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Your key to the latest industrial automation and process control information

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Calibration Practices in the Age of the Industrial Internet of Things

August 2nd and 3rd brought together a dedicated group of experts and trainees for the 4th Annual Beamex Interactive Calibration Best Practices Conference. Held at Harvard University, this conference not only provided a hands-on look at Beamex's calibrators and software, with training, but also provided a select group of highly experienced measurement and control professionals from a variety of walks of life. George Lister, from Del Mar College in Texas, drew on his lifetime of experience to talk about whether or not it is time to calibrate your calibration program, not just your instruments.

Harvard Faculty Club

George Lister

Cory Peters

Cory Peters, chief metrologist of Exelon Power Labs, talked about the systems he has developed to build successful calibration programs that can even be operated across an entire fleet of assets.

Hunter Vegas, from Wunderlich-Malec Engineers, who recently co-published his first book with the famous Greg McMillan, "101 Tips for a Successful Automation Career", gave a robust discussion of things that can go wrong in automation systems, and what to do about them. He probably could have gone on for several hours with his tips.

Hunter Vegas

Jody Damron, currently masquerading as a "business analyst", whatever that is, for Salt River Project, is one of the most knowledgeable professionals on calibration standards in the world. As co-author of ISA77.70.01, and committee chair, he has serious chops in the world of calibration. He talked about creating a calibration system people actually like to use. Imagine!

Jody Damron

Mike Uhrin

Michael Uhrin, associate director of engineering compliance and technology for Boehringer Ingleheim, one of the largest privately held pharmaceuticals companies in the world, talked about a risk based system for meeting regulations and quality standards. There are some things you needn't do, but there are things you must do if you want to maintain a standards-qualified manufacturing environment.

Other speakers included Jun Bautista, from American Gage, and Ned Espy and Roy Tomalino from Beamex.

The *INSIDER's* Walt Boyes keynoted the event, and we've reproduced his speech here.

Calibration Practices in the Age of the Industrial Internet of Things (continued)

Walt Boyes

As was said, I'm Walt Boyes. I've been doing this through ... There was a sign up earlier that asked what was the first thing you ever calibrated, and I said, "Well, that's easy. I remember that." When my dad gave me the opportunity when I was 12 to work in his instrument shop or mow lawns, my mother didn't raise no fool, and I started working in the instrument shop. The first thing I calibrated was a Foxboro 12 inch circular chart recorder. I remember that vividly because it was an incredible pain in the ass to calibrate.

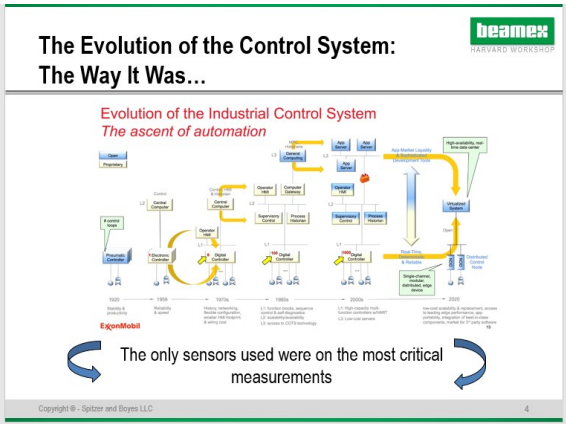
I've done a lot of things. My first jobs in this industry were as bench technician and field service engineer. Those of you who do those jobs ... How many of you do those jobs or have done those jobs? Yeah. It's fun, isn't it? Now I have bad knees, a pot belly, and I don't do that stuff anymore. It's a real interesting ... It's kind of like you can't keep me out of plants, you can't keep me away from instruments. It's in my blood, kind of like a virus. I'm sure it's all the same to you all.

A little bit about what Spitzer and Boyes does: first, we're publishers. We publish the Industrial Automation and Process Control Insider, which happens to be the only publication in the automation business that carries no advertising at all. It's a subscription based publication. If you want a copy to see what it looks like, flip me your business card sometime in the next two days, and I'll make sure that you get a copy of the July issue.

We are also strategic consultants. We work with a lot of different companies to help them figure out what they are going to do in the future because I'm a practicing futurist. I'm a member of the Association of Professional Futurists. I took Jim Pinto's place at APF when he retired. We generally help consult on a variety of different things, including mergers and acquisitions, marketing and sales strategy, we help companies find technologies, we help companies who have a technology find a market for it. We do technology due diligence for mergers and acquisitions. We do forensic engineering, which is lots of fun. The lawyers call us to figure out what's really going on, and then we testify about it. We've done a lot of strange stuff with forensic engineering.

Somewhere between a third and a half of what we do is content creation. We write white papers for people. We produce reports for people. We write blog posts for a lot of companies who don't have time to blog their own. We actually have to know something about what we're talking about. It's an amazing thing. We've written a whole series of books that are called the Consumer Guide series. The one in the picture is the Consumer Guide to Differential Pressure Flow Transmitters book. There are about 13 of those books. That's a sample of what we do at Spitzer and Boyes.

What we're going to talk about is calibration in the age of the Industrial Internet of Things, which means, of course, we're going to talk about the Internet of Things and what all the issues are going to be faced by people who are responsible for calibrating all those "things."



The evolution of the control system ... The way it used to be, it originally started out one stage further to the left there, where you had a dial indicator or other sensor indicator and a calibrated guy with a box wrench turning a valve. That was the first smart transmitter because the guy knew what he was doing. At this temperature reading, he gave just a little tweak. When the temperature went up to here, he'd give it another tweak because he knew what the temperature was supposed to be.

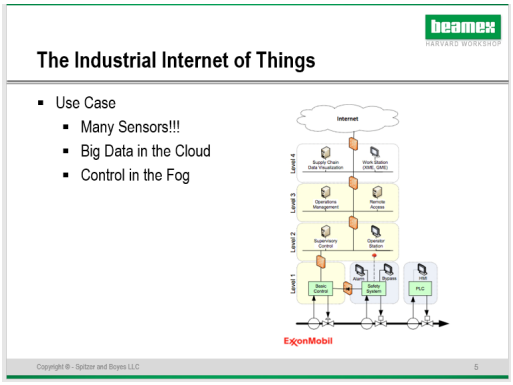
Then, in the 1920s, Foxboro produced the first single loop controller. They thought it would be really, really cool if they could have more than one sensor generating values in kind of a matrix. They found out that with a pneumatic transmitter, you can't do that. They had to pick one value, one PID,

Calibration Practices in the Age of the Industrial Internet of Things (continued)

that you could use to get the biggest bang for the buck. If you change this value, then the process does this, and that's the biggest value per unit change that you can get. Thus they created the single loop controller and the PID loop algorithm.

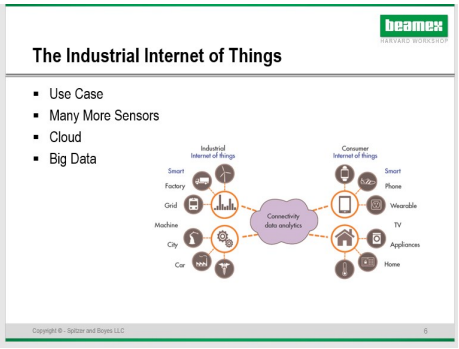
How many of you have calibrated pneumatic instruments? Those are more fun than just anything, aren't they? Then we went to what they call central computer and electronic controller, which still used a single loop control, one loop per variable. If you'll notice, going all the way through here, it's still one loop per variable. We went all the way from a calibrated guy with a box wrench all the way up to DCS's scada systems and things like that.

Now we have single channel modular distributed edge devices. Do you want to hold ... Are those Charms there? Yeah, you want to hold one of those up? That's a single channel modular distributed edge device. It's what you connect your single sensor, which measures a single parameter to so that you can send signals up to the DCS and get a control value back so that the final control element moves. In other words, we've become much more sophisticated at this level above the sensor level. At the sensor level, we haven't changed very much in what we expect the sensor to do since the 1920s really. Since that's almost 100 years ago now, it's probably about time that we do something about that and make some kind of a change.



What the internet of things does is it changes the basic control system, the safety system, and associated PLCs and HMIs and things like that, into a single system very quickly so that the data goes up the chain from level one to level two to level three to level four, and it's in the cloud, very straight forwardly.

The use case is that if you have many sensors reporting to the cloud or to a matrix style controller, you can have higher accuracy than if you have one sensor on that single variable. The higher accuracy is debatable, but certainly you get better repeatability. In control situations, you want high repeatability, whether it's accurate or not. Does everybody follow that? Repeatability is much more important than accuracy. In order to that you, you have to have many sensors. This is the idea about the internet of things. You give everything the ability to be smart and the ability to report back its data. Instead of 5,000 sensors in a plant or 10,000 sensors in a very large plant, you may have 100,000 sensors or a half a million sensors that you're bringing all the data in.



This is going to really change the way we use data, and the kinds of data we use. This does a lot of things for you. As you can see in the figure, you can bring in medical data. Is your guy upright in the plant? You can bring in data that says he's taken a fall and go find him. You can bring in data from gas sensors. Did your guy just walk into an atmosphere that doesn't have breathable air? You can bring in data from automobiles, from the city, from machines, from robots. You can bring in data from the grid, from your factory, throughout all of the Industrial Internet of Things, and also the consumer Internet of Things.

Now, of course, the problem with this that there's been a lot of resistance, both on the industrial side, which is a little more difficult to understand, and on the commercial side. A lot of people don't want Siri and Alexa and the other personal assistants helping you because they are afraid, with some reason, that those personal assistants will be reporting back to Google and Amazon and Apple all the things that you have said or bought or what you are discussing in the privacy of your home or office. People are really concerned about that, so they've stopped buying ... The earliest adopters have bought those things, and they haven't gone a whole lot further than that. And then there's cybersecurity….

