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Your key to the latest industrial automation and process control information

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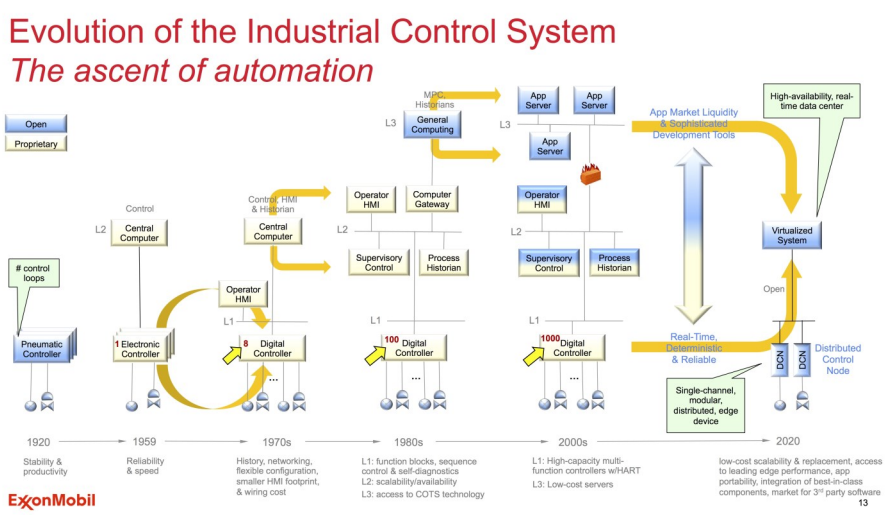
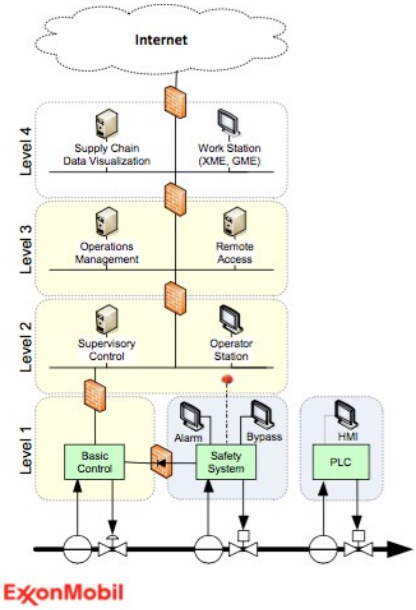
# The Future of Control Systems: ExxonMobil, Lockheed-Martin, and The Open Group

As an industry, we have known for at least two decades that there was something wrong with the common control system model. Even its name made no sense— distributed control system— when the control was clearly not distributed. Companies like ExxonMobil, who have many control systems, have been looking at the issue for quite some time. In 2010, ExxonMobil launched a project they called *Breakthrough* to come up with a coherent vision of the future of control systems, not just for ExxonMobil but for the entire process industry.




## The Problem

The problem is that the way control systems are designed makes it hard to upgrade them. They are proprietary, closed systems, and the user is tied to a single vendor for capabilities and upgrades. "The high cost of technology refresh limits adoption of leading





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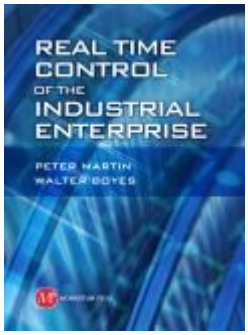
# The Future of Control Systems: ExxonMobil, Lockheed-Martin, and The Open Group(continued)

edge performance products," ExxonMobil's Don Bartusiak, chief engineer for downstream automation, pointed out at the East Coast Industry Day on August 23. "It is expensive," he went on, " to integrate third party best in class components." Bartusiak was joined in his comments by ExxonMobil's Steve Bitar, who now is the lead for this project.

Steve Bitar

ExxonMobil's Don Bartusiak




In addition, the way the current control system is architected, getting data out of the control system into the enterprise is difficult and unwieldy. Getting real time data to the business systems from a traditional control system, as Peter Martin and I showed in our 2014 book *Real Time Control of the Industrial Enterprise*, is nearly impossible.

"Our industry is completely barking mad!" ARC's Harry Forbes quoted an anonymous lead software architect for a major automation supplier. "We give our engineers what are effectively circuit diagrams and ask them to use what are effectively jumpers with alligator clips to integrate systems—to connect one wire to the other. That's industrial control." Forbes' anonymous vendor isn't wrong. At Schneider's Fooxboro/Modicon/Triconex User Group meeting earlier this year, famed automation tricky guy Steve Apple, had a schematic of a system, done in typical control system GUI and he was asking people to tell him what he was controlling. It was an automobile. Fewer than one in five people got the joke.

Harry Forbes of ARC

In their research, Bartusiak and Bitar looked at what other industries were doing, and they came to the Aerospace industry.

## The FACE Standard

One of the successful standards and certification programs ExxonMobil found was the Future Airborne Capability Environment or FACE. This is a standard that is underwritten by the Department of Defense so that all electronics, controls, and avionics interoperate in a standards-based way. Just like the vision Bartusiak and Bitar, and their upstream colleague, Sandy Vasser were coming to.

After looking at other standards bodies, ExxonMobil decided to bring on Lockheed Martin and The Open Group to create, administrate, and certify products for a FACE-like standard for automation systems. Lockheed's specific charge is to produce a prototype open system that shows that it can be done, and how to do it.

The Open Group's Mike Hickey

## Some Solutions

There are other solutions being proposed and prototyped out in the world of automation already. Inductive Automation's Ignition! product has clearly defined and open APIs so that system integrators and end users can build their own applications and easily integrate them into the (proprietary) substrate.

The Smart Manufacturing Leadership Coalition, which just was awarded a Center of Excellence grant to produce smart sensors, has two working prototype test beds with an open substrate and open APIs. This model is closer to ExxonMobil's vision than anything else.

## The ExxonMobil Plan

Of course, ExxonMobil has a vision for going forward. What they are looking for is a standards-based, open, secure and interoperable process control architecture that enables access to leading edge capability, allows integration of best-in-class components, preserves asset owners' application software, uses an adaptive "intrinsic security" model, and promotes innovation and value creation.

If that isn't enough, it should be equally applicable to both greenfield and brownfield facilities, and it must be a commercially available system.

