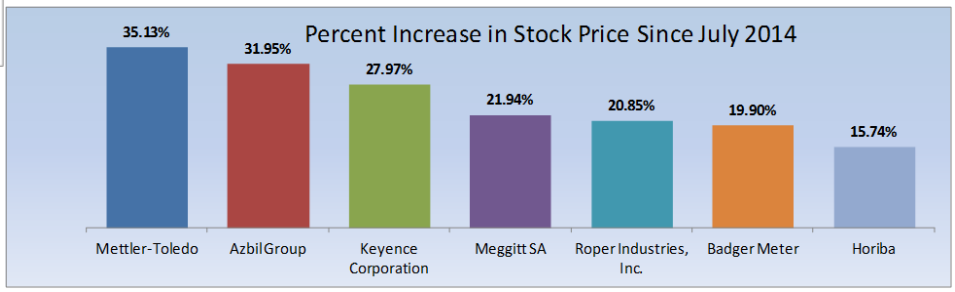
Looking at year over year comparisons, the Automation Control Index has shown an increase since 2014, but lags behind the Dow by almost ¾ of a percent.



The overall picture for the ACI may be less than stellar, but some companies have managed to thrive in spite of the challenges that have plagued our industry over the past several quarters. While the chart below is not all inclusive, it shows that some ACI companies have performed extremely well over the past year.

Mettler-Toledo's stock price increased over 35% in the past year. With a strong focus on areas such as food retailing which includes the installation of comprehensive solutions that collect data and integrate readily with existing IT infrastructures; medical applications where data generated by instruments can be analyzed and managed in Mettler-Toledo's application-specific software and interface with customers' information systems; and industrial solutions which optimize operations through use of automated processes and integrate directly into customers' existing ERP systems, Mettler-Toledo is strongly positioned for continued success.

Azbil Group also performed extremely well year over year, with a stock price increase of almost 32%. While Azbil is

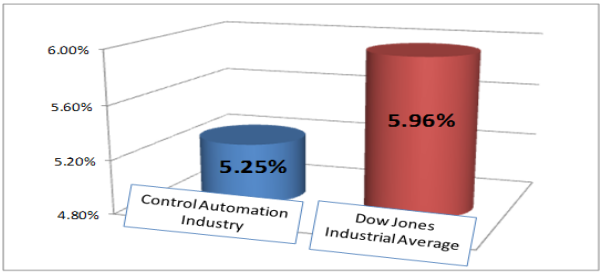


Is the Roller Coaster Ride Just About Over? (continued)

INSIDER
INDUSTRIAL AUTOMATION & PROCESS CONTROL

Health Watch

By Mary Samuelson



loosely associated with the gas and oil industry, Building Automation, Advanced Automation, and Life Automation are its primary divisions, with a strong presence in pulp and paper, iron and steel industries, public utilities, waste water, and environmental monitoring systems.

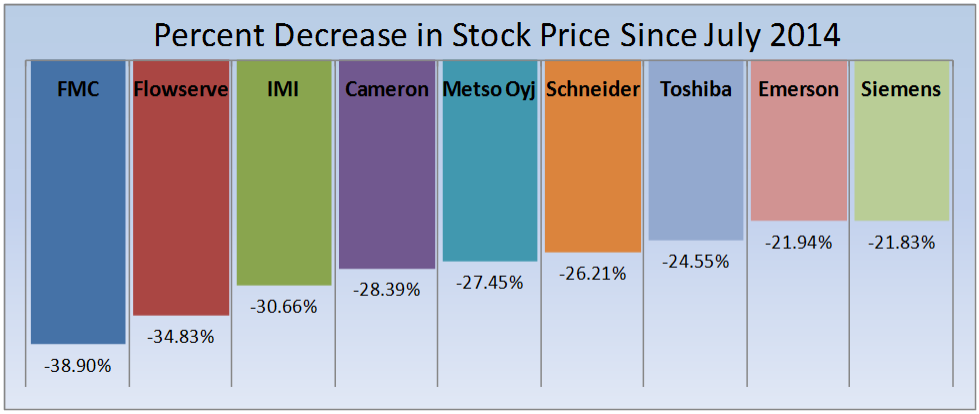
Keyence Corporation stock increased 28% since July of last year, not surprising with net income up 27% and sales up 21% at last reporting. Keyence, a major player in the sensor market, provides sensors to 200,000 customers in over 100 different countries. Keyence Corporate Profile makes the following statement:

> *Sensors, found in millions of applications, provide the positioning information essential for factory automation. There could be no automation of assembly lines without sensors. Keyence has consistently aided the automation revolution by developing superior sensor solutions.*

Meggitt, Roper Industries, Badger Meter, and Horiba also performed very well, and while most of these specific companies were not heavily affected by the challenges associated with the oil industry, many of them struggled against adverse economic conditions and devalued currency issues. Congratulations to each of them for their outstanding performance in a very tough economy.

At the other end of the spectrum are the companies that did not fare so well. The following chart, again not all-inclusive, shows some of the specific companies who have not yet regained their July 2014 stock price level.