Everybody knows about the Nest thermostat, the wireless thermostat? Nest sales have plateaued. About 10% of households in the United States have Nest thermostats, and sales have just absolutely flat lined. The reason is because of cyber security concerns because when you have all these instruments ... The idea behind the internet of things is that you have lots of sensors. Not just the typical process variable sensors in a plant, but you have lots of sensors, humidity, temperature in the plant, outside temperature on a pressure vessel. There's all kinds of things that you now can bring in to your data, whether it's a personal cloud or a local cloud that's owned by a

Calibration Practices in the Age of the Industrial Internet of Things (continued)

company or a public cloud that is in the internet somewhere.

The reason for doing that is of course to have data analytics. It's what we call Big Data. Big Data operates in the cloud, whether it's your cloud or somebody else's cloud. Big Data takes vast amounts of data and finds previously unexpected correlations between datasets. For example, you get an idea that your production of something may be tied to the outside temperature. You use Big Data to find that out. The way you do that is to have lots more temperature sensors, lots more temperature sensors. Of course, the problem with Big Data is you have to understand what you're looking at before you do it.

Honeywell Aerospace did an interesting study a few years ago when Big Data first became popular. They called in a data analytics firm, and the data analytics company said, "Oh, yeah, sure. Give us the data." They gave them five years or so worth of data from airplanes landing and taking off. Just huge amounts of data, many, many, many landings, and after a couple weeks, the data scientists came back and said, "We have noticed that airplanes come in in kind of a stepwise pattern, and they land like this. It would be far more efficient for them to land on single glide slope." The Honeywell people said, "Hmm, thank you very much. The reason they come in this way is aircraft safety because they have to miss outgoing planes. There're actually lanes in the air, even and odd altitudes, depending on where you're going."

These people didn't have any idea of what they were looking at, but they found a correlation that they thought was significant. Remember, correlation does not imply causation. How many of you proved that on day one of your first statistics class? Correlation does not imply causation. There are going to be all kinds of interesting changes when we start to do this, and it's not a question of whether we do it. It will happen.

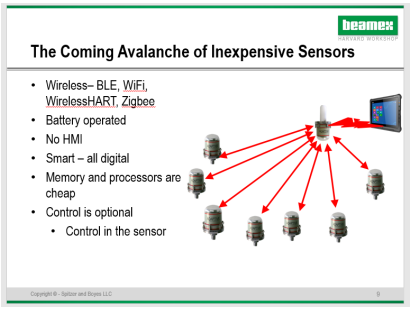
What happens is many of these new sensors will go directly to the cloud to data analytics systems. They will go to historians and other data management systems. They will go directly to asset management systems. They will also go to the control systems. In some cases, the sensor will be smart enough to do totally local control. Those of you who went through the fieldbus wars, we actually are going to have control in the field now, whether we need it or not. That's probably a good thing because there's a lot of things you can do with local control that you can't do with supervisory control or control through a DCS.

This is going to mean, though, that sensors are going to be designed quite differently ... Budgets for sensors are going to have to skyrocket, or sensors are going to have to become much less expensive, probably as much as 80% less expensive. Now, when I say this, all the big sensor vendors go nuts because the margin that they make on sensors is the highest margin they make in their company. A pressure transmitter, for example, is generally designed to have a 60% gross margin at list price. That's a lot of money.

You can imagine how much fun somebody like any of the large transmitter manufacturers has, when I say that the cost of transmitters is going to have to come way down in order to implement the Industrial Internet of Things. It hits them right where it hurts, right on the bottom line. They are not at all happy to hear that. Their defense is yes, but these are very high accuracy sensors, and they are stable. They don't need to be calibrated more than once a year. You just need to buy an expensive sensor because ... Well, yeah, okay, because.

What is this going to do to sensor design, this Industrial Internet of Things? There's a lot of uses for sensors. We're going to see a whole lot of sensors. Class I, Division 2 is basically going to go away. The EPA has done a tremendous job, and so has HSE in Great Britain and the other environmental agencies around the world, in reducing fugitive emissions. Fugitive emissions are what cause Class I Division 2 areas to become hazardous. They're normally not hazardous. When you add a fugitive emissions leak, they become hazardous, but only as long as the leak is there. If you have a good fugitive emissions chasing program, you can see how unnecessary sometimes Class I Division 2 areas are.

People are already beginning to make some of those areas general purpose areas, which means you can use much less expensive sensors because you don't have to have a Class I, Division 2 housing, you don't have to have any number of things like that. You're going to have lots and lots of sensors, and they're going to be lots cheaper. This particular sensor is a Bluetooth pressure transmitter. It is a broadcast, low energy, Bluetooth, so it's designed to once a minute, report the pressure. It sells for $100. It's accuracy is about 2%. It's repeatability is a half percent.



Calibration Practices in the Age of the Industrial Internet of Things (continued)

Where could you use this where you are now using one of those? Lots of places. There's lots of places where you didn't really need the value enough to put a sensor in. Now, you can afford to do that because of what is coming. You're going to see data broadcast to the cloud, where people can use it. You're going to see, in some cases, control from the cloud. Honeywell introduced a cloud based SCADA system last month. They usually don't want you to use it when you're operating something that makes a lot of boom if it goes up. You wouldn't want to use that, for example, to control an oil refinery, but there's a lot of things that you can use it to control, wind turbine, solar energy farm. There's all kinds of things that you can use to control from the cloud.

There's also control from the sensor. One of the things that is happening is at the same time that sensors are coming down in price, memory, storage capacity, and processor power are getting so huge that people are putting large sets of memory in simple transducers. For example, every one of these devices here has 64 Gigabytes of memory. It has the capability of storing over 15 years of individual readings. It's smart enough to do a whole bunch of diagnostics that most instruments are not able to do. They report by Bluetooth to this device up here that is a HART transmitter. You only have to have one HART transmitter for about eight of these other devices. That's neat stuff that's coming.

You're going to be able to do control directly from the sensor. You're also going to be able to put sensors in subnets so that you can do matrix control directly from the field. In other words, you're going to be able to do advanced process control whenever it is that you want to. Sensors are mostly going to be wireless, and many of them are going to be battery operated. This is interesting because remember I said you might have as many as 20 or 30,000 sensors on your plant? That also means that you'll have 20 to 30,000 batteries that you have to change. This is slowing down the uptick in wireless transmitters because how many of you in your instrument shop have somebody that you can dedicate to go out and change batteries all day, every day? I don't see any hands.

I believe that. I don't think there's anybody that can afford to do that. When maintenance manager finds out that he's got 10,000 new batteries that he's got to change every two to three years at the most, and sometimes as many as eight months to 18 months, he tends to want to slow down here, want to slow that down a little bit because I don't have the people to do it.

Sensors don't need HMI either, which is really kind of cool because how many of you have been out in bright sunlight, squinting at a two line by 40 character LCD display, and it's hot enough that the display is kind of sort of trying to turn black? Yeah. You don't need to do that. It's got great display. All you have to do is to use what's currently available. People are starting to do that. Sensors don't need HMI. HMIs are already out there, and those HMIs are significantly better than what you can get in a sensor mounted display.

Now, what about controllers? How many of you know what a Raspberry Pi is? How many of you have a Raspberry Pi? There's a few of you. Raspberry Pi is an extremely inexpensive programmable computer. It was designed to be an all-purpose, single board computer for hobbyists, and it's now being used to produce controllers for industrial HVAC and a whole bunch of other uses. In fact, you can go to Pepperl+Fuchs and a couple of other box manufacturers and buy a NEMA 4X box to put your Raspberry Pi in. Raspberry Pi is also now available in industrially hardened versions. Raspberry Pi, of course, comes with a really neat HMI. Your cellphone, tablet or computer.

You can see that what you're going to get as instruments over the next few year is going to change really dramatically. Raspberry Pis cost, what, $35, something like that? Let's say that the box cost $40, and your HMI is free because you download it from the app store. Your transmitter cost $100. Now you're looking at a control loop for pressure, cost you $170. What does a typical control loop cost if you're using an old fashioned single loop controller, which are still made? Pressure transmitter is $1,500. A single loop controller is $2,000. What are you going to do? In a lot of cases, you're going to go to the raspberry pie loop with a simple, inexpensive sensor. This is going to happen because the cost differential is too much for it not to happen.

The question, of course, is how is all this stuff going to work for you? What is it going to do? This is a complete wireless sensor suite. It's manufactured by a client of mine up in Hudson, Massachusetts. It's battery operated, has no HMI. It's smart, all digital. It has 64 Gigabytes of memory in each one of the sensors. It can do things like time and date stamp every value so that you can track and trace directly from the instrument. Controlling the sensor is optional. Memory and processors are cheap. People are beginning to look at doing this kind of sensor. Oh, and by the way, these sensors are relatively inexpensive.

I've been working with a couple of manufacturing companies about what the design criteria are going to be for sensors in the 21st century. Number one, they're going to be very simple. They don't need an HMI. They don't need a lot of things that we consider absolutely necessary, and they're going to be throw-away because bat-

Calibration Practices in the Age of the Industrial Internet of Things (continued)

tery technology is improving to the point where instead of going out and replacing batteries in wireless sensors, you just take a new sensor out there. It's just as cheap to replace the sensor as it is to do anything else.

They're going to be inexpensive, but they're going to have the same gross margins. Now, what does that mean? Well, it means that in order to make the same amount of money, you have to sell a whole lot more sensors. Companies are going to be pushing sensors. Instead of control centered control systems, we're going to have sensor centered control systems, and we're going to be doing control in a whole different way to do it. Sensors are going to be all digital. They're going to have powerful processors that can do all kinds of things, including run self-calibration algorithms, run diagnostics, maintenance, and things like that. They're going to have very large memory. They're going to be designed primarily for digital outputs with wireless HART, ISA 100, ethernet, MQTT, which is a really interesting protocol that IBM is pushing, and OPCUA, and a whole bunch of other digital data outputs. Four to 20 milliamps is now going to become optional. In a lot of cases, you won't buy something with a four to 20 because you don't need it.