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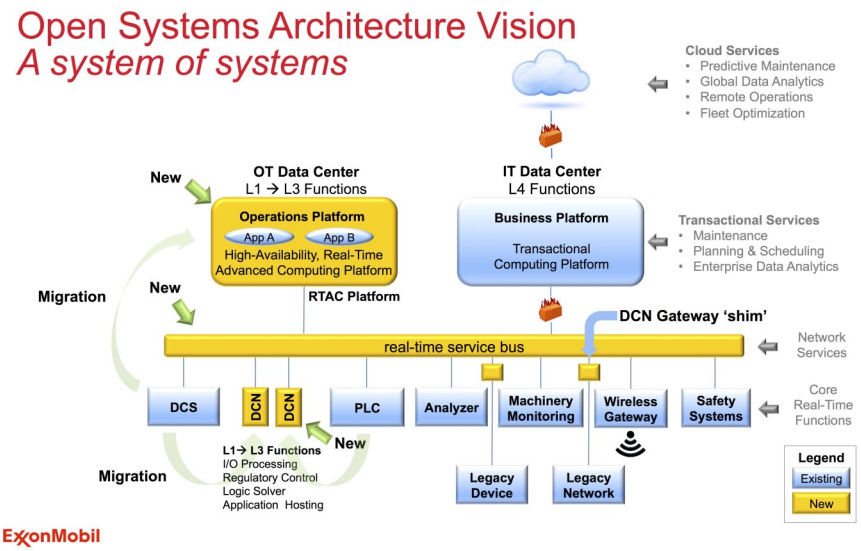
# The Future of Control Systems: ExxonMobil, Lockheed-Martin, and The Open Group (continued)




ExxonMobil believes this is only possible with an inclusive collaboration between users and suppliers to provide the framework for an open systems architecture.

Lockheed Martin and The Open Group are charged with making ExxonMobil's vision real. If you are an end user company of any size, or a system integrator (big or small), and especially if you are a vendor, you should do yourselves and ExxonMobil a favour and check this out.

Mike Hickey, director of The Open Group pointed out some commonalities in successful standards efforts. "Collaboration from both buy– and sell-sides of industry is required, with strong leadership from the buy-side along with strong interest from the buy-side in certification to help drive product or candidate availability and adoption is necessary. Customer support via procurements is necessary to show value to suppliers."

Lockeed Martin's Dennis Stevens

Lockheed Martin's Dennis Stevens, who is chairman of the FACE Business Working Group detailed the FACE approach and the experiences they'd had producing this successful standard. He noted that the initial problem was that the R&D cost of next generation aircraft (or control systems in process automation) didn't scale. The problem was that the next generation of fighter aircraft would be simply unaffordable unless there were common designs and system compatibility and interoperability.

The same problem is true for automation and control systems, especially when you consider that the true next generation system will be a "system as a network" architecture, a "system of systems" that is as much cloud based as it is plant-based, and is designed to push data bi-directionally from the sensors and field controllers to the business and operations systems of the enterprise.

And as Harry Forbes noted, "The problem is that we cannot apply higher level abstractions to control systems." Engineers, he said, need a comprehensive control system modelling language. ISA's S88 and S95 are not good enough for what is required in today's automation. Such a control system modelling language cannot exist in a universe of non-interoperable proprietary systems.

**Moving Forward, or not?**

This is a really good idea, but… If it is such a good idea, why aren't all the end users and system integrators beating ExxonMobil and Lockheed Martin's doors down? For the record, some are, but many are not.

Well, possibly it is because not everybody recognizes the problem, or sees the problem the same way ExxonMobil does. There are companies who are happily running forty year old Honeywell TDC2000 control systems, and as long as they can get parts and service from Honeywell and Azbil, they are reluctant to do anything to upset the apple cart. These companies do not see the value in flexibility, and simply want to continue making their products as they have. It is easy to off-handedly compare these companies to buggywhip makers, but it isn't quite so easy in the real world.

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## The Future of Control Systems: ExxonMobil, Lockheed-Martin, and The Open Group (continued)

These companies are profitable, and it is hard to throw all that away for a dimly perceived value.

Another problem is that the issue of cyber security has paralyzed many companies into inaction. Why should they invest in new control systems when those systems are just as likely to be penetrable by the latest state actors as the systems they already have, and perhaps be even more vulnerable? Many end users are waiting for a new generation of control systems to be "intrinsically secure" with "security built-in" instead of added on. Nobody really knows what that means, yet, because there aren't commonly accepted standards for what "intrinsic security" means.

The good news, though, is that many companies, from the chip foundries to the app makers are pursuing various intrinsic security strategies, and one of them or more than one of them will be successful and widely used. The IEC and ISA are working on standards, too.

It is the end user companies who recognize the game changing quality of bleeding edge control systems that are the most interested in what ExxonMobil wants to do. And ExxonMobil needs them. Regardless of how large ExxonMobil is, they aren't big enough to force vendors and system integrators into an open system solution for control systems by themselves. They will need a sizeable contingent of the larger end users, and they will need them not just to talk the talk, but walk the walk.

The most significant difference between the FACE standard and the ExxonMobil vision is that the FACE standard had the absolute and unwavering support of the Defense Department and the Federal Government. The DoD insisted on a FACE standard, and compliance certification with the FACE standard, and so it was.

**No DoD Daddy**

Unfortunately, in the process industries, there is no one big authority, like DoD, who can say "Do it!" and it gets done. Each asset owner is independent and jealous of their independence— and eager to gain a competitive advantage over any competitor— and a modular and open control system would be a heady advantage.

It is clear why the larger end users would want to get on board with this concept. It is even fuzzily clear why smaller end users ought to do the same thing. It is also extremely clear why control system integrators, from very large ones like Maverick Technologies, to smaller firms that specialize in only one or two industries or machine builders, would want this to be a successful path going forward.

The end users want out of the "annuity" as Harry Forbes described the hold that proprietary systems have on asset owners and end users. The control system integrators want to be able to work in every possible part of the control system, not just hanging APIs off the ends of the proprietary operating system. Many CSIs would love to offer standards-based custom control systems tailored exactly to the needs of their asset owners and end user customers. Without an open standards-based controls architecture, they can't do that.

**Unfortunately, in the process industries, there is no one big authority, like DoD, who can say "Do it!" and it gets done.**

The problem, as has become obvious, is that there is no clear advantage for vendors, either of edge devices and sensors, or networking devices, or control systems themselves, and the software associated with them, like historians and Big Data analytics, to be in favour of and cooperative with an open systems initiative in process automation.

The way that vendors were co-opted and induced into agreeing to and adopting the FACE standard was that a coalition of buyers (DoD and its first tier suppliers) stood together and told the vendors that this was the way it was going to work, so they'd better get on with the program.

**In the final analysis**

So, ExxonMobil, Lockheed Martin, and The Open Group face a somewhat different challenge. The INSIDER believes that what ExxonMobil wants to do is the way forward for manufacturing in the first world, not just for oil companies, and we fervently hope that this project is successful, and all of its obvious follow-on projects are, too.

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# The *INSIDER's* August 2016 Roundup

## News from Brazil

***Rousseff Impeached and Removed***

As we predicted when we first started covering the disastrous financial issues that enveloped Petrobras and other state monopoly utilities in Brazil, the scandal has brought down Brazil's President, Dilma Rousseff. On August 31, the Brazilian Senate voted overwhelmingly to permanently remove her from her office. It is not clear what will happen next, since Vice President Temer is extremely unpopular, and has done a relatively poor job as Acting President.

The deep dive of the Brazilian economy has had major repercussions for automation companies trying to do business in Brazil, especially those who had contracts with Petrobras and other similar utilities. But there is, occasionally, some good news.