FMC stock is down 39% compared to July 2014 figures. Heavily vested in the oil and gas industry, FMC is struggling to keep its head above water, and the Subsea Technologies Division is the only division that is performing even marginally well. According to second-quarter 2015 results released after close of the trading session on Tuesday, July 21, 2015:



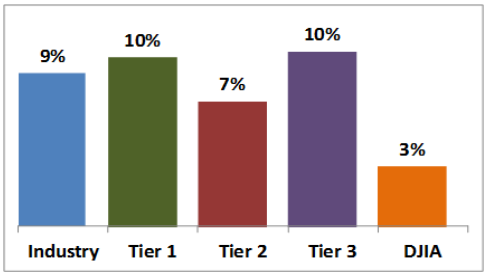
> *Subsea Technologies second quarter revenue was $1.2 billion, down 7 percent from the prior-year quarter due to the strength of the U.S. dollar. Excluding the impact of foreign currency translation, total revenue increased by $62.2 million year-over-year. Subsea Technologies operating profit decreased 5 percent from the prior-year quarter to $183.5 million, primarily due to the decrease in revenue and $5.4 million of business restructuring costs. Excluding the impact of foreign currency translation, total operating profit increased by $15.3 million year-over-year.*

Other FMC divisions performed considerably more poorly than Subsea Technologies. Surface Technologies second quarter revenue decreased by 29% compared to the prior year quarter, with orders down 39%. Energy Infrastructure also performed badly, with operating profit down by 71% and revenue down by 32%.

Flowserve is also struggling, with its NYSE stock price down 35% compared to July 2014. In February of this year, Tom Pajonas, Executive VP and CEO of Flowserve made the following statement:

Is the Roller Coaster Ride Just About Over?

... continued...



The recent decline in crude oil price has challenged certain oil and gas projects, but Flowserve's approximate 40 percent oil and gas exposure predominantly services existing infrastructure in the mid- and downstream. With roughly 80 percent of our total revenues focused on existing facilities and their respective maintenance budgets, we believe Flowserve will be less impacted than others might perceive due to the recently announced upstream-focused capital spending reductions and project delays.

As the industry works toward recovery, it would not be at all surprising and is in fact expected, that we will begin to see mergers and acquisitions in the near future.

Flowserve plans to release its 2nd Quarter earnings release on Friday, July 31, 2015.

It will be interesting to see if Mr. Pajonas' prediction about Flowserve being less impacted than others holds true, because based on the performance of Flowserve stock over the past year, the market evidently does not share his optimism.

Cameron International, down 28% compared to July of last year and also heavily vested in the oil industry, has received some positive encouragement recently. Zacks Equity Research and RBC Capital both reported positives concerning Cameron stock based on a variety of factors including an $8.8 billion backlog and recent One Subsea contract wins.

On July 8, Zacks reported that, "The company [Cameron International] has a diversified product portfolio, specialty service capabilities, strong order backlog and proprietary technological expertise. This is reflected in Cameron's current Zacks Rank #2 (Buy), which implies that the stock will outperform the broader U.S. equity market over the next one to three months."

On July 10, 2015, RBC Capital upgraded Cameron International Corp, and raised the target price from $55 to $65. The analyst, Kurt Hallead, believes that the "Surface and Subsea

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Health Watch

By Mary Samuelson

The *INSIDER* Health Watch(tm) is written by Mary Samuelson, Quantitative Research Practice Lead at Spitzer and Boyes, LLC.

Ms. Samuelson was director of research at Maritz Research, and vice president at Rockhopper Research, and a Senior Project Manager with The Right Brain People.

"The Health Watch shows what we are capable of, in quantitative research, at Spitzer and Boyes, LLC.," she said. "If you are looking for research that is different from the kind you get from the usual suspects, give us a call."

Spitzer and Boyes, LLC has a complete qualitative and quantitative research capability, focused on the automation industries. For more information, contact Walt Boyes at waltboyes@spitzerandboyes.com.

The *INSIDER* Health Watch™ is available for license to use in other publications. If you are interested in doing that, please let Walt Boyes know.

Mary Samuelson is available for speaking engagements about the Health Watch™ and other quantitative marketing issues. Contact Walt Boyes for details at waltboyes@spitzerandboyes.com.

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INDUSTRIAL AUTOMATION & PROCESS CONTROL

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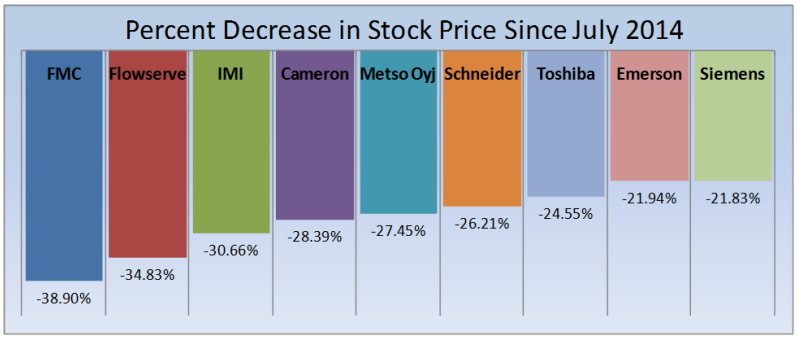
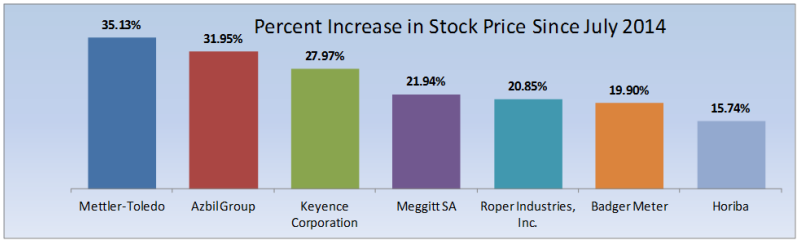
Is the Roller Coaster Ride Just About Over? (continued)





Among the primary strengths of the company is its solid financial position based on a variety of debt and liquidity measures that we have evaluated.