Analyzers are going to go the same way. At dinner last night, I forget who it was that was telling me about a company that they had just visited, Ned was telling me, a company that they had just gone to, which makes a blood analyzer that's about the size of a penny. Instead of taking three days to come back with a complete blood spectrum analysis, it takes three hours. You can get it right there in your doctor's office. That's already FDA approved. That's going to radically change the way analyzers are made. You're going to see new sensors. You're going to see sample cells that work, don't clog, and in some cases, sample cells that you don't need anymore because you'll be able to just stick the sensor directly into the flow of gas or liquid, the same way that you do with a PHer, ORP, or connectivity cell.

Again, they're going to be inexpensive, all digital, large memory. All of that stuff is going to be true for field analyzers, just the same as or temperature, pressure level flow. It's all going to be the same requirements.

What do you do with many, many more sensors? Well, from a calibration point of view, let's look at that. Calibration takes time, and it's a finite amount of time. It takes, I don't know ... How many are comfortable with an hour to calibrate a pressure transmitter? Half an hour? An hour. How do you deal with this if you have hundreds of pressure transmitters in the field now instead of tens? That's hundreds of hours of calibration time instead of tens of hours' worth of calibration time. The more sensors you have, the more time you have to devote to traditional calibration methodologies. The more sensors you have, the more time you need, the more technicians you have to have.

Well, current standard calibration procedures will be unsupportable because the more time in technicians is more cost, and your companies are simply not going to agree that just because they bought a whole bunch of new sensors, that you have to calibrate them. You need actually the number of people to actually do that. You don't need that. You can do it with the people you've got. Just put people on double shift. You can do that. No problem, right? What happens when a set of practices becomes unsupportable? You have to change them because you can't keep doing what you've been doing all along. You can't. You have to figure out what else you can do to make sure this works.

Sensors will either work or fail in the future because they're all digital, you won't get a lot of sensor drifts or partial fails. You will get sensor drifts like .00001 percent of full scale over a year, or two more zeros percent of reading over a year. In other words, you can't tell the difference from a functional point of view. It would be nice if you could calibrate them all, but unless you have a very serious laboratory situation, where you have a full blown metrology lab, and you have to calibrate all this stuff on a very regular basis, you simply aren't going to calibrate them anymore.

Because they're very smart, they can report their own sensor drift. If you've got 64 Gigabytes of memory to correlate readings within, you can have an algorithm that will help you determine drift. When drift gets out of parameter, it sends a flag to the maintenance department to come change the sensor. You can try to recalibrate the sensor on the bench, or you can just do what a lot of people are going to be doing, which is throwing it in the dumper. Because if it's $100 to buy a pressure sensor, is it worth recalibrating it when it dies? Probably not. One of the things that's really going to happen ... Is thing plugged in? It says plug in or find another power source. Well, we'll get there. …

Data collection is all going to be by wireless, and that's going to happen fairly quickly because there are 35 or 40 million HART sensors out there, and it costs about $600 to make those sensors wireless HART. You can put an adapter on those sensors so that it will become a wireless HART device so you can get all of the diagnostics out of it. That's way cheaper than putting in another wireless HART device. In some cases, those things won't need batteries because those are all HART devices that are powered, so you won't need to change the batteries on them.

Calibration Practices in the Age of the Industrial Internet of Things (continued)

Data collection is all going to come by wireless. You're not going to be able to do manual calibrations. You just will not be able to go out with a clipboard and a calibrator and a test meter and go, "Hmm, I probably ought to calibrate this thing," and do your calibrations. You can't afford it. You're not going to be able to afford it. It's becoming difficult to afford to calibrate. How many agree with this? It's becoming difficult to afford to calibrate all the instruments you have already? It's not impossible yet, but supposing you have three times the number of instruments and the same staff. What are you going to do? You're either not going to calibrate those instruments, or you're going to figure out a way to calibrate them on a much more automated basis. You're going to have to re-think the best practices you have now.

Absolutely essential is going to be calibration software that allows you talk to multiple instruments and get data out of those instruments, directly into an asset management system. It's going to be critical to have that. The old calibration method of five by seven cards in a shoebox just isn't going to work anymore. It simply not feasible to do that. You're going to have to have calibration software, and it's going to have to be very sophisticated calibration software. You're going to have to have smart enough instruments to take full advantage of the calibration software that you're using. You're going to have to have calibration software that is designed to plug and play with all sensors. You're going to have to …

Because if you have a set of sensors that doesn't talk to the calibration software and doesn't talk to asset management system, why did you buy those? Why are you using them? Why don't you throw them away and get something that works because it's far cheaper to do that then to have people running out to calibrate dumb instruments. You just don't do that. Calibration software has got to be plug and play with all the instruments that you have.

In the future, we're going to look at least automatic sensor checking for drift, for maintenance, for failure. As I said, most digital sensors either work or they fail. That's going to be very useful in the future. It's a nice byproduct of digital transmitters. They're either going to work real well, or they're going to fail. There's none of this, "Oh, it's kind of sort of working. No, we better go out and look at it as it drifts away." You're not going to have to do that anymore. You're going to have matrix sensors, and you're going to have to have matrix calibration techniques.

If you have a 50 by 50 sensor matrix, and two of the sensors go dead, what happens? Statistically nothing. You've still got 48 sensors that are in the matrix that you can average or take the mean of or whatever you want. That's going to mean that you have lots of backup, and you're going to be able to play without a full deck, if you will. You're going to have automatic diagnostics. You're going to have automatic reporting. Sensors are going to say, "This reading is squirrely, come look at me," because it knows that usually they have a steady state, and then it goes like this, and then it comes back up. There's a problem here. They don't know what it is, but they know there's a problem. As they get smarter, they're going to actually know what the problem is because you're going to be able to put in AI use cases so that they know what's going on.

Sensors are going to write their own work orders. They're going to say, "I have a leak. Come fix me." They'll write their own work orders, and somebody will go out and replace the sensor, generally speaking.

You're going to have to have longer times between calibrations. As the number of sensors geometrically increases, for the industrial internet of things, you simply can't afford to have six month or one year calibration intervals. You cannot do it. You will not be able to afford to do it. What you'll have to do is triage your sensors into important first tier sensors. They get calibrated. Second tier sensors get calibrated when they look wonky. Third tier sensors don't get calibrated. They simply get replaced if there's something wrong with them.

That's going to bring the cost of doing calibration back in line with what it is now. People are going to have to think about that.

You're going to have to think about whether you need a tenth of a percent accuracy or one percent accuracy. Can you live with one percent full scale, or do you need a half a percent a reading? In a lot of cases, you don't need the level of accuracy that vendors are selling. What you need is the level of repeatability that your process needs. That could be two to five percent repeatability, and the process works just fine. You don't care what the accuracy of the sensor is, as long as you get that repeatability number that's somewhere in that one to five percent range that you really want.

Once you have come to these new realizations, you will see what calibration is going to look like in the future. There's going to be longer times between calibrations. You're going to see a lot more things like that. You're going to see sensors that are smart enough to do a lot of the stuff that we have to do with them. The future is going to be really interesting from the point of view of what sensors are going to look like and what the future of calibration is.

The *INSIDER's* July 2017 Roundup

Investing in Cyber Security Is Not Always a Rational Choice

By Joy Ward

This is the first in a series on Cyber Security. We will be looking at it from many perspectives over the next few issues. This article in the series covers the basic understanding of why cyber security initiatives often are not implemented, or when implemented, fail.

With the growth of ransomware and other malwares and the increasing focus of state actors on industrial control systems, you would think that the most obvious thing in the world would be to invest heavily in cyber security protection for industrial enterprises. I am about to bust your bubble!

Whether or not to invest in cyber security is heavily influenced by emotional motivators and barriers, and not engineering or financial reasons. Engineering and financial reasons, actually, are developed from, and motivated by emotional states, and are not, at bottom, rational at all.

This month, Merck was hacked so badly, in both IT and OT spheres that it may be six months or more before their production lines are fully back in operation. Yet we don't see the phones ringing off the hook at cyber security vendors' offices.

We all know we should protect our professional and personal cyber worlds. We have seen a number of high profile cyber security failures recently yet how many companies still do not put cyber security at the top of their financial priorities. Even companies like Merck where cyber hacks can mean hundreds of people injured or dead, thousands without service and millions of dollars lost, these same industries are often woefully unprotected.

Cyber Security is intimately bound up with the Internet of Things (IoT), and its commercial and industrial cousin, the Industrial Internet of Things (IIoT). In both its consumer and industrial versions, IoT posits a vastly increased number of "smart things" or "smart sensors" which will report to databases and control systems. By inspection, if you start looking at orders-of-magnitude increases in sensors and other edge devices, you are also looking at orders-of-magnitude increases in the threat surface of your networks that all these devices are connected to. This should have made executives and engineers alike make Cyber Security a very high priority. But this hasn't happened. Why?

On the IoT consumer side, sales of Nest thermostats and other home automation products have flatlined, even though power companies are practically giving Nest instruments away and Amazon and Google have spent millions advertising Siri and Alexa as virtual assistants.

Both in industry and in the home, the resistance to these "helpers" and "smart instruments" is rising. The early adopters have put them in, and now the markets are stagnating. The question is, "Why?" But when potential purchasers, whether in the home or in the plant, are asked why they aren't buying, they duck the issues and give answers that are clearly smokescreen. In short, consumers and industry professionals alike are avoiding cyber discussions like a digital plague.