**Brazil electricity producer UEGA ensures generation with ABB's ServicePort**

Usina Elétrica a Gás de Araucária (UEGA) of Brazil has added remote-enabled control system monitoring services powered by the ABB ServicePort to its existing service contract with ABB. The ABB ServicePort Service Delivery Platform allows users to view, scan and track Key Performance Indicators (KPIs) that impact equipment and process performance, so that actions can be taken to improve site performance.

ABB Service Port

UEGA operates its electricity generation plant with an ABB 800xA Control System with Harmony Infi-90 controllers. UEGA had previously engaged ABB for three System 800xA Fingerprint Assessments annually, and now will have these assessments completed in a secure, remote-enabled fashion through the ServicePort. With ABB Fingerprint reports, ABB helped UEGA identify and repair a domain controller issue that would have prevented the plant from generating electricity. As a result, in January, ABB helped UEGA evolve to updated technology.

The ABB System 800xA Performance Service powered by ServicePort uses data collected during scheduled and on-demand analyses for comparison against best practices and standards to detect performance irregularities. This comparison quickly pinpoints issues, helping to improve system reliability, availability and performance. With ABB System 800xA Performance Service, proactive data analysis delivers advantages to reduce the time and effort needed to identify software, hardware, system and network performance irregularities.

## Nick Denbow on the IIoT

**What's the Future for the IIoT?**

Technews in South Africa has recently published their 2016 Industry Guide to the Industrial Internet of Things (IIoT). The whole publication is available on line, despite being a massive 60 page publication, with many and varied articles on this all-pervading topic. This Annual Supplement to the SA Instrumentation and Control magazine draws on example applications from Europe and the USA, as well as from suppliers who provide the technology capability. This industry guide can be downloaded from the SAIC Archives, on http://www.instrumentation.co.za/archives.aspx. The challenge the Editor, Steven Meyer, gave me, was to write an introduction to explain the future direction of the 'Internet of Things', so inevitably I turned to some of the new gurus of the industry, who seem to be given the label "Futurists", or "Trendwatchers" – and it is a growing discipline!

**The specialists' views**

The latest trend evident in the presentations at conferences and corporate presentations, such as those organized by automation suppliers like Emerson and Yokogawa, is for a look into the future, and speculation as to what is to come in the next 15 years. Apart from the information about their new products, and new applications of their systems enabling better automation, these conference organizers also now offer a presentation from a "Trend-watcher" or "Futurist". Inevitably basing their arguments on the way technology has grown, in relation to computing power, mobile phones, and the Internet, these presentations try to explain the IOT, Internet Of Things, of today - to then discuss what the IOT will really provide, and what will be accepted as normal, in ten

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years' time.

**Richard van Hooijdonk, a 'Trendwatcher'**

**Richard van Hooijdonk, a 'Trendwatcher'**

For the Yokogawa European conference, their Trendwatcher was Richard van Hooijdonk, from the Netherlands. A well-known Radio lecturer, Richard is also a lecturer at the Nyenrode & Erasmus University (maybe they made a new subject area for him?). Entitled 'Trends 2030', his presentation linked the IOT with the growth of robots; with wearable and injected (into the body) electronics; with 'Big Data'; with 4D printing and with cybercrime.

Van Hooijdonk backs up what he says with his actions, at least enough to make us stop and think. He has had an RFID code implanted into his arm, which not only establishes his body with an IP address, but provides the access code to the electronic lock on his apartment, so that he is recognized and the door is unlocked when he turns the door knob. The unit also is programmed with the number for his Bitcoin account. While admitting that the injection process was not painless, his whole approach was that such technology will become smaller and cheaper, with future volume application. So the injections will be less painful, at least!

**Personal sensors vs robot automation**

Probably everyone in the audience understood and could relate to different parts of Richard's view of the major future developments likely. Certainly I could understand the function of some wearable electronic systems that monitor heart rate, temperature and blood pressure, etc, but lost the plot when this device was also bio-chemically analysing data from an internal pill or pills that circulate around and analyse the blood and other fluids, to look for symptoms or diseases that need treatment, and then automatically call the Doctor!

However I could relate to the emphasis placed on robot automation, which particularly included advanced drones that can now use optical imaging to identify sections of fields or crops which need spraying with insecticide or seeds or fertiliser etc: the drones are self-programmed to fly over the field in a regular search pattern. Automated and self-checking robots for window cleaning, lawnmowers, carpet cleaning and floor polishing, litter picking and hoovering are all about to take over such manual jobs. Robotics will then take over other duties, like planting out seedlings and watering individual pots in garden centres. In the kitchen the fridge will know when it has run out of specific items like eggs, milk and butter, and order them automatically from the grocer, on a schedule.

**Relating this to IOT**

In terms of automation the IOT offers the interlinking between multiple devices, pieces of home equipment for example: the alarm clock rings, after having consulted your schedule, weather and traffic reports, to decide when you need to be awake: the curtains open, or alternately the lights are switched on, the bath is filled and the coffee pot or kettle switched on to brew a drink. But these actions may not have to be programmed, the devices themselves, and other sensors, will have been fed into a big 'consequences' database in the cloud somewhere, that uses pattern recognition to learn repeated sequences, and can then take over and run these sequences automatically. This 'Big Data' processing facility, using pattern recognition, creating artificial intelligence that can process all this data, is a necessary adjunct to the simple sensors – we can't look at all that mass of information ourselves. Such data processing can be seen in a small way already, when the supermarkets collect your purchase pattern information, and use this to predict when you will buy these same goods again: if you don't buy them when the computer thinks

**Futurist jack Uldrich**

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## The *INSIDER's* August 2016 Roundup (continued)

you should, it can send you a reminder, or even a special offer, to tempt you back to the store. Alternatively, look for a price for a flight on-line: suddenly adverts for that flight appear on every web page you access, and alongside your emails that mention keywords like 'holiday'.

**Jack Uldrich, a 'Futurist'**

The Emerson European User Group conference on the other hand, brought Jack Uldrich over from the USA. Jack started life as a naval intelligence officer, and developed an ability to talk American almost as fast as my brain can translate the words being used. He now describes himself as a Futurist, and consults for many major investment groups, plus is a regular guest on CNN and CNBC. In his website (jackuldrich.com) he presents a paper describing the ten ways IOT will "Open up a Future of Opportunity". Jack sees the alarm clock wake-up routine quoted above as the simplest use of IOT: a more comprehensive view is that sensors in your pyjamas, mattress, home lighting systems and the kitchen monitor everything from your diet to your sleep pattern, and tell you to modify your behaviour to improve your lifestyle – for example tell you to reduce the caffeine intake after 6pm, and tell your bedroom lights to slowly get brighter as soon as you come out of REM sleep – whatever that is!

I leave you to read the rest of the paper: but Uldrich takes IOT with Big Data as just one of the major triggers for change. The other factors he lists are Social media, robotics, biotechnology, nanotechnology, AI and renewable energy, which will all coalesce to focus on the intelligent automation of our lives.