At the same time, however, we also find weaknesses including a generally disappointing performance in the stock itself, unimpressive growth in net income and disappointing return on equity." [Emphasis mine.]

segments would drive healthy free cash flows through 2017."

TheStreet rating team is less optimistic, and their assessment more closely mirrors the belief of this analyst:

"We rate CAMERON INTERNATIONAL CORP (CAM) a HOLD.

The primary factors that have impacted our rating are mixed some indicating strength, some showing weaknesses, with little evidence to justify the expectation of either a positive or negative performance for this stock relative to most other stocks.

...as of close of market on July 22, 2015, Cameron stock was down an additional 5%.

Who is correct in their assessment remains to be seen, but even with all the positive reporting, as of close of market on July 22, 2015, Cameron stock was down an additional 5%.

IMI, Metso, Toshiba, and others continue to struggle as the economy fights to recover.

Even the big boys like Schneider, Siemens, and Emerson are not immune to the effect the oil field collapse and general economic downturn has had on the ACI.

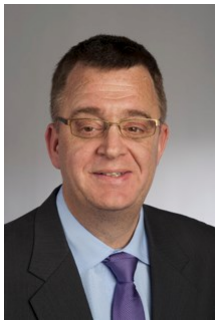
As the industry works toward recovery, it would not be at all surprising and is in fact expected, that we will begin to see mergers and acquisitions in the near future.

Emerson Makes Changes in Europe

Roel van Doren, President of Emerson Process Management Europe, has announced some changes to his organization structure in The Netherlands. The new General Manager there will be Constantijn Tsiris, who has previously held the position of Sales Director for the Emerson Process Systems and Solutions business in The Netherlands, where he has been overseeing complex and large-scale control and safety systems projects. Constantijn takes over from Guido Wink, who having held the position of General Manager for the last five years, has become Senior Director of Sales for the Emerson Process Systems and Solutions business unit in Europe.


Constantijn Tsiris


Guido Wink


Roel van Doren

Roel van Doren commented "Emerson is committed to helping the process industry execute modernization and improvement programmes. Constantijn's extensive experience in executing projects will be invaluable to our continued success in the region."

HIMA Paul Hildebrandt Posts Double-Digit Growth

In fiscal year 2014 HIMA Paul Hildebrandt GmbH achieved record sales – €121.3 million (previous year €105 million). The family-owned enterprise headquartered in Bruehl, Germany, continued double-digit growth with a sales increase compared to the previous year of 15%.

HIMA further extended its market leadership for safety-related automation solutions in Europe.

"Considering that five years ago in fiscal year 2010 we had revenues of approximately €75 million, our growth is a proud achievement."

The safety specialist achieved a strong positive result in Europe in fiscal year 2014, increasing sales by 24%.

In North America, HIMA posted a 12% gain compared with the previous year.

"We again succeeded in significantly improving our performance, particularly in the established markets of Europe and the U.S.," said Sankar Ramakrishnan, CEO at HIMA.

"At the same time we are focused on the development in growth markets. Today we generate half of our sales outside of Europe; this is not only indicative of a healthy expansion strategy, but it also strengthens our Bruehl headquarters location," he continued.

The development in Africa was particularly successful. Last year in Africa HIMA won two major projects, in Nigeria and the Republic of Congo.

Based on current incoming orders, the positive business development is projected to continue by the company, with a high growth rate forecasted for fiscal year 2015.

"We continue to write the HIMA success story," said Steffen Philipp, Managing Partner of HIMA. "Considering that five years ago in fiscal year 2010 we had revenues of approximately €75 million, our growth is a proud achievement."

Near doubling of sales in 5 years, with the vicissitudes of the global automation economy is, indeed, an amazing story. The evidence suggests that there are at least two markets for process safety systems, each of them with different requirements.

In process plants, we see a continued push toward safety systems that are integrated with the DCS and the CMMS systems. In other applications, such as offshore oil rigs, and similar highly critical installations, the customers steadfastly continue to insist on stand alone process safety systems, such as those made by HIMA.

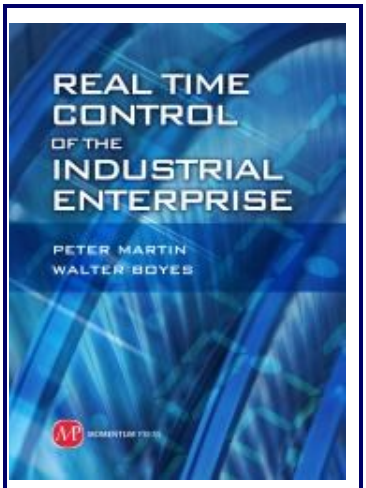
The *INSIDER* continues to watch this trend closely.

Pingo!