Of course, lots of automation executives want to talk about IIoT (the Industrial Internet of Things). Some suppliers are devising new ways to use IIoT information and others are offering new applications that allow corporations to use digital connections to increase their top down control or decrease the number of managers or workers. So there is some talk about connectivity but it seems that very few people want to honestly face real and potentially devastating threats.

Why?

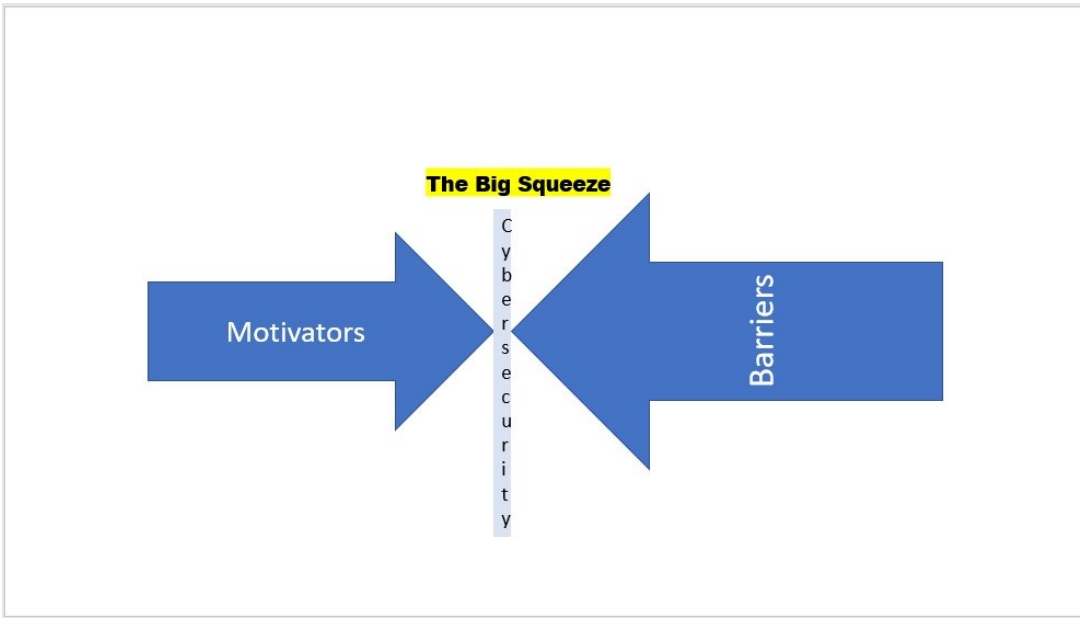
With the obvious benefits the IIoT and Big Data analytics can provide to an industrial plant, or groups of plants in an enterprise, you would expect that it would be a no brainer to move forward on these projects. Especially since these projects are considerably less expensive than the MES and MOM projects of yesteryear. But something less than 20% of companies are doing active IIoT projects. Why?

Worse yet, a new study by Zurich Group, the insurance giant, says that 49% of small and medium sized corporations are doing virtually nothing. In the UK, despite over 875,000 firms having been the target of at least one cyber attack, more than half of the companies surveyed said they were spending 1000 GBP or less this year on cyber security defense. When you get this kind of "ostrich" behavior, there is clearly something going on. What is it, and why?

Almost every decision humans make, personal and professional, are an intricate blend of rational and emotional factors. Before most humans can use rational factors for decision-making they must first find their way through the emotional factors. The problem is that these factors are generally subconscious, meaning most people are not aware of how the emotional factors influence them or their decisions.

Emotional factors are divided into Motivators and Barriers. Motivators are emotions and/psychological factors that move a person toward something or a decision such as purchasing and implementing new cyber security products and services. Barriers are emotions or psychological barriers that keep a person from moving in a direction or making a decision to do

The *INSIDER's* July 2017 Roundup (continued)



The Big Squeeze: And Cybersecurity Expenditures Compete with Paving the Parking Lot.

something.

In short, Motivators move someone to do something. Barriers interfere with that person doing it.

Which brings us to successful cyber security decisions. With all of the high profile hacks, such as the numerous cyber ransoms, it would make perfect business sense to put the most effective cyber security protection into place from the start, no matter the cost. Yet how many automation and other decision makers confide to each other that they view cyber security as a budgetary add-on? They see it as a budget item, but not among the most important!

How do we identify the Barriers? More importantly, how do we overcome the barriers? In so doing we can make sure that our industrial environments and businesses in general are safer from ever present cyber hacks? Research!

If you want to understand emotional Motivators and Barriers it requires in-depth research by trained researchers who know how to get in the appropriate people's minds. It cannot be done with Big Data because Big Data cannot tell you "why." Big Data can tell you how, and what, and can provide correlations between seemingly disconnected data sets, but it cannot tell you why people do what they do—or in this case, why they are not doing what everyone agrees they ought—increasing spending on cyber security.

"Why" is the question that must be answered if you want to find real solutions. General business analysts cannot give you the answer to this question because the answer is in the heads of those people in the midst of the decisions. You could just ask these people but they cannot answer you truthfully, even if they want to, because they do not know their own deeper motivations. So cyber security spending is competing with paving the parking lots.

They may try to answer your question because as humans we are trained to answer when someone asks and your customers are highly intelligent people. They will probably give you a very rational answer because that is what they think you expect of them. All those answers will be worse than ever even asking why! You will get superficial and bad information that will lead you down useless and potentially expensive rabbit holes. Wasted time, opportunities and money.

When you are looking at a sales situation where the sales resistance far exceeds what it should be, you aren't seeing the Barriers and your sales pitches aren't a good enough set of Motivators. You can't just keep pushing and saying, "Well, eventually they'll understand." They may not ever.

Which brings me back to how do you find out why enterprise executives, plant managers and operations engineers are making cyber security almost an afterthought?

In-depth research is the best and fastest way.

Joy Ward is Research Director for Spitzer and Boyes LLC, the publishers of the INSIDER. If you want to know more about in-depth research, and how it can help you discover the Motivators and Barriers you need to understand to maximize your successful sales and marketing strategies, contact her at joyward@sbcglobal.net or +1 -314-283-5251.

The *INSIDER's* July 2017 Roundup (continued)

PAS Global LLC Includes Innovative Alarm Mechanic in New Release

PAS Global LLC, has announced the new release of PlantState Suite™ (PSS) 8.3 featuring Alarm Mechanic. This new feature helps improve process plant safety and console operator performance minimizing nuisance alarms through automated analytics and recommendations.

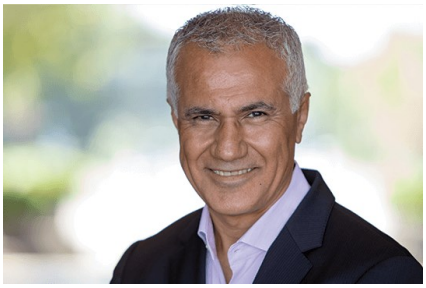
ARC's O'Brien

"With its new software release, PAS demonstrates its continued commitment to providing innovative alarm management capabilities that make operators more effective," says Larry O'Brien, vice president of research at ARC Advisory Group. "Its history of innovation is one reason why ARC identified PAS as the #1 independent alarm management software and services supplier in the world for 2017. PAS pioneered the alarm management space, and it is a proven entity for driving ISA 18.2 and IEC 62682 standards compliance."

PlantState Suite makes power and process plant operators more effective at identifying, evaluating, and managing alarms. PSS is the industry's most comprehensive, integrated abnormal situation management software platform designed to optimize Independent Protection Layers (IPL), such as process control loops, alarms, safety instrumented systems, and pressure relief systems. With PSS, companies gain improved operator situation awareness and effectiveness, greater speed and accuracy in detection and response to abnormal situations, reduced severity of process upsets, and safer, more profitable plant operations.

With the addition of Alarm Mechanic, PSS 8.3 fully automates complex analyses that determine alarm delay time settings. Delay time is a critical method for solving nuisance alarm problems. Leveraging decades of PAS project experience and a proprietary master alarm database, Alarm Mechanic replaces manual calculations and guesswork with automated, deterministic recommendations that ensure consistent and optimal settings. PSS is the only alarm management solution in the market today with this functionality.

PSS 8.3 also enhances support for corporate operational excellence programs and risk-tracking dashboards. The new release also eases integration and enables custom alarm analytics. PAS technologies are deployed throughout 13 of the top 15 chemical companies, 10 of the top 15 refining companies, and 5 of the top 15 power companies in the world. PAS is the recognized industry leader in improving operator effectiveness and has authored the definitive book on alarm management best practices, The Alarm Management Handbook.



PAS Global's Eddie Habibi

"Only PAS automates alarm analytics by utilizing deep alarm management expertise gained from hundreds of successful projects," says Eddie Habibi, founder and CEO of PAS Global, LLC. "Driving better operator situation awareness is at the heart of plant safety and profitability. With this new release of PlantState Suite, we provide capabilities that our customers need to achieve their operational and safety objectives."

Waterfall Security Solutions Partners with FireEye

WATERFALL® Stronger Than Firewalls

Waterfall Security Solutions has announced a partnership with intelligence-led security company FireEye, integrating FireEye's cloud-based Threat Analytics Platform (TAP) with industrial networks using Waterfall's Unidirectional CloudConnect to eliminate the threat of remote cyberattacks entering the monitored ICS.

The integration enables organizations to focus their efforts and resources on the highest priority organizational and industrial targets, and identify the most significant risks. It supports a more comprehensive approach to unified visibility for cloud systems into industrial operations, with centralized security monitoring and teams.

This partnership is Waterfall's latest in a series of collaborations focused on multi-layered, interoperable cyber security approaches for ICS.