**New opportunities**

Jack Uldrich sees some major business entrepreneurs emerging as a result of the technology changes around us already, identifying Spacex in satellite launchers (the reuseable ones that now land on ocean barges); Tesla new designs of electric cars, and their plans to develop a 0.5 million units a year production facility for the required car batteries by 2020; GE producing 3D printed aero-engine parts (such as turbine blades) by 2020; and Deloitte recently moving into an office building in Amsterdam that can use IOT sensors to automatically reduce energy consumption by 85%. Richard van Hooijdonk also pointed to disruptive new ideas overturning established markets, mentioning Uber in taxi services; BnB in renting holiday houses; Spotify in music; and Netflix in taking over the video rental market digitally.

These Trendwatchers/Futurists do have a place in business. In fact, van Hooijdonk teaches companies how to anticipate and deal with major changes that might disrupt their business, by creating their own internal disruption team. In this way they may avoid the fate of Kodak, Blockbuster, and Proctor & Gamble. There are obviously many profitable careers opening up in presenting trend-watching lectures, some forecasting IOT scenarios for the future.

**But what about the IOT?**

Gartner, a leading information technology research and advisory company, forecasts that 6.4 Billion 'things' will be connected to the Internet by end 2016, up 30% from 2015, and that this number will reach 20 Billion by 2020. These devices will generate a market for service spending of USD235 Billion in 2016, so this spend will be approaching USD1000 Billion worldwide by 2020. Admittedly only around a third of these connections will be in business operations, two thirds will be in consumer areas. But the major market demand will be for services, where businesses employ external providers to design, install and operate their IOT systems. In reality this means processing the information available using Big Data techniques, to allow the client to get on with his own business, yet benefit from new technology. "IOT services are the real driver of value in IOT, and increasing attention is being focused on new services by end-user organisations and vendors," said Jim Tully, vice president and analyst at Gartner.

So the attention Gartner speaks of can already be seen coming from the major automation suppliers, who are offering 24/7 services to analyse the data available from industrial internet based sensors, or from plant sensors connected over a VPN link via the Internet. The GE, Emerson and Yokogawa companies of this world see their customers using their products, but that these products have far more capability than the customer can absorb, so they need to be the supplier who provides the expansion and development services. Otherwise someone else will jump in and pinch the client's attention, and the work.

So we already have GE supporting their aero-engines with wear and condition monitoring systems, then extending this to their compressors and pumps on LNG liquefaction plants, with teams of GE people monitoring and reporting back to their clients. These teams might only be in three or four places around the world, all linked by the internet, but they can control their maintenance staff on site. These guys are directed to the machine or plant area that needs attention: and the whole contract is no longer measured in man hour charges, but

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## The *INSIDER's* August 2016 Roundup (continued)

in percentages of the plant output capability, when the equipment availability is maintained above X%. Similarly we see automation companies developing similar contracts, where they use the IOT inputs to enable plant performance improvements, so that a South African plant benefits from operational experience learned from a similarly linked up Canadian plant: and the payment is a proportion of the performance improvement.

There are opportunities also for specialists to develop expertise in their own specific areas, eg for machine manufacturers to link all their own machines worldwide, and be the leaders in offering the most efficient, reliable widget production machinery: but eventually these will be linked into a major supplier of widget production and business services.

The IoT benefit will come from collaboration and learning, matching patterns and experience from knowledge gained elsewhere: it needs AI, which could be 'artificial intelligence', or may be 'Automated Intelligence' – and it will come from Big Data, from multiple small sensors, interconnections, and collaboration!

### Xylem to Acquire Sensus: Water meets IIoT

Xylem Inc. announced that it has signed a definitive agreement to acquire Sensus for approximately $1.7 billion in cash.

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Sensus, owned by investment funds affiliated with The Jordan Company and GS Capital Partners 2000, is a leading provider of smart meters, network technologies, and advanced data analytics services for the water, electric and gas industries. It has more than 80 million metering devices installed globally, and its distinctive FlexNet® communications network technology uses licensed spectrum in the U.S. and other geographies and provides secure connectivity solutions that support multiple applications.

Sensus generated $837 million in adjusted revenue and $159 million in adjusted earnings before interest, taxes, depreciation and amortization (EBITDA) in fiscal 2016, which endedMarch 31, 2016. The $1.7 billion cash purchase price is 10.7x Sensus' fiscal year 2016 adjusted EBITDA. Xylem expects to achieve at least $50 million in annual cost synergies to be substantially realized within three years of closing as Xylem extends its proven global procurement and continuous improvement initiatives into this business, with significant additional revenue synergy potential. The transaction is expected to be accretive to Xylem's adjusted earnings in 2017.

### Opto 22 Node-Red!

Industrial automation manufacturer and Internet of Things platform developer Opto 22 announces immediate availability of Node-RED nodes for its industrial programmable automation controllers (PACs), significantly decreasing IIoT application development time and complexity. These Node-RED nodes for PACs make it easier to prototype and develop applications for connecting physical assets to cloud applications. Node-RED nodes and a RESTful API for Opto 22 SNAP PAC R-series and S-series controllers are available free for download at http://developer.opto22.com.

#### Rapid IIoT Application Prototyping

Linking technology assets and services together to build IIoT applications often requires layers of complex software development and long development cycles that quickly erode IIoT application ROI. Opto 22's Node-RED nodes for SNAP PAC programmable automation controllers enable nearly anyone to rapidly prototype and develop IIoT applications with Node-RED, opening a path to quickly connect legacy physical assets to the digital world of cloud services.

#### Node-RED for IIoT

Node-RED is an innovative visual wiring tool to connect edge computing systems such as industrial automation controllers to cloud services such as Amazon Web Services™ (AWS) IoT, IBM® Watson IoT, and Microsoft® Azure® in new and interesting ways. Created by Nick O'Leary (@knolleary) and Dave Conway-Jones (@ceejay) of IBM Emerging Technologies (@ibmets), Node-RED is an open-source, cross-platform technology available on GitHub.com and npmjs.org, and is currently available for a variety of plat-

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# The *INSIDER's* August 2016 Roundup (continued)

forms, including OS X®, Microsoft Windows®, Linux®, and Raspberry Pi™, and cloud offerings like IBM Bluemix® and AT&T® Flow. Built on the popular Node.js JavaScript runtime, Node-RED benefits from a large Node-RED library—containing over 500 prebuilt and ready-to-deploy nodes—allowing IIoT application developers to leverage existing software code and deploy it directly into their applications.


"I've been very impressed with the whole Node-RED project," said Jim Turner, Senior Software Developer at Opto 22. "It's well run, polished, and of high quality, but still very practical and useful. It's been a pleasure to develop for their platform." At the time of this release, Node-RED has been downloaded from npmjs.org over 25,000 times in the last month.

### Lowering the Technical Bar

The Node-RED development environment offers a gradual and easily approachable learning curve for users of all levels and requires little to no programming skills. Instead, Node-RED takes advantage of pre-programmed, reusable code blocks called nodes. These nodes make IIoT application development simpler, easier to repeat, and faster to scale. Through a visual browser-based, drag-and-drop interface, Node-RED allows IIoT application developers to focus on identifying an opportunity and developing a solution, rather than building the components of an application from scratch.