Last July the report on the Yokogawa conference in Berlin mentioned that a major order for their European business group was for the engineering of the Gazprom Yamal peninsula LNG megaproject, situated in Northern Russia. The Siberian Times now reports that the warming weather conditions in Siberia are producing some interesting large holes in the ground. Professor Vasily Bogoyavlensky led the latest expedition to investigate some of these craters, which can be 100m across and 60m deep. The most famous crater is 25km from the Bovanenkovo gas field on the peninsula. Apparently the phenomenon is related to the 'Pingos' which are mounds of earth with an inner core of ice: normally when the ice cores melt, the Pingos just collapse back, but in these latest cases the Pingo has been filled with gas from below. When the top dome melts, the gas, held back by the frozen cap, is suddenly able to escape under pressure, and it throws the crust of soil on the top around the edges of the hole.

Pingo!

The sides of the hole are usually frozen, but start to melt from the sunshine and exposure to the air: the water produced falls to the bottom of the hole and forms a lake. Hopefully Yokogawa will complete the gas extraction project before too many more Pingos erupt!



SMART MANUFACTURING? INTERNET 4.0? READ THE BOOK!

In the last fifty years, almost all of the productivity gains in manufacturing have come from better automation and control of the processes: continuous, batch, hybrid, and discrete. The secret to sustainable manufacturing is better control. So, why aren't the theories that have led to enormous gains in productivity being used above the plant level? This book explains how better controls can be applied to the supply chain, and to enterprise financial management. It provides managers the insight and tools for achieving a fully integrated automated manufacturing enterprise, from the technical side to the business management side. It is helpful to anyone seeking to bring the non-technical parts of a manufacturing operation in line with the already automated production, inventory management, and plant management. The book is available from www.momentumpress.net, Amazon and other retailers.

Control System Integrators Targeted by Hackers?

In early July, CSIA president Lynda Patterson posted the following in CSIA's "Connected Community" :

IMPORTANT MESSAGE FROM CSIA INSURANCE PROGRAM MANAGER, PAUL BARNARD

<u>CSIA Members are being hacked!</u>

Twice over the last two weeks members have had their computer systems compromised. We want to put all members on notice.

The hackers entered their corporate computer systems and, as far as we can tell at this stage, monitored the entire e-mail network and traffic. They identified those who can authorize and execute wire transfers. They then appear to have waited until the person with payment authorization was away from the office. They proceeded to send an e-mail from that person to whoever makes such payments with instructions to transfer funds. In the first case the amount involved was $18,000 and in the second $188,000.

The $18,000 was paid. Fortunately, in the second instance, the person who was to remit the funds sent an e-mail to their CFO confirming that they had received the instruction. The CFO immediately called their office to cancelled the instructions. Given that both corporations are CSIA members it seems likely that more members can expect to be attacked.

*We recommend that all instructions for wire transfer be **<u>confirmed verbally</u>** and that under no circumstances are any e-mails actioned without such verbal confirmation.*

In the second case, the member immediately, via verbal instructions and not via e-mail for obvious reasons, instructed every employee to change their passwords. This did not stop a further attempt by hackers, who then sent another e-mail from the CFO to the controller requesting the payment be made.

If you are attacked, please advise us and immediately get an IT expert to work with you to stop this threat.

There is insurance available for this type of loss and you should consult your insurance advisers in this regard.

CSIA Walks It Back

"Thank you for your interest in providing media coverage of the recent announcement in CSIA's Connected Community. This was originally referred to as a "hack," but we would caution you against using this term as it was likely more of a phishing scam that was not necessarily targeted at integrators. It is always prudent to be vigilant, though, so we continue to encourage all members to be wary when asked to send large sums of money." — Kristen McGuine, CSIA publicist

Neither Paul Barnard nor Lynda Patterson strike the *INSIDER* as being alarmists. Based on the fact that many CSIA members' clients are the same critical infrastructure asset owners that the Chinese and Russians have famously been attempting to penetrate, it seems to us that it could be very likely that this WAS targeted at control system integrators. The good news is that CSIA, being well organized and proactive, was able to get the news to its membership quickly.

The *INSIDER* suspects that many hacker teams see control system integrators as another way into the critical infrastructure system, and we further suspect that this is only the first of many alerts we will be seeing in the future.

THE WAY I SEE IT
Editorial

Integrating Unusual Networks—IT and OT Working Together

Over the years, we have moved from analog signals in home run conduit to digital signals running on proprietary networks, to digital signals running on TCP/IP Ethernet networks with all of the advantages and disadvantages of those networks.

Network administration has become quite different, as OT (Operations Technology) has all but merged with normal IT functions. This has not been an easy or polite discussion. It has had all the earmarks of a barroom brawl at times. I remember one Plant OT manager telling me, "I don't have any more problems with the IT guys, since they all work for me now." You could hear the evil laugh a mile away.

But we are about to blow ourselves and our recent new-found complacency out of the water once again.

The Internet of Things brings with it the concept of nested networks, where the configurations of these networks can be radical and very different from the networks we are used to managing in an industrial environment.

For example, think about "wearables." People are producing "smart" clothing for a variety of purposes.

Here's an example of how this might work in the industrial environment. Take a smart refinery coverall. It would have a temperature sensor for ambient, a temperature sensor for body temp, an accelerometer for determining body position, a hazardous gas monitor, and a geolocation sensor of some kind, as a minimum. That way, the suit can be broadcasting information about the location of the worker, the health of the worker, and the ambient conditions. It can tell if there are hazardous vapors. It can tell if the worker has fallen.