Fellows and Celebrating Excellence Award Honorees to be Recognized at 55th Annual ISA Honors & Awards Gala

ISA is proud to announce those ISA members elevated to the distinguished membership grade of Fellow and the Celebrating Excellence award honorees for 2017—including Member's Choice honorees who were selected by a preponderance of votes cast by their peers. Elevation to the distinguished grade of ISA Fellow is granted to Senior Members in recognition of their exceptional engineering scientific contributions to the field of automation. ISA's Celebrating Excellence Awards honors companies and individuals, both members and nonmembers, for significant contributions in leadership, technical innovation, and contributions to education that have advanced

The *INSIDER's* July 2017 Roundup (continued)

the automation profession. Award presentations will be made at the 55th Annual ISA Honors & Awards Gala on 29 October 2017 at the Grand Hyatt Tampa Bay, Tampa Bay, Florida, USA.
2017 ISA Fellows Elevation to the distinguished grade of ISA Fellow is granted to ISA Senior Members in recognition of outstanding achievements in scientific or engineering fields as recognized by ISA peers.

Penny P. Chen, Ph.D.
Communications Division, Yokogawa Corp of America, Mclean, Virginia, USA
For innovation and leadership in industrial wireless as related to process automation and instrumentation.

Gerald Combs, Ph.D.
Analysis Division, Retired (Siemens Industry), Kemp, Texas, USA
For contributions to process analytical technologies for environmental monitoring.

David L. Neal, PE
Louisville Section, Advanced Industrial Systems Inc, Harrods Creek, Kentucky, USA
For contributions to the field of computer based programmable data acquisition and test systems.

Brent Shumaker
Power Industry Division, Analysis & Measurement Services Corp, Knoxville, Tennessee, USA
For development and implementation of online technologies to assess the health and remaining useful life of critical components in nuclear power plants.

Iwan Van Beurden
Chemical & Petroleum Industries Division, Exida, Sellersville, Pennsylvania, USA
For development of probabilistic analysis safety verification data, methods, and tools used to improve the safety lifecycle in the process industries.

2017 Celebrating Excellence Honors & Awards Program

Excellence in Leadership
Recognizes an individual who has made significant contributions to the industry and/or profession to advance automation.

Judith F. Marks
Siemens USA, Washington D.C., USA
For taking a leading role in STEM issues through apprenticeships to fill the skills shortage in manufacturing.

Excellence in Analytical Technical Innovation
Endowed by the ISA Analysis Division
Recognizes an individual who has played a critical role in the conception, design, and/or implementation of an innovative product, process, and/or service in the analytical technology field.

Dale Harrison, Ph.D.
VUV Analytics, Cedar Park, TX USA For his contributions in the development of vacuum ultraviolet absorption spectroscopy instruments.

Excellence in Technical Innovation
Endowed by UOP, a Honeywell Company
Recognizes an individual who has played a critical role in the conception, design, and/or implementation of an innovative product, process, and/or service.

Mr. Manikandan Pandiyan
Mercedes-Benz Research and Development India Pvt. Ltd., Bangalore, Karnataka, India
In recognition for developing a portable real-time Electrocardiogram device for local on-chip data acquisition of health parameters and remote diagnosis.

Excellence in Corporate Technical Innovation
Recognizes the company whose contributions and innovations have enhanced social value.

APERIO Systems
Haifa, Israel
For developing an innovative solution in recognizing and protecting Industrial Control Systems against data forgery.

Excellence in Technical Presentation
Recognizes the author(s) of the most outstanding paper, article, presentation, or document published and/or presented on behalf of ISA that introduces a new technology or explains an existing automation process.

Cyrus Taft
Taft Engineering, Harriman, TN, USA

John Sorge
Southern Company, Birmingham, AL, USA

Mircea Lupu
Emerson Process Management, Pittsburgh, PA, USA

Rick Kephart
Emerson Process Management, Pittsburgh, PA, USA

For paper, "Application of Model Predictive Control to Improve Steam Temperature Control on a Pulverized-Coal Unit" presented at ISA 59th Power Industry Division Symposium.
Excellence in Education Recognizes an individual who has developed and/or enhanced established educational programs to advance the automation profession in educational institutions.

Chetan B. Bhatt
Government Engineering College, Gandhinagar, Gujarat, India

The *INSIDER's* July 2017 Roundup (continued)

For developing university courses in India using the Automation Competency Model and developing Web-based Intelligent tutoring system for I&CT students.

Excellence in Enduring Service
Recognizes dedicated volunteer service to the Society at the grassroots level. May be presented to multiple (up to five) honorees.

Kenneth Belteau
Process Measurement and Control Division
Spectra Energy Transmission LLC, Kingwood, TX, USA
For outstanding service and contributions to the Society and its members.

M. Venkatram
Maharashtra Section
The Tata Electric Power Co., Airoli, Maharashtra, India
For outstanding service and contributions to the Society and its members.

Richard O. Williams
Process Measurement and Control Division
Cypress, TX, USA
For outstanding service and contributions to the Society and its members

Division Excellence
Recognizes an ISA Division for development and/or execution of programs and/or services to advance the mission of the Society.

The division will be revealed at the Gala. The top three nominees are:

Analysis Division
For promotion of student participation at the 61st ISA Analytical Division Symposium through collaboration with local colleges that hold analyzer and instrumentation certificate programs.

Food and Pharmaceutical Industries Division
For organizing ISA Food and Pharmaceutical Industries Division Symposium in collaboration with the Ireland Section, and promoting society goals

Process Control and Measurement Division
For collaboration with ChemPID, Safety, Pulp and Paper, Communication, and Education and Management divisions in organizing 2016 ISA Process Control and Safety Symposium.

Section Excellence
Recognizes an ISA Section for development and/or execution of programs and/or services to advance the mission of the Society.

The section will be revealed at the Gala. The top three nominees are:

Bangalore Section
For hosting the Food Safety Symposium, attended by automation experts to discuss technical solutions, and for organizing 8 technical presentations.

Ireland Section
For hosting the third ISA International FPID Symposium in Ireland and conducting training courses on alarm management and security.

Texas Channel
For reactivating a student section, sponsoring student team's travel to the International Instrumentation Student games and adopting two FIRST robotics teams.

Standards Excellence
Recognizes an ISA standards committee member for exceptional efforts in organization, development and/or administration to further the development of ISA standards and for services to advance the mission of the Society.

Nicholas P. Sands, CAP
ISA18.2
DuPont, Newark, DE, USA
For years of dedication to ISA standards, and especially the development of ISA18.2

Member's Choice Award Honorees

Member's Choice candidates are nominated by the Member's and honorees are selected by vote of the members.

Division Leader of the Year
Recognizes a Division leader whose activities in the previous year, in an innovative way, have provided exceptional value to a Division, or enhanced an existing conference and/or symposia, or contributed to the development of a new conference and/or symposia.

Sohail Iftikhar
Chemical and Petroleum Industries Division
Honeywell Process Solutions, Houston, TX, USA

Section Leader of the Year
Recognizes a Section leader whose activities in the previous year, in an innovative way, provided exceptional value to a local Section.

Rajesh Rathi
Bangalore Section
Control Infotech Ltd, Bangalore, Karnataka, India

Student Mentor of the Year
Recognizes a member whose activities in the previous year have promoted and encouraged student involvement in automation programs.

The *INSIDER's* July 2017 Roundup (continued)

S. Vivekanandan
South India Section
VIT University Vellore, Thiruvannamalai, Tamilnadu, India

Volunteer Leader of the Year
Recognizes a member who in the previous year has demonstrated exceptional leadership of a task force, committee, or board at any level within the Society (Section, Division, District, Department, Executive) resulting in a specific positive outcome.

Dr. Veena Hegde
Bangalore Section
BMS College of Engineering, Bangalore, Karnataka, India

Fuji Electric Announces New Spool Ultrasonic Meter

Fuji Electric's New Ultrasonic Meter

Fuji Electric Corp. of America (FEA) has announced that they have developed a new Spool Type Ultrasonic Flow Meter (FST) that utilizes wetted sensors to achieve precision accuracy (the INSIDER isn't quite sure what that means), resulting in reduced energy consumption and costs. The flow meter is low maintenance and easy to use, with an accessible front panel and simple configuration and data management by PCs. With improved zero-point stability and sensitivity, it's the ideal choice for plant applications and filtration equipment.

"The addition of the Spool Type model to our Flow Meter lineup aligns with our commitment to provide products designed for reliability, safety, and convenience ," said Teruyoshi Tominaga, FEA's Director/Division General Manager of Instrumentation & Control. "This unit offers a selectable panel position and is capable of event-triggered alarms and configurable bi-directional range for both forward flow and reverse flow. These are the advanced features that customers expect from Fuji Electric, and we are pleased to deliver a product that meets their evolving needs." The FST, which is now available for shipment to customers, has a simplified front panel for easy configuration of parameters, and allows customers to enter piping conditions or calculate sensor spacing without opening the cover. Designed as a global product for customers around the world, the FST offers a backlit LCD and measurement results that are shown on the 16-digit 2-line display in Japanese, English, German, French or Spanish. (The INSIDER suggests that if Fuji wants a real global product, it ought to also speak Portuguese and Chinese).

Mr. Tominaga adds, "Whether the end-user is a plant utility looking to reduce water consumption, or a facility manager looking to optimize flow rates on one (or more) pipes, the Spool Type Ultrasonic Flow Meter is the ideal choice."

Longbow Research Issues Guidance on EMR and ROK

Longbow Research, a boutique analyst and investor firm, has long followed the automation industry, both discrete and process. This month, they released their latest report. In it, the firm indicates that their research finds, "Outlook sentiment hit a nearly three year high driven by an improving pipeline of greenfield projects for CY18. In addition, CY2Q results suggest demand improved in line with expectations setting the table for a favorable earnings season for EMR, ROK, and NDSN despite elevated expectations for the space."