Advanced JavaScript functions can also be created within the editor using a Function node. A built-in library lets developers save useful functions, templates, or node flows for re-use. The flows created in Node-RED are stored using the widely known JSON format, which can be easily imported and exported for sharing with other developers and applications, promoting the idea of social application development.

## aeSolutions Designs ISA Cyber Training

aeSolutions worked throughout 2015 with ISA (the International Society of Automation) to develop their new ISA/IEC 62443-based cybersecurity training and certificate program (www.isa.org/CYBERCertificate). The program is designed to help professionals involved in industrial IT and industrial control systems improve their understanding of, and acquire a command of the principles covered in, the ISA/IEC 62443 series of standards. These standards apply to all key industry sectors and critical infrastructure, providing students with the knowledge to identify and mitigate vulnerabilities in industrial automation and control systems.

Cyber class at Camp Atterbury

The entire program consists of four training courses. The fundamentals course is two days in length. Additional three day courses take deeper dives into risk assessment, design, and maintenance. All the courses include extensive high-quality hands-on labs. After attending each course, students may take an exam to demonstrate their command of the material. Students taking all four courses, and passing all four exams, are allowed to use the title ISA/IEC 62443 Cybersecurity Expert.

John Cusimano

"It was an honor for me and my team to work with ISA, to fulfill our mutual vision to develop a practical, standards based curriculum. I am particularly thankful to the ICS vendors who provided ISA with hardware, software, and support to make the hands-on labs extremely realistic," said John Cusimano, aeSolutions' Director of Industrial Cybersecurity.

ISA's Pat Gouhin

Patrick Gouhin, Executive Director & CEO of ISA expressed his appreciation to aeSolutions and stated, "You truly employ world-class subject matter experts that are shaping the future when it comes to ICS cybersecurity knowledge."

In addition to the training materials, the aeSolutions' industrial cybersecurity team created exercises to introduce students to technology such as passive and active vulnerability scanning, intrusion detection, network monitoring, industrial firewalls, white listing, secure remote access, PLC configuration management, and system hardening.

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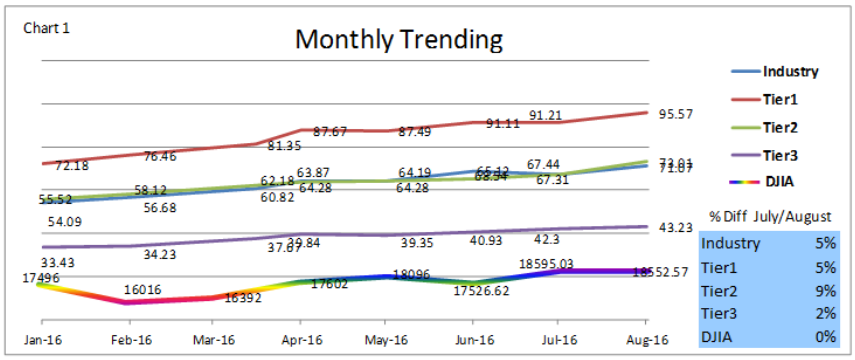


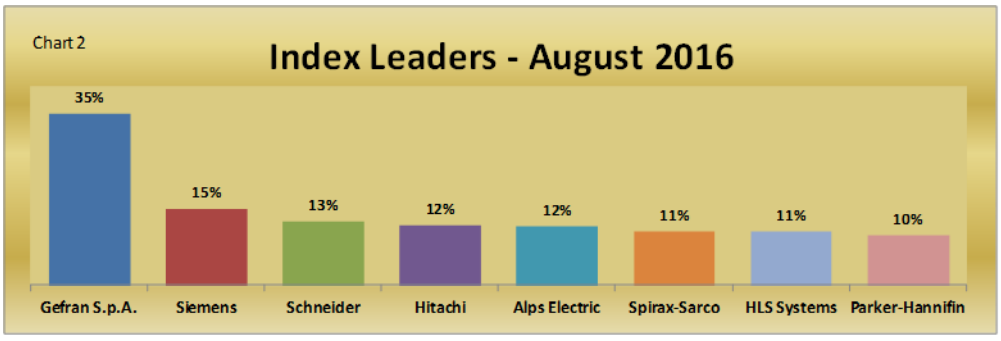

# Health Watch

## Compiled by the INSIDER staff

Our industry performed admirably since last reporting, with an overall industry index increase of 5%, compared to the Dow Jones' gain of zero for the same period.

This jump is significant in that for the first time in 2016, the Control Automation Industry Index outperformed the Dow by more than 3%.

All tiers performed well, with the Tier II portion of the Index reporting the largest average gain (8.6%). Tier III companies, overall, outperformed the Dow by 2%, but lagged behind the rest of the industry, due in large part to price volatility exhibited by some of its members. Even so, Tier III companies did well as a group and several of the individual Tier III companies showed impressive gains.




***Gefran***

Some members of the Tier III group performed very well this period. One of them, Gefran, holds the #1 position in this month's "Index Leaders" chart. Gefran stock soared an impressive 35% since last month, more than double the increases seen for any other member of the Index.

Gefran has had a hard road to travel over the past 18 months. In March of 2015, the stock was trading at 3.72€. By Feburary 12th of this year the price had fallen to 1.33€, a decrease of 64%, with very little rebound before August 5th of this year.

While several factors could have influenced the stock's rebound, a major factor was in all probability the report released on August 4 of this year by Gefran Financial Reporting Director Fausta Coffano. The report does not reveal impressive revenue gains, but does point to improvement in several financial health indicators, including increased EBIT, EBIDTA, and Group Net Profit.

Maria Chiara Franceschetti, Gefran S.p.a.'s Chief Executive Officer, is quoted saying: "The profit and the improvement, for the fourth consecutive quarter, of the main financial statement indicators shows that we are on the right track. We have carried out measures to increase the organisational flexibility (in Italy and in the subsidiaries) and the focus on business; we are now in the position to efficiently deal with the economic slowdown in certain geographic areas."

The report engenders confidence through its clear and concise reporting, showing clearly that Gefran has addressed needed issues and has a strategy for the future. To paraphrase the words of a song from the movie *Hairspray*, they obviously 'know where they're going and they know where they've been."

***Siemens***

In second place this month is one of the giants in our industry, Siemens (SIEGY). On Aug 4, IBD's Elaine Low reported that, "**GE** (GE) rival **Siemens** (SIEGY) raised its profit guidance for the year after posting solid third-quarter results." Pulling from information released by Siemens in its latest financial report, she noted that Siemens "now sees full-

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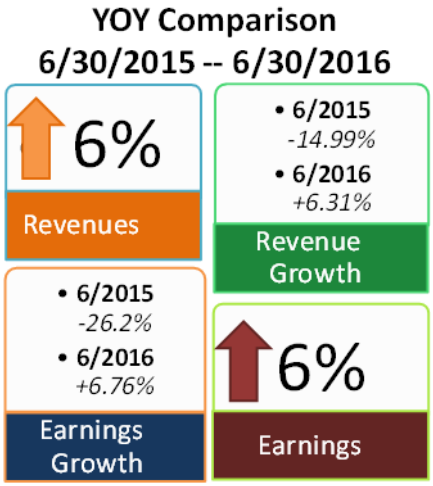
year basic per-share earnings from net income of 6.50-6.70 euros ($7.24-$7.46), up from a prior outlook for 6-6.40 euros EPS. It reaffirmed expectations for "moderate" revenue gains in fiscal 2016." CapitalCube released a Siemens Earnings Analysis on August 9 that shows impressive results. The chart below, created from information provided in the report, indicates a strong rebound that includes revenue growth that reversed from -14.99% to 6.31% YOY, and revenues and earnings which are both up 6% since the same reporting period last year.