In all probability, we will stop thinking about where a networked resource exists, and simply use it. If you think about it, that's what we do now, with Internet resources.

It will be up to OT professionals to figure out how to configure this. Will they be individual sensors, or will there be a small, low power router that makes all these sensors a subnet, reporting as a unit? How will the plant network cope with hundreds of these small networks, or groups of sensors, moving around the plant all the time, and going on and off line?

Similar issues exist for plant vehicles, railcars, and other moving network segments. These are possibly just the tip of the iceberg.

As cloud-based computing comes on line, we will need to figure out whether a cloud is part of the plant network, something separate, or whatever. As plants become more fully integrated into global wide area networks, where does the conceptual "plant operations network" start and stop?

In all probability, we will stop thinking about where a networked resource exists, and simply use it. If you think about it, that's what we do now, with Internet resources. We hardly ever think about the location of the server on which resides the data we are accessing. A .com URL could literally be anywhere.

But for the people whose job is to make all this work, there are currently many more questions than answers about exactly how this will work, how it is supposed to work, and how to securely protect these networks and their data from unfriendly people who might want to interfere with them.

At that point, there will not be IT and OT. There will simply be "the network" and the users. Getting there, of course, will be much more than half the fun.

Comments? Talk to me!
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Read my Original Soundoff!! Blog:
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INSIDER
INDUSTRIAL AUTOMATION & PROCESS CONTROL

Profile

Peggie Ward Koon

by Joy Ward

Peggie Ward Koon is an amazing woman: mathematician, long-time process control professional, ex-president of the International Society of Automation (ISA), author and process control thought leader. We caught up with her long enough to hear how she got into the profession and where she sees the automation and process control field moving in the future.

For her, it all started with her older brother, who went to Massachusetts Institute of Technology (MIT) and was her first mentor, encouraging her to take on the sciences.

Joy Ward: Your older brother is a physicist?

Peggie Koon: Yes. He always believed that physicists were the best mathematicians so he encouraged me to take physics and chemistry. I wanted to excel because he excelled. He was the smartest kid in his class and I wanted to be right behind him.

My brother went to MIT and I wanted to go to that same area. That's how I ended up at Smith College. I majored in math. I was kind of torn between math and chemistry but I really loved mathematics. He loved mathematics and I could talk to him about mathematical modeling and all those things and he and I would have wonderful conversations.

I believe it is so important for a girl, in particular, to have a mentor. It doesn't have to be a male, but it's kind of nice if it's a male in those fields because they are so male dominated. When I was going to school and if I said, "I want to be an engineer," or whatever it might be, my brother was right there saying, "Go for it!" So I think the mentoring piece is so important. Then when you enter a workforce, having a mentor is also important.

So the other great thing that happens to me was my first job was with General Motors and I had a mentor immediately. He made sure that I not only learned the business part of General Motors but also learned my field and opportunities to grow in my field.

Again, I don't think it has to be a male but it helps because it is a male dominated area. If you have a strong female in a position of authority who can take you under her wing that works too. But in order to succeed I think you do have to have great mentors and someone who is helping you to develop your skills so you are constantly on top of the changing technology because it is constantly changing.

I have personally over the years, if I have seen women or young men who want to be engaged in process control, process engineering, I've actually tried to make myself available as a mentor. But I've also given them opportunities to do on the job training. So for example, when I was process control manager at Graniteville Company, which was a textile manufacturing company, oftentimes I would have console operators who were basically young men that I had taken from production who showed an interest in learning the technology. I brought them in to train them and allow them to grow into console operator roles. Then if one of those guys said to me, "I would love to learn how to configure this system; I'd love to learn what a PID is and to be able to write control system algorithms." I would provide on the job training for that person and allow them to move into that role. Some of my very best process control programmers and process control engineers came up through the ranks. They understood the machinery and the process really well because they had worked there and they understood the system and how it integrated everything together and interfaced back to that machinery and all the instruments in the field because they had worked there. They also acquired an understanding of the system and the software. Those were my very best process control engineers.

Some of my very best process control programmers and process control engineers came up through the ranks. They understood the machinery and the process really well because they had worked there and they understood the system and how it integrated everything together and interfaced back to that machinery and all the instruments in the field because they had worked there.

JW: That's a very different way of getting new talent than what we hear of. You obviously started out with the possibility of doing a lot of different things. What was it that drew you into con-

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Profile

Peggie Ward Koon (continued)

by Joy Ward

trol process?

PK: While I was at Georgia Tech I took a course called Time Series Analysis and Forecasting. It was all about process control but I didn't know it. So I'm taking this course that is required for my major and when I go to work for General Motors I'm still not using this. Several years later, I'm offered a job at Graniteville Company and the job was not in process control. The job was in information technology, which was programming and that kind of thing. I had done that for several years. I go to this job and I'm on the job for maybe a year. The vice president said to me, "I want you to look at this process control area. I want you to manage it."

I was young and I said. "Okay." I wasn't afraid of it because I had this strong math background. I had an IT background so I understand computers and software.

I actually just spent about three months with an old guy on the floor who walked me through the textile main factory process end to end every day. Then I spent another three months watching the console operators; actually sitting with them and watching what they were doing. I worked with the instrument techs to kind of understand how things were wired together, what kinds of instruments, to kind of learn that. And I was ready.