Despite this, Longbow continues to rate Emerson and Rockwell as "neutral."

For Emerson, Longbow says, "Accelerating steel & primary metals demand as well as gradually improving oil & gas bidding provides a positive backdrop for EMR's process automation business (~60% of EMR sales pre-V&C) into the FY3Q (June) call, and we suspect EMR may modestly improve underlying FY17 Automation sales guidance to -1% to -2% (vs. -2% to -3% currently) given positive trends. MRO demand currently leads the way, but as brownfield projects turn on

EMR – Longbow Forecasts vs. Consensus and Guidance

	3Q17E	4Q17E	1Q18E	2Q18E	2017E	2018E
Revenue ($M)						
Guidance*					Roughly Flat ($14.5B)	
Recent Consensus	*$4,006*	*$4,357*	*$3,724*	*$3,985*	*$15,144*	*$16,583*
Longbow Forecast*	**$3,823**	**$4,007**	**$3,407**	**$3,762**	**$14,619**	**$15,474**
EBIT ($M)						
Recent Consensus	$753	$839	$640	$721	$2,822	$3,082
Longbow Forecast	**$712**	**$795**	**$582**	**$673**	**$2,623**	**$2,922**
EPS						
Guidance*					$2.55-$2.65	
Recent Consensus	$0.68	$0.78	$0.56	$0.67	$2.59	$2.89
Longbow Forecast*	**$0.69**	**$0.80**	**$0.58**	**$0.65**	**$2.63**	**$2.90**

Excludes the V&C Acquisition

Sources: FactSet, Longbow Research

during 2H17 and bidding for new projects continues, we see a positive setup into FY18."

As for Rockwell, Longbow predicts, "Our checks support fairly bullish estimates, and while expectations remain elevated, we expect ROK bookings for FY3Q (June) will again highlight improved backlog as the secular automation trend continues to gain momentum, while discrete automation end markets continue to driving robust growth led by food & beverage and packaging and warehousing providing a positive set-up for FY3Q earnings. Given the run in the shares and some cautious automotive data-points of late, we see ROK as fully valued,

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ROK – Longbow Forecasts vs. Consensus and Guidance

	3Q17E	4Q17E	1Q18E	2Q18E	FY2017E	FY2018E
Revenue ($M)						
Guidance*					$6,250	
Longbow Forecast	**$1,574**	**$1,657**	**$1,549**	**$1,602**	**$6,275**	**$6,549**
Recent Consensus	*$1,579*	*$1,654*	*$1,574*	*$1,630*	*$6,256*	*$6,598*
EBIT ($M)						
Longbow Forecast	**$314**	**$310**	**$318**	**$287**	**$1,189**	**$1,289**
Recent Consensus	$303	$319	$321	$294	$1,187	$1,306
EPS						
Guidance					$6.45-$6.75	
Longbow Forecast	**$1.69**	**$1.68**	**$1.86**	**$1.56**	**$6.67**	**$7.22**
Recent Consensus	$1.65	$1.72	$1.82	$1.68	$6.66	$7.30

*Midpoint

Sources: FactSet, Longbow Research

but would look for further acceleration in A&S demand as a potential lever for incremental earnings upside."

Discussing the implications of their Emerson model, Longbow says, "Our sales estimates remain unchanged since our checks support continued gradual improvement in process automation. Steel & primary metals demand witnessed an uptick exiting CY2Q, while oil & gas project bidding continues to improve which supports our 2018 growth expectation. As a result, we continue to forecast FY3Q automation sales growth of +1.5% y/y (+4.3% q/q vs. +3.2% 3-year average) and FY18 automation sales growth of +6.8%. Our FY3Q and FY17 EPS forecasts decline by $0.01 respectively given incrementally higher corporate expenses. We now forecast FY3Q EPS of $0.69 (vs. $0.68 consensus) and FY17 EPS of $2.63 (vs. $2.59 consensus and $2.55-$2.65 guidance) on sales growth of +0.7% and EBIT margin of 18.0%. We also forecast CY18 EPS of $2.90 (vs. $2.89 consensus) on sales growth of +5.8% led by +6.8% Automation Solutions growth and +4.3% Commercial & Res growth. The Pentair V&C acquisition is not included in our current forecast or guidance, but is expected to add roughly $1.7B of annualized sales, and is expected to be slightly dilutive to EPS for FY17 (ex-one-time charges of $0.25-$0.30).

Regarding Rockwell, Longbow's model implies better performance than Emerson, but not enough to raise their estimate from "neutral", "We are reiterating our Street-high FY3Q (June) EPS forecast of $1.69 (vs. $1.65 consensus) on sales of $1,574M, vs. $1,579M consensus, but better than consensus EBIT margin of 21.4% (+30bp y/y on a ~26% incremental margin). We currently forecast +9.6% organic growth within ROK's Architecture and Software segment for CY17 (+9.2% net given +1.1% M&A, -1.4% FX) as the company's PlantPAx software and integrated suite continues to gain ground. We also forecast +4.7% CP&S sales growth for CY17 for total ROK sales growth of +6.7% (vs. +4.5%-7.5% guidance). We continue to forecast FY17 EPS of $6.67 (vs. $6.66 consensus) and FY18 EPS of $7.22 (vs. $7.30 consensus) on total sales growth of +4.4% and adjusted EBIT margin of 21.1% (+60bp vs. our FY17 forecast)."

HIMA Bangs It Out Again

HIMA's turnover rose to EUR 126.3 million in the 2016 business year; Significant growth of six percent despite the cautious oil and gas sector; Especially positive trend in rail business

HIMA Paul Hildebrandt GmbH closed the 2016 business year with sales revenue of EUR 126.3 million, an increase of six percent compared to the previous year. An expanded range of package solutions for the process industry and positive evolution of the rail business were the main sources of new growth. HIMA also made strategic investments and forged global partnerships to secure the company's future.
"The general economic conditions in the process industry, in particular the oil and gas sector, were not easy in 2016," says Sankar Ramakrishnan, CEO of the HIMA Group. "Our sound overall performance was due to promising trends in the growth markets APAC and Middle East, strong demand for our package solutions for pipelines, turbines, burners and boilers, and our good business in the rail sector", comments Ramakrishnan.

Basis for further growth
HIMA forged strategic partnerships, the most important of which was a EUR 3.1 million investment in a global ERP system. The international rollout will extend over several years. A cooperation agreement with Freudenberg IT will create a uniform, reliable, secure and accessible global infrastructure for HIMA, enabling the company to respond even faster and more effectively to individual customer needs. HIMA founded a fully owned subsidiary in China, and reorganization of the company's activities in the Asia Pacific region also had a sustained positive impact. Founding a new regional headquarters in Singapore in early 2016 represented a key component of the regional growth strategy.

Good evolution of the rail business
HIMA's business in the rail sector also showed a very positive trend. "We were able to expand our rail business in 2016 with above-average growth. We have now completed rail projects in more than 30 countries,", comments Steffen Philipp, Managing Partner of HIMA.

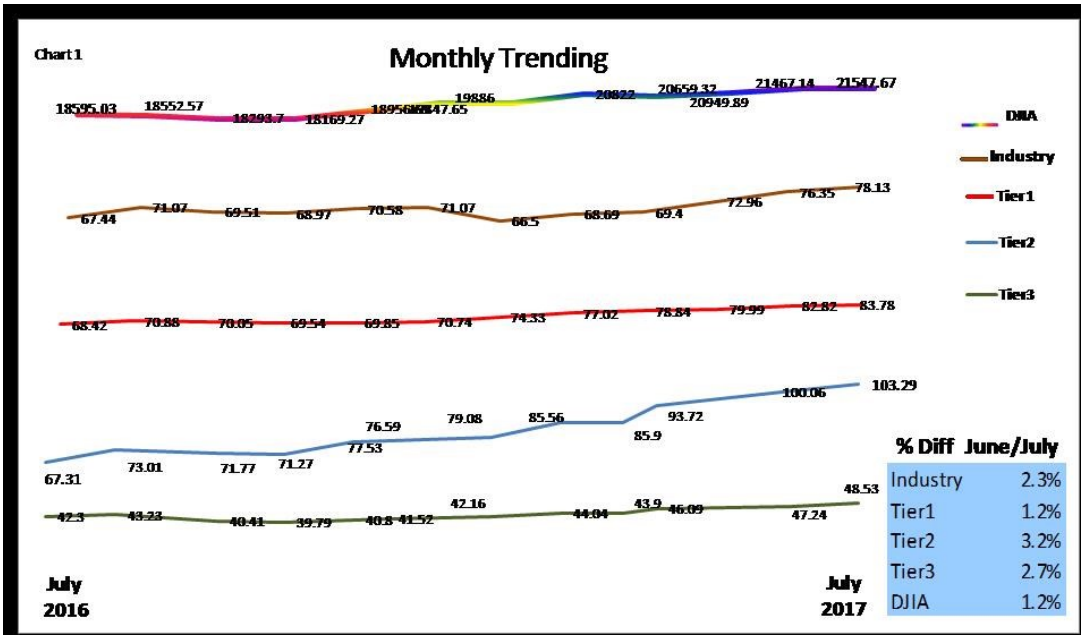
COTS safety controllers are becoming the standard in the rail industry due to their deployment diversity and their distinctly lower acquisition and life cycle costs compared to proprietary technology. HIMA's strategic goal is to position the company as the first choice for safety in the rail sector.

New organizational orientation
To focus the company strategy on further global growth and closer customer contact, HIMA created the autonomous Process and Rail business unit for the process industry and the rail sector, respectively. Each business unit is headed by a business unit manager with global responsibility. By setting up these new organizational units, HIMA aims to boost effective access to new markets and strengthen existing customer contacts.

Dow Does Well, We Do Better!