Even better news is that Siemens said that in the third quarter, revenue growth was fueled by "double-digit" growth in its power and gas, as well as its wind power and renewables segments.

***Schneider***

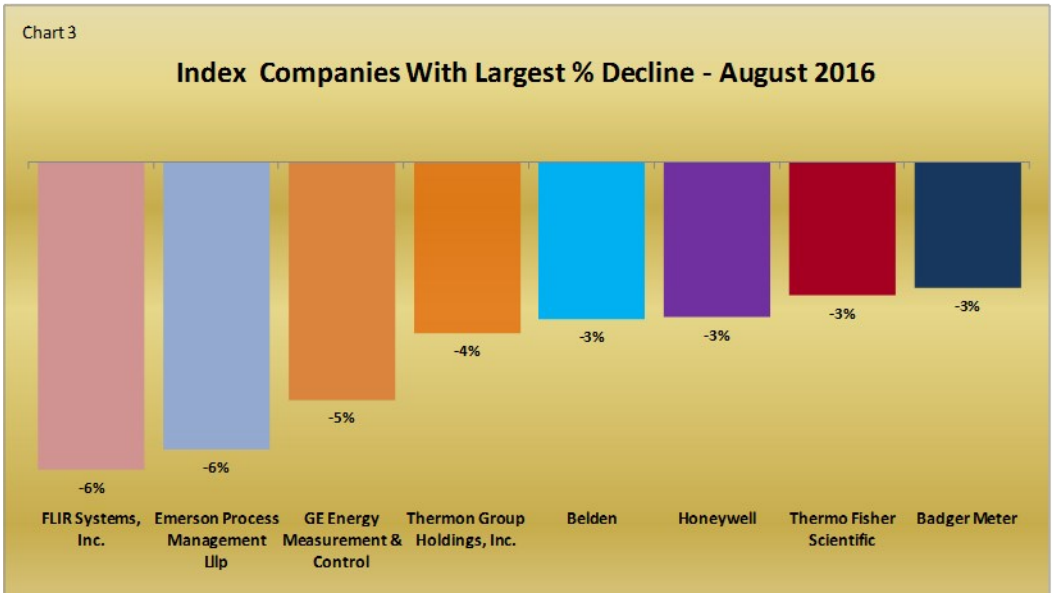
In the third position with an increase of 13% for the month is another one of our industry's giants, Schneider. Schneider's recent performance comes as a welcome relief to stockholders who watched the stock drop over 22% during the week of June 22nd.

Since that time however, Schneider stock has increased from its low of $54.10 on June 27th to $68.90 on August 25th, for a total increase of 27%.

At the other end of the spectrum are the Index members who did not perform well over the past month.

The bar graph in Chart 3 shows the Index members whose stock performed poorly.

Individual Index member losses, while present, are small compared to gains. The largest loss reported is only 6%, a far cry from losses seen by individual Index members in earlier months. The pattern of smaller losses and higher gains has prevailed since April, a strong indicator that the economy is finally improving.




To provide a comparison, we pulled the chart created for the August 2015 edition of the Health Watch for comparison. Metso currently has a much smaller role in our industry after selling the automation portion of its business to Valmet,

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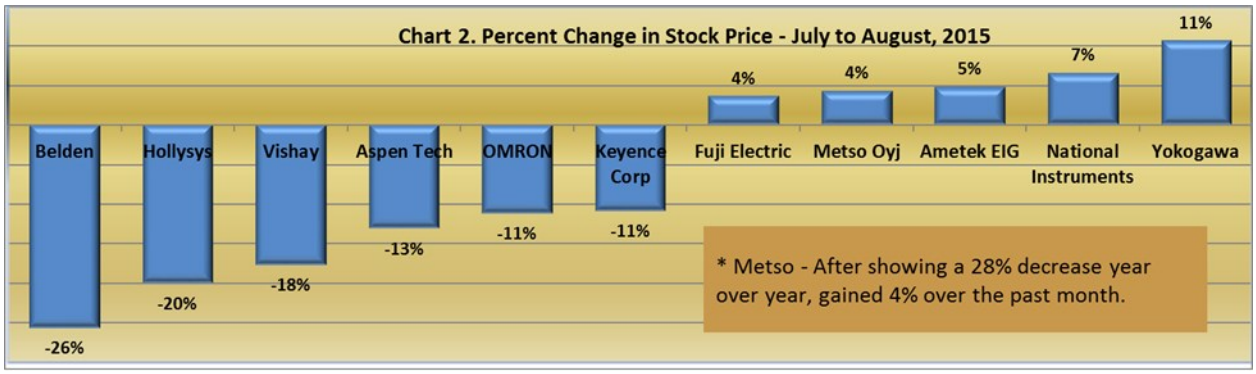
but all other companies shown are still viable players.

If that same range had been used in August of 2015, the chart would have contained 26 separate negative bars. To provide an even more startling comparison, the total percentage of losses greater than 2% for the 26 Index members who were part of this category in 2015 sums to 214. For this month, the total of percentages for companies with losses greater than 2% sums to 33. We've come a long way, baby!




performance in Qtr 2. According to a Zacks Equity Research article published July 27th, FLIR earnings once again failed by a narrow margin to meet Zacks Consensus Estimate. In addition, FLIR earnings "deteriorated almost 5.5% on a year over year comparison."

For this month's bar chart, pulling the names of all companies who posted a loss from the largest calculated difference (6%) down to -3% produced a chart containing eight names.

***FLIR***

So what's going on with the few Index members who did not show a gain over the past month? FLIR, which showed the largest loss (6.4%) was in all probability negatively affected by less than stellar

FLIR's performance for Qtr 2, 2016 varies greatly by segment. For example, net income for the latest quarter is $45.4 million compared to $50.5 million for the same quarter a year ago.

According to Zacks the fall is largely due to "a $2 million write-down of a non-core minority investment." Some segments of the company, for example the Security segment, experienced record growth of over 5% YOY and OEM and Emerging Markets rose an impressive 23% compared to Qtr 2 of 2015.

Other segments such as Detection did not fare so well (down 2.2%) and the Instruments segment declined over 13% compared to the prior-year quarter, potentially due to continued softnesss in one of their primary areas, mid-range handheld thermal products.