Here's what I did for myself. I actually drew out an entire preparation process end to end with all of the flow diagrams that demonstrated that I understood how the system worked. When I showed it to the guys they asked, "How did you figure that out?"

I said, "Because I'm a math major. I have good logic skills." As I was doing that and looking at the PIDs and seeing how control algorithms were written, I realized I had taken all those basic concepts that were in that course. So the light came on and I said, "Oh my gosh, this is my Time Series Analysis and Forecasting. It's how you determine what the change in the process is."

I was sitting there thinking I already knew how to do this. I just didn't remember it because it had been several years before. I fell in love with it.

I believe that we live in a world where there's constant change and so if you think about process control, that's what it is. It's looking at aberrations in the process, understanding if this is changing. How do I get it back to a steady state? So I'm learning how constantly to look at the aberrations that are going on around but keep everything in a controlled state. I love that because that's really what we have to do to be successful in life. We're always having these aberrations that occur and it's how we respond to it and level them out so that we maintain control. That's what determines if we're successful or not.

So that's why I love it because it is so much my image of what a successful life would be. When I would go to work every day one of the things that amazed me was if one of my guys said, "This thing isn't doing what it' supposed to do." I wanted to dig right in and try to figure out, what do we need to do? Do we need to change the control algorithm? Should it be a Smith Predictor block or what should we be using to try to make this a control process so we get the outcome we're looking for? To me that was a challenge and we had a lot of those in the textile industry. Just watching the change in the control systems and the functionality that was available was also exciting. It made me feel like I've made a huge contribution to the success of my company.

When I showed it to the guys they asked, "How did you figure that out?"

I said, "Because I'm a math major. I have good logic skills."

I had an employee who actually came to me and said, "We can reduce the footprint and the wiring cost. I want to do this but I can't get anybody to listen to me." So I said, "Let's work up the business model for this and let's go and present this."

It was gratifying to me that I saved the company some money and introduced some new technology, new techniques, new components. But it was also gratifying to me that I was able to help an employee who could envision something that needed to be changed, and accomplish that change. So for me personally every

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Profile

Peggie Ward Koon (continued)

by Joy Ward

time I was able to help my company either migrate from an older control system to a new one or change a process or go into something that was manual and automate it to improve productivity and quality, I felt like I was making a contribution to the success of the company, which I think is what we all want.

It goes back to my upbringing. Our parents taught us that it's not so much what we get from something that we should want to give in return. I felt like the company invested in me by allowing me to have this opportunity to manage these people and millions of dollars in systems.

They trusted that operation and resources to me and in return I felt I should be giving back. You've given something to me, I want to show you what was given was not wasted, that I will, in fact, live up to your expectations and mine. So I have my own personal set of expectations and a part of that is to be successful at whatever I do; to make a difference.

When I was elected as president of ISA one of the guys said, "Peggie, you have a choice. You can try to make a difference or you can just ride it through. Because a lot of people just take the position, just go where they're asked and do what they're asked to do." I told him, "That's not me. If I am going to be involved in something I want to make a difference, a positive impact. So that when somebody looks back on my year in this role they say she did this."

That's what I thought about my jobs, every one of them.

Every year I would go to my boss and say, "Now the minute this job is no longer a challenge for me I'm leaving.

He would say, "We'll see about that." For almost every year I was at Avondale/Graniteville we did some modernization projects.

I used to tease him and say, "I know you're doing this to keep me." I wanted to make a positive impact. I wanted people to look back on a system and say, "Peggie Koon put that system in there and look at the savings we've gotten from it."

That's my approach to everything. I want to give back. I want to leave a legacy of having accomplished something, of having made a change, a positive change that positively impacts the organization I am engaged with.

JW: You've been in process control for 20 plus years. What are the trends that you're watching?

PK: The use of data—big data—to figure out what are we doing: not just in a process area but how does that rate with what's happening in the whole organization?

One of my biggest disappointments with control systems back when I was managing the systems was that they were all focused on the plant with no real tight integration with any supervisory systems to bring that information up to the business level so the board could make decisions based on what was happening on the plant floor.

"Peggie, you have a choice. You can try to make a difference or you can just ride it through. Because a lot of people just take the position, just go where they're asked and do what they're asked to do."

I think we've come a long ways with that. Technology people tend to be concerned about process, product, operations, all these things and there is a bigger picture. You need to be able to look at the entire supply chain. Systems still aren't quite there. But they are getting there.

The other thing that I think is very important to control systems is – and I'm not sure people really get it – is cyber security. I've spoken to people who work, for example, in power and water treatment facilities. They know that they have control systems that control the process but what they don't get is now there is this control engineer has an IPad or a laptop that is integrated with this system and this whole Internet of Things that we are now dealing with – IP to IP kinds of communications.

While it's great it also opens us up more to cyber threats. That's

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Peggie Ward Koon (continued)

by Joy Ward

huge in the area of process control because people do not understand that cyber security should be executed and implemented with their control systems for our power, our food, for our health systems, transportation, everything.

To me that's a hot topic. It's being talked about and people are trying to raise awareness but the awareness is not there yet.

JW: What keeps awareness from being there?

PK: Cost. I think it comes down to a matter of costs. I think it was someone from Siemens said to me that the cost of malware was very, very expensive. So he said the only way we will ever mitigate cyber threats is if we make it so expensive that the people wanting to create the threat can't afford it.