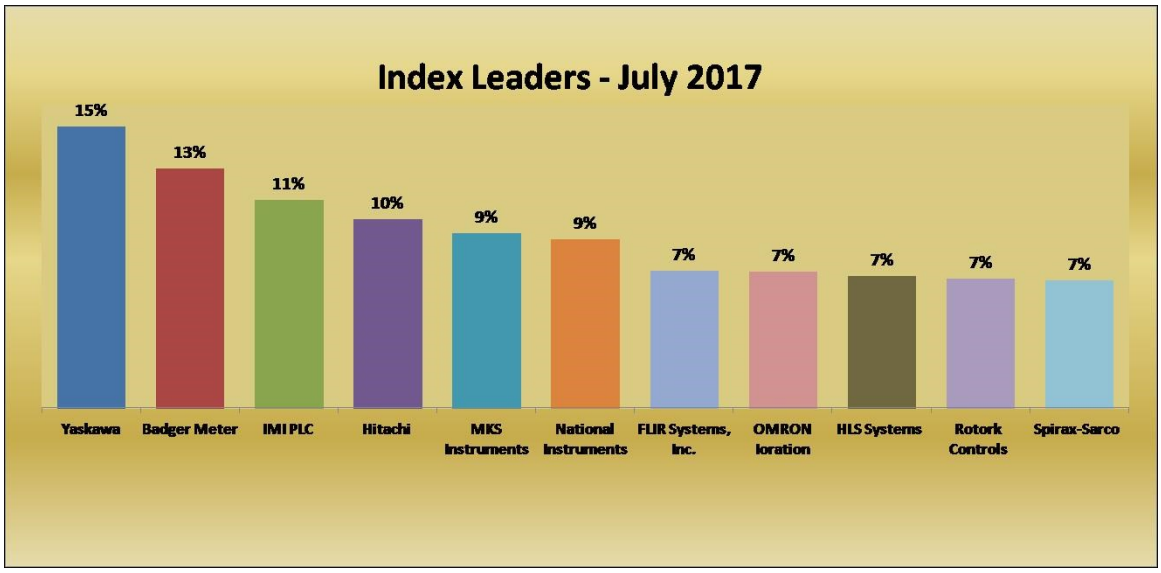
INSIDER
INDUSTRIAL AUTOMATION & PROCESS CONTROL

Health



The Dow is doing well this year, but our industry is doing better. The Market as a whole has increased 8% since January.

Our industry, in comparison, has moved upwards of double that, with a six month increase of 17%.



This reporting period does not show the magnitude of increases seen last month, but the industry as a whole, and all Tiers, matched or outperformed the Dow.

The Leaders

Two of the leaders on this month's list are returning champions. National Instruments showed a 15% increase for June, and an additional 9% for July. Yaskawa increased 14% in June and 15% in July.

Badger Meter also shows increasing performance, as do IMI, Hitachi, MKS, FLIR, OMRON, HLS, Rotork, and Spirax Sarco. All of these companies are leading the industry model in growth.

IMI & MKS

This shows a significant turn around for both companies. Each showed a loss of 7% on the "Less Fortunate" list in June.

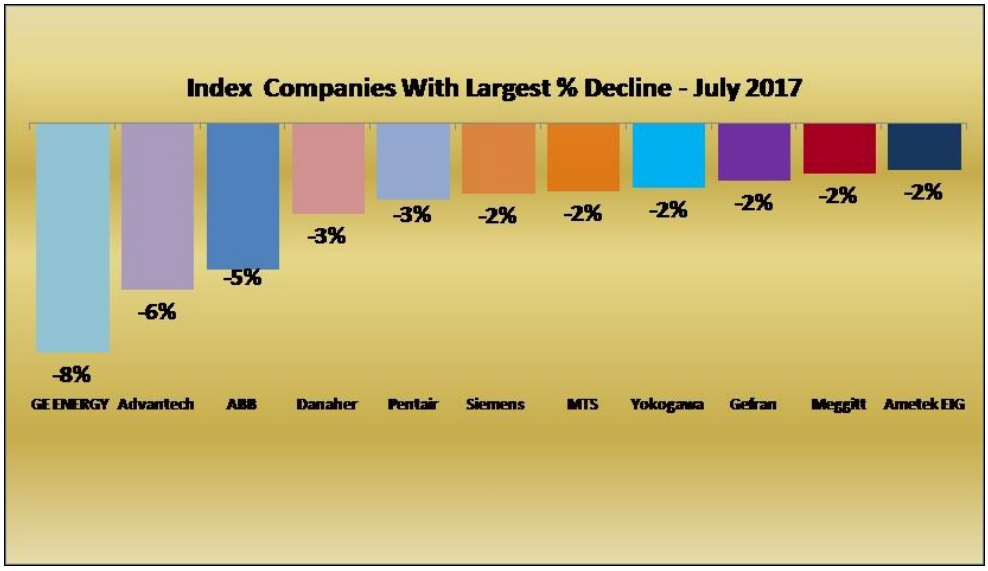
The Less Fortunate

And as for those less fortunate companies, there are a few, beginning with General

Dow Does Well, We Do Better! (continued)

INSIDER
INDUSTRIAL AUTOMATION & PROCESS CONTROL

Health Watch



Electric. GE, which just sent long-time CEO Jeff Immelt packing, is turning in dreadful results.

Advantech appears to be reaping its "all the eggs in one basket" approach to the Industrial Internet of Things, which appears to be stalling out.

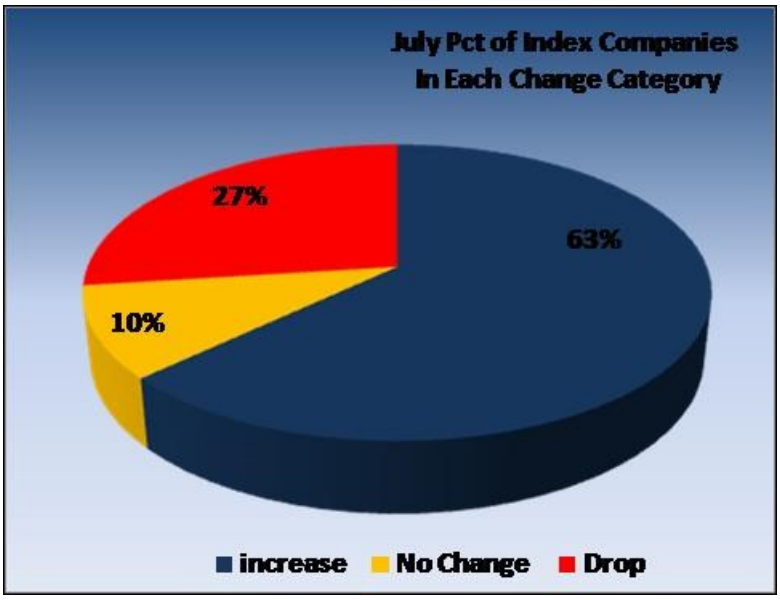
ABB once again is reduced to reporting electric group wins, with very little to say about process automation, while most are waiting to see what the B&R acquisition will produce. Longbow Research commented that they had heard positive comments from the distribution channels on the B&R acquisition.

Danaher may be feeling the first pinch of the Trump Administration's desire to kill the EPA, since so much of Danaher's business involves environmental monitoring.

Pentair may be feeling the results of the shakeout of selling its valve division to Emerson in a fire sale. The jury is still out on Emerson's acquisition, although Longbow Research views it at least cautiously optimistically.

Siemens, too, may be feeling the stalling out of Industry 4.0, their version of the Industrial Internet of Things, as they dipped into the negative, but only by 2%. This may be a passing phase.

Yokogawa appears to have been caught by the continuing weakness in the oil sector. All of the index companies on the list, with the exception of GE, Advantech, ABB, Danaher and Pentair, are 2% or less negative, which may be restored if the market continue to develop and grow. As the image in Fig 4 shows, there is a broad based increase happening here.



THE WAY I SEE IT
Editorial

The Workforce of the IIoT

We have spent a great deal of space and ink talking about how the assembly-line jobs that most high school graduates in the United States have depended on to stay above minimum wage are going away quickly. That's still and increasingly true. It is sad to see President Trump assuring his followers in West Virginia and Ohio that their jobs in the coal mines will be coming back any day now. They won't. For two really good reasons. First, the coal companies themselves mechanized most of their jobs out of existence, and then the cheap natural gas from fracking tanked the price of coal to under $100 a a ton. Unless some amazing miracle occurs, the mines will stay mostly closed. Much has been said and written about the need to re-train those workers.

We have spent a lot less time worrying about existing knowledge workers, automation workers, and the like. At the Beamex conference this past week (see cover story) one of the attendees asked me a question that had clearly frightened him. "If you're right, and sensors are going to be able to self-diagnose, and self-calibrate, and even send in work orders, what does that make me? I don't want to be just a replacer of sensors."

The jobs of automation workers are changing just as fast or maybe faster than the jobs of assembly line workers, those that still have them, of course. Previously, automation workers were instrumentation and controls engineers and technicians, PLC programmers, and similar functions. Now the jobs have expanded to encompass network engineering, data management, virtualization, and asset management expertise. A well-rounded automation worker should be able to do all of those things to a professional capability.

"If you're right, and sensors are going to be able to self-diagnose, and self-calibrate, and even send in work orders, what does that make me? I don't want to be just a replacer of sensors."

Today, most of us cannot do all of those things. And if we aren't careful, in just a few short years, we will be on the same side of the unemployment desk as the assembly line workers we feel so sorry for now. One of the important keys to securing and keeping quality employment, now and in the future, is to bring some personal value add to the job.

It's all well and good to say that, but there are really few opportunities to get more than the basics of automation education. Companies are really averse to paying for training. ISA has found that out for years. That's one of the reasons that the tuition for the Beamex conference was so low— so that workers could see paying for it themselves.