While FLIR Systems is enthusiastic

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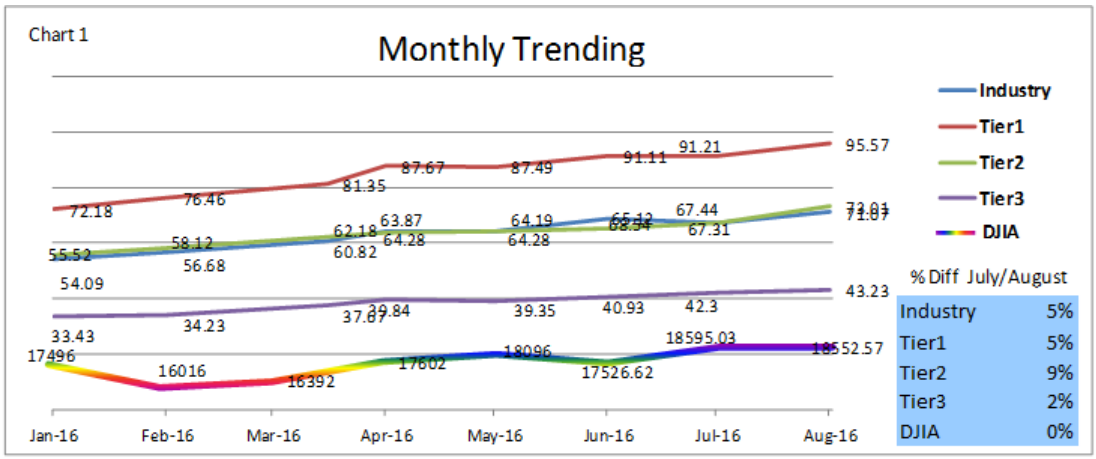


about its solid bookings and backlog during the second quarter and believes it will fuel future growth, Zacks sends a stern warning concerning this particular Index member.

They point out that "the company is currently pressurized with unusual product mix in the Surveillance segment as well as escalating costs in the Instruments and Security segment. If the product mix does not return to normal levels in the second half of the year, FLIR Systems' prospects looks bleak."

As badly as we hate to admit it, in this case we must agree with Zacks that FLIR's profitability will depend on its ability to adjust its product mix and control costs for the remainder of the year.

Emerson also fell 6% this month.

Motley Fool believes that Emerson (which it labels a "dividend aristocrat" in its August 27th article *3 Beaten-Up Dividend Aristocrats: AreThey Bargains?*) is a consistent dividend payer and a great add to one's portfolio if consistent dividend payment is the goal.

The Fool also praises Emerson for "using the down cycle in industrial manufacturing to make a $3.15 billion acquisition of Pentair's valve business." Adding a word of caution, the article points out that stagnant economic growth in Europe and slowing demand from major growth markets, such as China, have led to a 15% decline in revenue for Emerson over the past five years and while the company has been able to make up some of the difference by cutting costs and improving margins, but this can only make up for so much revenue loss.

Others are not so ready to praise Emerson for its Pentair acquisition.

The Street's August 19th article pointed out that Emerson stock slumped after the acquisition and was also downgraded to "underperform" from "neutral" at **Buckingham.**

The firm reduced its price target to $44 from $49, based on the belief that "the acquisition adds higher risk to earnings over the next several years [ in areas] such as dividend sustainability, while diluting the quality of the portfolio."

The consensus of onlookers is that Emerson, having promised its shareholders acquisitions and growth, has decided to retreat to a business (valves) that it already knows, instead of taking the risks that might be necessary for real growth in the future. With process automation finding a new bottom, and Emerson's lack of focus in the discrete automation segments like automotive, gaining more market share in a potentially shrinking market may be problematic over the long term.

The news this month is once again positive, with the industry overall performing very well compared to the Dow, and continuing to show improvement as we deal more and more effectively with the changes that have rocked the global economy and our industry for almost two years.

Congratulations to the leadership of Gefran, Schneider, and Siemens on their performance this reporting period. When we look at where we are now compared to where we were a year ago, we can be proud of the company leaders in our industry who have made some tough decisions to keep the companies they are responsible for, whole and directed in the chaos the last two years has delivered.

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# THE WAY I SEE IT
# Editorial

## What happens to open systems when the big boys say "No."?

In our cover story this month, we talked about the incredibly ambitious project begun by ExxonMobil and led by Lockheed-Martin and The Open Group. It is a project I overwhelmingly support. It is a project that will make the IIoT actually happen, if the end users of the automation world can agree and stand together to get the vendors and system integrators to agree to go along.

This is the project that will provide automation with the open systems that Peter Martin and I called for in our book *Real Time Control of the Industrial Enterprise* in 2014, and what we, at the Smart Manufacturing Leadership Coalition (SMLC) have been working on for seven or eight years now.

There are three requirements to make the IIoT (the Industrial Internet of Things) a reality. One is something we've talked about before—the reduction of sensor prices and complexity so that using many more sensors becomes practical and cost effective. One of the engineers from ExxonMobil at the Industry Day said that he believed that an over 90% reduction in the price of sensors was necessary and achievable. I won't use his name, because I don't think he was speaking for ExxonMobil.

The second requirement, actually, has been nearly entirely solved. That is the issue of security of control systems and sensor networks. More than one company has designed devices with "inherent security" or "intrinsic security" built in.

**So far, all of the big vendors have made agreeable noises toward the ExxonMobil project, but none of them have wholeheartedly embraced the idea. The reason is what ARC's Harry Forbes calls "the vendor annuity."**

The technology exists, it just needs to percolate through the industry. This will happen very quickly, too, at least as fast as the industry adopted virtualization.

The third requirement is that the big control system integrators and above all, the large control system vendors like Honeywell, ABB, Siemens, Schneider, Yokogawa, and Emerson, go along with the open system concept. Of those listed, only the Foxboro division of Schneider seems not only willing but positioned to go to open systems.

The others, and smaller vendor companies too, have at least "checkered" histories when open systems are considered.

So far, all of the big vendors have made agreeable noises toward the ExxonMobil project, but none of them have wholeheartedly embraced the idea. The reason is what ARC's Harry Forbes calls "the vendor annuity."

Vendors are extremely jealous of their installed base, because it is the fount of profit in control systems. Spare parts, software upgrades, and service contracts are the most profitable parts of control systems— to the vendor. Making it necessary for an end user to be welded to a single vendor is the traditional strategic marketing and sales objective of the control system vendor.

In the past, vendors have resorted to sometimes convoluted ways to maintain their "annuity." There was the OPC open standard, which was only open if you used a particular vendor's version of OPC, and then only open to that vendor. There were the fieldbus versions that were not quite compatible. There were the control systems with nearly secret APIs so that they weren't really open, even though claimed to be. And in the past, end users have been more than willing to roll over for a few bucks off the price.

So, what are we going to do when the big boys say "No!"?