So I asked him a question. "Can you look me in the eye and tell me that your organization has adopted the framework?" He answered kind of around about, sort of, kind of, lahdahda.

(Cyber security is) an insurance policy if you will. Some people buy insurance policies because they just are really conscious something could happen.

Nothing is going to happen to him.

Well, a lot of companies take that attitude, especially when it comes to the technology they are investing in is very expensive.

Then you have people you have to train to be able to operate and control that process and systems cost.

So I asked him a question. "Can you look me in the eye and tell me that your organization has adopted the (security) framework?" He answered kind of around about, sort of, kind of, lahdahda.

Well, I can't just buy any old controller I want. It's got to be an ISA secure controller. What's the cost of that? Oh, I just trained these operators and now I have to send them to training again to try to figure out what is a cyber threat and mitigate it. Oh, by the way, I have to do all these things. What do I have to invest in to do all these things?

I don't think people will say it but I believe that cost has a lot to do with it. This cost thing and do I believe that I'm going to be attacked? That's really what it boils down to.

The reality is that all of us are vulnerable; more vulnerable than we've ever been because of the Internet of Things. And control systems are right in there.

JW: What's next for you? You've retired but I suspect you're not really retired.

PK: I decided to step back and think about what I want to do next. Strategic planning. I would love to be in a management consulting type of gig focusing on the strategy of looking at what people are doing and where they want to go, helping them to develop a road map to get from point A to point B. I'm also writing a book called *Leading Change*. I hope to get it done in the next six months. ISA will be publishing it.

JW: So we can expect to see you at some ISA events talking about your book?

PK: Absolutely. It's going to be about how difficult it is for people to adopt change. I've already outlined this book and identified about fourteen different change scenarios. So it will be about the change scenarios in the automation and IT areas and the people area.

I'm going to go from "change just happens" to change agents. Then there's times when we just have to make change. There's much to be learned about working with change.

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Rajabahadur V. Arcot: ECIL, India's homegrown automation company, yet to unlock its full potential

India, with a growing economy, is an excellent market for automation companies. After a two year slowdown, the growth sentiments have revived. Large investments in industries such as electric power, refining and petrochemicals, cement, metals, drugs and pharmaceuticals, and automotive have contributed to the growth of the country's automation market. There are high expectations that the good days are back again.

India has emerged an important market for almost all the global automation suppliers such as ABB, Honeywell, Invensys / Schneider, Siemens, Yokogawa, Hitachi and others. Unlike in China, these global companies do not face serious competition from domestic companies.

However, I must qualify that by highlighting that there are two domestic companies, Bharat Heavy Electricals Limited (BHEL) and Electronics Corporation of India Limited (ECIL) which have consistently performed well in niche segments. These companies have their strengths, and the emerging expanding opportunities may provide them the impetus to change their focus and overcome their present weaknesses.

Domestic Automation Companies Target Electric Power Industry

While BHEL is a leading supplier of main power plant equipment for coal fired thermal stations and integrated control systems, ECIL largely addresses the needs of nuclear, defense, strategic communication segments. With India desperately needing to generate more and more electric power to meet the requirements of an expanding economy and a robustly growing manufacturing industry, massive investments are flowing into the electric power industry to augment the generating capacity.

Presently, the country largely depends on fossil fired power plants, but it recognizes that it has to tap other sources of energy, and nuclear is one among them. While large investments taking place in the electric power industry in India has catapulted BHEL as the top supplier of DCS in India, ECIL has emerged as a control and instrumentation supplier of choice for nuclear power plants and some other strategic industries such as defense and aerospace.

Whereas BHEL manufactures most of the equipment under licensing agreements, ECIL is a company that is strongly committed to support in-house technologies and design engineering efforts. Companies that are interested in India's automation market must fully comprehend the competencies of these companies and roles they play. Therefore, I plan to write about both these companies, but let me begin with ECIL.

Recently, at Hyderabad, I met Viswanath Panchagnula, Executive Director (Marketing), ECIL over dinner. We had a long chat about the automation market in India, the company's contribution to the industry, and its future growth plans. Like his global counterparts,

Rajabahadur V. Arcot: ECIL, India's homegrown automation company, yet to unlock its full potential (continued...)

Viswanath believes that the country's automation market will remain one of the fastest growing globally in the foreseeable future.

While he is confident that ECIL will keep introducing state-of-the-art new products and systems into the market, he concedes that his company's market share may not dramatically expand. ECIL's commitment to serve the strategic needs of the country does hinder it from setting high expectations of competing for improving the company's market share. The company's forte is technology and not aggressive positioning in the market!

ECIL's Impressive Achievements in Nuclear Plants

ECIL's initial charter was that it should focus on Computers, Control Systems and Communications and create robust capabilities in India in the field of professional electronics and systems so that it can meet the Control and Instrumentation requirements of India's nuclear program which includes both scientific research and commercial power generation. Viewed in that context and its technological achievements, Viswanath pointed out that the company's performance is *par excellence* and to prove his point he highlighted some of ECIL's successes stories. ECIL was the first company to design and supply control and instrumentation systems for nuclear power plants that are designed, engineered, and built in India. India builds pressurized heavy water reactors (PHWR) based power plants. ECIL's supplies include Reactor Control Systems, Fuel Handling Controls, Primary and Secondary Shutdown Systems, Power Supplies, Computerized Operator Information Systems, and Full Scope Replica Simulators. ECIL's control systems are in operation at 18 nuclear plants in India. It also designed and supplied turbine condition monitoring systems that some of the domestically made turbines and power plant including nuclear use to measure vibration, eccentricity, and axial shift.