It may be that workers will have to build that expense into their cost of living, and maybe they should. But companies who depend on them torun and repair multi-billion dollar plants need to think about whether they should invest in education and traing for the people who steer their hugely complex and very expensive asset into the future.

Yet many enterprises pay their automation workers considerably less than business executives. This is not a good thing.

Frankly, if you can't see your way clear to paying for education and training for your operators and other automation workers, you're telling them you don't think they are very important, and that their jobs don't matter. We all know better, don't we?

Comments? Talk to me!
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Read my Original Soundoff!! Blog:
http://waltboyes.livejournal.com

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Rajabahadur V. Arcot: Robust design & engineering and empowered operators help maximize automation value

Automation is an integral part of industrial operations. Industries' mounting need for achieving operational excellence spurs manufacturing firms to invest in automation systems and there is a growing recognition among them that there is economic value to be mined from such investments.

Because of their inherent ability to play an important role in ensuring plants' timely and trouble free commissioning and in meeting the fundamental/technical objective, automation systems form an essential subset of the capital expenditure, especially in the case of new or greenfield projects.

Because of their inherent ability to play an important role in ensuring plants' timely and trouble free commissioning and in meeting the fundamental/technical objective, automation systems form an essential subset of the capital expenditure, especially in the case of new or greenfield projects.

During operational phase, they play an equally crucial role in improving process efficiency and productivity, minimizing down time, energy conservation, and such others - the business objectives.

Robust design & engineering and well trained operators help meet both the technical and business objectives and thus contribute to maximizing automation value. While design and engineering always plays a major role in every industrial project, in the case of automation project, design and engineering has a bigger role comparatively.

Automation systems are customized to meet the plant's explicit need and every element that forms a part of the automation system is specifically selected and hence the important role of design and engineering.

The role of operator by the same logic is plant specific and hence the need to pay special attention to the training of operators.

Often, the focus of the teams, responsible for implementing automation projects, is on meeting the technical goal and they lack the necessary design, engineering, and training resources to vigorously pursue business objectives. Therefore, this potential remains largely unrealized.

This presents an opportunity to automation companies to play not merely the role of supplier of automation systems but also a much larger role as a value-enhancing partner.

With the industrial trend indicating greater use of Industrial Internet of Things, analytics, artificial intelligence and such others, it is time for automation suppliers to evaluate their engagement strategies with end user industries.

Automation systems objectives

Industrial firms invest extensively in automation systems with two fold objectives – technical / fundamental objective and business objective.

Operation of a plant, whether process or discrete, requires data and information about various parameters, such as temperature, pressure, level, position, and others to be measured, visualized, and maintained at the designed or desired values.

Plant operations also involve starting and shutting down of the plant equipment, such as pumps, fans, and valves, in a prescribed sequence. Such operations are also required to prevent accidents.

Automation systems play this important role in monitoring & controlling the parameter values and presenting them to the operator so that they can ensure proper and safe operation of the plant. Meeting these requirements remains the technical and fundamental objective.

The other objective is business driven and is related to managing manufacturing processes

Rajabahadur V. Arcot: Robust design & engineering and empowered operators help maximize automation value (continued...)

and production costs, ensuring product quality, improving productivity, reduce energy consumption, and such others, all aimed at making the industrial enterprise achieve operational excellence.

Role of design and engineering
For an automation system to deliver its full value, it must be designed and engineered well and supported by highly skilled operators.

Excellence during the design and engineering phase maximizes the economic value of automation projects. The design and engineering team must have deep automation and plant process domain knowledge, engineering skills, multi-disciplinary approach apart from other professional competencies. They must possess not only deep domain knowledge about production process, automation technology, and engineering skills but also project management abilities – multi-disciplinary skill set that is always in short supply.

The design and engineering team must have deep automation and plant process domain knowledge, engineering skills, multi-disciplinary approach apart from other professional competencies.

Design and engineering decisions, relating to the proper selection of the sensors, transmitters, and actuators and how well they are installed and maintained play important roles in ensuring that automation systems deliver full value. It is equally important to comprehensively leverage all the built-in control systems' functionalities, such as alarm management functions, historian, asset management, control in the field, and others to enhance the value of automation investment.

Extracting value from automation systems depends on operators' skills as well and hence investments in training them will yield rich dividends. Even though most industrial companies engage either project engineering consultants or system integrators to carryout application engineering, it is highly desirable that they also develop in-house engineering competencies, not only for successful implementation of automation projects but for their subsequent maintenance and timely upgrades. Empowered workforce will greatly help the economic value of the automation system to be realized over the entire lifecycle of the plant.

Functional Design Specifications
In an automation project, the Functional Design Specifications (FDS) often referred to as Front End Engineering & Design (FEED) that takes into account process / production requirements, statutory compliances to be met, the present and the future operational and maintenance needs, is an essential first step in the proper selection, design and engineering. FDS reflects the owner operator's operational and maintenance philosophy. FDS must be developed so that the automation system meets the basic criterion relating to health and safety of the people, plant, and the environment not only during normal plant operation but also during startup, shutdown, and emergency. It is necessary for the FDS to identify and specify all the parameters to be measured, monitored to alarm deviations, and controlled (automatically /manually/sequentially) during the operational phases.

The FDS must also take into account the parameters to be measured for plant asset maintenance purposes. It should lay down the guidelines governing the interactions between plant operating people & the plant system, the means by which the interactions take place, and how the functional and safety requirements of the process plant are met.

It must also define the systems' functional details and describe the assets required to meet the requirements. In addition it must reckon with the future expansion and modernization needs so as to ensure that the chosen architecture has the necessary flexibility to cater to the future needs.

In the case of a large plant, the owner operator may appoint an engineering firm with proven automation engineering competencies and deep process expertise to prepare the FDS in consultation with in-house expert team. The basic inputs have to come from process licensor & main equipment suppliers. The FDS document

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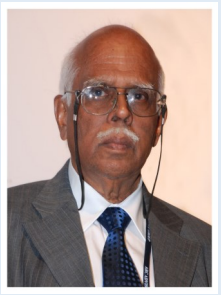

Rajabahadur V. Arcot: Robust design & engineering and empowered operators help maximize automation value (continued)

must be reviewed by all the stakeholders including process licensor, equipment suppliers, plant operators and maintenance people to ensure the ultimate success of automating the plant and that it receives all the necessary inputs for finalizing the same. The FDS must also include recommendations relating the bidder's qualifications for consulting engineering companies or engineering, procurement, and construction firms or for main equipment suppliers including automation.

Request for proposal specification and engineering documentation

Based on functional design specifications' recommendations, the request for proposal (RFP) specification is to be prepared for procuring automation systems, which comprise of sensors and transmitters, actuators, control systems such as PLC, DCS, SCADA, protection, interlock, & safety systems, panels & enclosures, standalone alarm annunciators, electric power supplies, and such others. While the FDS lays down what is to be done, the request for proposal (RFP) document describes from the technical perspective how the goals are proposed to be achieved and the requirements met. RFP is second step in the proper selection, design and engineering of automation systems. RFP must also demand automation contractor to submit various documents, such as the piping and instrumentation diagrams, instrument and control loop diagrams, cable and impulse pipe drawings, marshaling cabinet and panel wiring drawings, user & instruction manuals, as erected drawings and such others. In addition automation contractor must be made accountable to establish necessary calibration facilities with appropriate documentation procedures as instruments require to be calibrated regularly for their proper performance.

Successful implementation of an automation project requires not only deep domain knowledge and engineering skills but also project management abilities. It is equally important that al the engineering details are shared with various stakeholders in timely manner to ensure smooth installation and commissioning. Tapping points for sensors must be finalized in consultation with plant and equipment suppliers. For example in the case of flow measurement using orifice plate or flow nozzle, minimum pipe straight length requirements before and after orifice plate/flow nozzle are to be met. Location for installation of transmitters and other field devices must be decided during the design phase so that they are accessible for easy installation and maintenance. They have to be suitably grouped so that multicore cables can be used in case of 4-20 mA signals and in case of fieldbus systems the segmentation requirements are met. They have to be mounted on suitable racks and enclosures so that they are protected from rain, dust, explosion, and such others.

In this simulators can play an important role. Simulators help create and experience various plant operational scenarios in a virtual world.

How the plant control information is presented to the operators is another important aspect that requires attention. The displays must be designed such that they can easily and quickly visualize the critical information required for operating the plant safely and efficiently. Presenting the information without distractions is critically important. The information must be presented in such a manner so that they contribute to enhancing the operators situational awareness which involves being aware of what is happening to the process or in the plant and understand how events can unfold due to his interactions with the process both immediately and in the near future. It is also necessary to ensure that the information presented is not cluttered or overwhelming.

Operator training and simulators

While design, engineering, and project management plays an important role in ensuring the success of an automation project, it is equally important for the end user companies to ensure that plant operators are well trained to interact with the automation systems and maintenance group so that they are empowered to maintain the automation-system hardware and software during the operational phase. Such structured interactions help to maximize the benefits.

In this simulators can play an important role. Simulators help create and experience various plant operational scenarios in a virtual world. Dynamic simulators, with their ability to demonstrate the plant process operation under varying conditions, including startup, shutdown, and abnormal conditions, is a powerful tool to train operators.

End user companies must pay careful attention to the design and engineering aspects of automation systems and operator empowerment for maximizing the return on investments of their automation systems. Often they lack the necessary resources. Automation suppliers by providing the related services can help end users justify enhanced automation investments.

Walt Boyes and the other INSIDER staff are available for speaking engagements, webinars, and workshops. Walt is a member of the Association of Professional Futurists, as well as an ISA Life Fellow and an INSTMC Fellow in the UK. For information, contact Walt at +1 630-639-7090 or waltboyes@spitzerandboyes.com.

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