Comments? Talk to me!
waltboyes@spitzerandboyes.com

Read my Original Soundoff!! Blog:
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## Rajabahadur V. Arcot: Automation suppliers can look to emerging and developing Asia for growth

Large sized economics, such as the US, countries in Europe, Japan, and China, have been the major markets for automation suppliers. China, emerging as the manufacturing hub of the world and as the global growth engine, provided significant support to the robust growth on the automation market in recent years. However, economic slowdown in China and stubborn sluggishness in the global economy are matters of concern for automation supplier companies. In the coming years it will be the turn of the emerging and developing Asia countries, comprising of China, India and ASEAN – 5 countries (Association of Southeast Asian Nations - Indonesia, Malaysia, Philippines, Thailand and Vietnam), to spearhead the revival of the global economy. More importantly, from the automation suppliers' perspective, all these countries depend significantly on manufacturing to drive their economies. Within the region there are global sized automotive plants, auto component firms, oil refineries and petrochemicals, cement plants, pharmaceutical units, semiconductor and electronics manufacturers, textile and garment firms, and such others. Additionally, large investments are taking place in establishing new grassroots plants and building world-class infrastructure facilities in these countries.

**...the recovery will be driven primarily by emerging markets and developing countries. They will account for the lion's share of projected world growth in 2016...**

The International Monetary Fund's report "World Economic Outlook April 2016" highlights the fact that despite desperate measures such as negative interest rate and quantitative easing, the global economic growth prospects continue to remain muted in developed economies and says that the economic recovery continues "but at an ever slowing and increasingly fragile pace." It has revised down the baseline projection for global growth in 2016 to a modest 3.2 percent. The growth is too slow and the world has been experiencing economic stagnation far too long! IMF expects the trend to reverse only next year and the global economic growth to inch up to 3.5 percent and the recovery to strengthen.

According to the report, the recovery will be driven primarily by emerging markets and developing countries. They will account for the lion's share of projected world growth in 2016 with prospects across various other countries remaining uneven and generally weaker than over the past two decades. While the overall emerging markets and developing countries are expected to post a growth of 4.6 percent in 2017, emerging and developing Asia comprising of China, India and ASEAN – 5 countries will remain the fastest growing. In 2017, emerging and developing Asia, as a region, will expand at 6.3 percent with India growing fastest at 7.5 percent and ASEAN countries growing at 5.1 percent.

The report "Asian Development Outlook 2016 - Asia's Potential Growth" also finds that on the whole the growth in developing Asia will be driven by India and ASEAN countries. The report says that the "solid growth in India and a pickup in aggregate growth in the ASEAN will help balance continued growth moderation in the People's Republic of China (PRC)." The region will contribute to around 60 percent of global growth in the next 5 years, close to its contribution in the past years.

ADB expects India's growth momentum to be maintained at 7.4 percent in 2016 before picking up to 7.8 percent in 2017. Strong public investment, reforms aimed at attracting more foreign direct investment, and strong macroeconomic fundamentals are contributing to the GDP growth in India. Aggregate growth in the ASEAN economies, is expected to be led by Indonesia as it ramps up investment in infrastructure and implements policy reforms that spur private investment. It is forecasted to accelerate from 4.4 percent in 2015 to 4.5 percent in 2016 and 4.8 percent in 2017. While

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# Rajabahadur V. Arcot: Automation suppliers can look to emerging and developing Asia for growth

## (continued...)

robust consumption and investment will provide a lift to the Philippines economy, Thailand's recovery is expected to gather momentum and Vietnam will be sustained. In contrast, Malaysian growth will slip further with low oil prices and weak external demand. The OECD's report Economic Outlook for Southeast Asia, China and India 2016 provides a comparison of growth prospects of China and India. It points out that, while "China's economy slows, India's growth remains robust over the medium term." "Continued investment in infrastructure in China is helping to support overall investment, though this stimulus is unsustainable in the longer term. Growth is slipping elsewhere as adjustments are underway in manufacturing to manage longstanding challenges from excess capacity." India, on the other hand, is seeing increased investment rates, thanks to public infrastructure development and private investment motivated by improvements in the business environment. It adds that "private consumption is also increasing in India, thanks in part to higher wages and improved benefits for public sector employees." The report also highlights that despite growth moderation, the China continues to account for about a third of global growth in 2015, almost the same as in 2010 when its then smaller economy was growing by double digits.

**These reports indicate that the demand is picking up; that augurs well for India's economy. It is an indication that things are moving in the right direction, when companies begin to produce more, post good topline and bottom line growths, and improve their order book positions.**

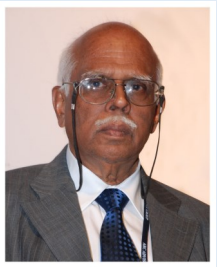
The New Global Growth Projections prepared by the researchers at the Center for International Development at Harvard University (CID) based on their research believe that India has the potential to be the fastest growing economy over the coming decade (2024). India tops the global list for predicted annual growth rate for the coming decade, at 7.0 percent. The researchers developed and used a measure of economic complexity, which captures the diversity and sophistication of productive capabilities embedded in a country's exports, to generate the growth projections.

Some reassuring developments and trends in India, a country that is expected to be the best performer in the economically troubled world, are the following. Recently India adopted the Goods and Services Tax (GST) system that many dub as the greatest tax reform by India. Analysts estimate the national GDP growth rate to go up by one percent as a consequence. GST does away multiple-taxation regime and replaces it with a more seamless and efficient single point taxation system. Capital goods prices would become significantly cheaper and therefore lower the project costs. It will also reduce logistics cost and help manufacturing companies to come up at places that have comparative advantages rather than locational advantage alone.

The Manufacturing Purchasing Managers' Index for the country rose to a four-month high of 51.8 in July. According to the Nikkei India report that tracks India's PMI index, "the performance of India's manufacturing economy continued to improve in July, with a stronger expansion in new business contributing to faster increases in output and buying levels." Some other highlights are that the overall increase in output was led by producers of consumer goods followed by intermediate goods category and that the growth of new export orders climbed to a six-month high.

There is good news in the recent data released by Commerce and Industry Ministry. It shows that the eight core industries - coal, crude oil, natural gas, refinery products, electricity, fertilizer, cement and natural gas – achieved a cumulative growth of 5.4 percent during the quarter April – June 2016. These sectors account for 38 percent weight of items included in the index of industrial production. Yet another good news come from the April – June quarterly performance of some 400 odd companies. According to a report in a leading business daily that appeared recently, after several quarters of relatively tepid growth, the companies' net sales grew by 2.3 percent in the quarter under review, compared to the same quarter last year. Their adjusted profits went up by 11.6 percent. The report also highlights that numerous companies have witnessed double-digit growths in both sales and profits. These reports indicate that the demand is picking up; that augurs well for India's economy. It is an indication that things are moving in the right direction, when companies begin to produce more, post good topline and bottom line growths, and improve their order book positions. Adoption of efficient single point taxation system, PMI at four month high, core industries' growth, and encouraging news about the quarterly performance of companies and overall industrial sectors are positive indicators of India's economy.

**Rajabahadur Arcot is an Independent Industry Analyst and Business Consultant, and** Director Asia Operations for Spitzer and Boyes LLC**with 40 years of senior management experience. He was responsible for ARC Advisory Group in India. Contact him at rajabahadurav@gmail.com**



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