The company's forte is technology and not aggressive positioning in the market!

ECIL as a Control Systems Supplier

In the plant control and automation domain, ECIL was the first company to offer, install, and commission in-house designed PLCs to integrated steel plants such as Bhilai Steel Plant, cement plants such as Tandur and Neemuch, and power plants such as Raichur in India. Subsequently, it upgraded the design to incorporate redundancy and supplied them to nuclear power plants. Viswanath elaborated about some additional features available in ECIL's PLCs, such as compliance with IEC61131, CPU and power supply redundancy, local I/O and remote I/O connectivity, GUI based programming software that works on MS-Windows/Linux operating systems and necessary interfaces to connect to the third-party HMI packages and OPC servers.

Viswanath also said that ECIL had developed the data acquisition software that supported functions such as historian & sequence of event recording and ran on the then popular minicomputer series PDP – 11/44 and PDP – 11/34. According to him such systems were successfully installed and commissioned at Raichur Power Station and based on this track record, the company went on to supply DAS to India's major utility company National Thermal Power Corporation for its power plant at Ramagundam.

ECIL, according to Viswanath, was also the first to supply, install and commission SCADA systems to operate *Bombay High* offshore oilfield platforms located close to Mumbai. Bombay High almost accounts for 35-40 percent of India's crude oil production.

The company repeated its success by supplying SCADA systems to the first major cross country gas pipeline project (Hazira – Bijeypur – Jadishpur gas pipeline) in India. He was happy to point out that the company continues to remain a leading supplier of SCADA systems especially to oil and gas pipeline projects in India. Talking about ECIL's SCADA software, he said that it has all the features, such as MIS reporting, trending, historian, alarm & event monitoring and reporting, generation of reports through Microsoft XL, web connection, and such others. The SCADA software runs on 32 bit or 64 bit servers that work with UNIX/Open VMX/ Windows 2008/Windows 2012. It supports

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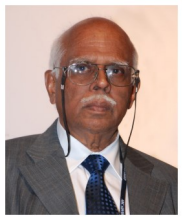

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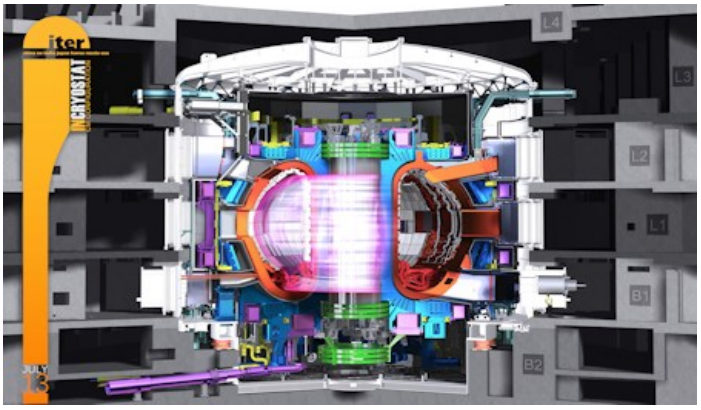
OPC DA and UA and the RTUs communicate with servers using industry standard protocols such as IEC 60870 / DNP 3.0.

ECIL's other offerings included under control systems & components and instruments category are command and control systems for missiles, inertial sensors and navigation systems, gyro stabilized horizontal roll bar systems – a landing aid for helicopters mounted on ships - atomic absorption spectrophotometers, and nucleonic thickness gauging Systems.

According to Viswanath, ECIL was also the first company in India to offer in-house designed mini computers and operating systems, cockpit voice recorders, and earth station antennas.

He added that the company is also participating in international science projects such as International Thermonuclear Experimental Reactor (ITER), France and the Facility for Antiproton and Ion Research (FAIR), Germany.



ITER's Tokamak Fusion Reactor Concept

ECIL's Profile

The Electronics Corporation of India Limited is a State Owned Enterprise, headquartered at Hyderabad, India. It was established under the Department of Atomic Energy (DAE) in 1967. DAE and its establishments such as Bhabha Atomic Research Center (BARC) and Nuclear Power Corporation Limited (NPCL) have played a major role in ECIL's success.

In the initial years BARC and later NPCL sent some of their best technocrats and scientists to establish and head various business divisions. The company has five main business verticals; Nuclear, Defense, Aerospace, Security, IT, e-Governance & Telecom.

The legacy endures and ECIL continues to set energetically technical and project goals to conquer but gaining market share is not one among them.

ECIL's Control Systems Group, which is part of the Nuclear, is 500 strong. The legacy endures and ECIL continues to set energetically technical and project goals to conquer but gaining market share is not one among them.

Yet, ECIL is a successful company that has delivered on its promises. However, it is yet to find the key to unlock its true potential!

In conclusion, a disclaimer from my side; about 25 long years ago I was a part of this company and I cherish my association!

Rajabahadur V. Arcot is Director Asia Operations for Spitzer and Boyes LLC, the publisher of the Industrial Automation INSIDER. Contact him at **rajabahadurav@gmail.com.**

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