



Executive summary

Moore's Law has proved an all-important influence as advanced automation technologies leapfrog the capabilities of legacy PLC, PAC, HMI, I/O, CNC, safety and motion technologies.

A key change in developed markets is the demographics of the industrial automation user. What is happening to the generation that grew up in North America with purpose-built PLCs, ladder logic, vendor-driven device buses and limited human-machine interface graphics? They're starting to retire, and they are being supplanted by a polarized work force consisting of computer scientists applying automation technologies on the one hand, and a perennially under-educated labor pool operating the machinery on the other.

Meanwhile, globalization is driving automation into emerging markets where standards and a skilled workforce don't exist. Manufacturers need a strategy for international standards that will help them control costs and maximize productiv-

ity across both emerging and developed markets.

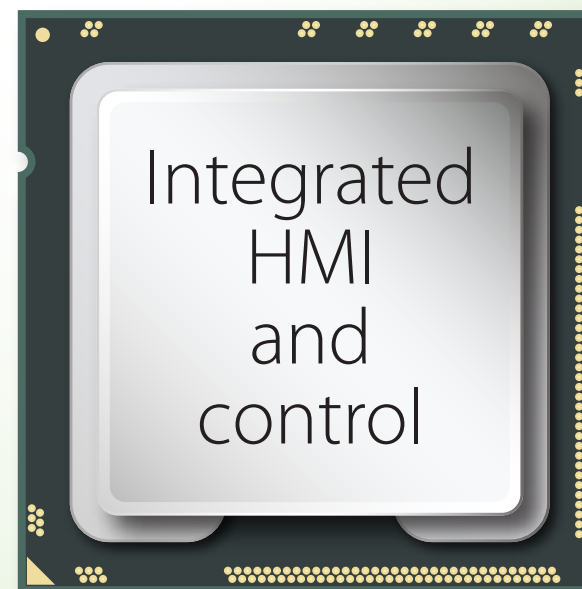
The natural progression across both worlds will be to apply advanced technologies to increase ease of use by an order of magnitude. Much like the evolution of the automobile, automation will embed technologies in such a way that they are transparent to the user and allow untrained users to not only operate but also become capable of performing self-guided maintenance tasks.

Leading the way is the convergence of functionalities on a single HMI dashboard, as part of an integrated control capability based on international standards. This convergence is led by Moore's Law and enabled by a host of new technologies, ranging from three-dimensional immersive animation to networked safety, to energy and condition monitoring technologies, to mainstream consumer and IT platforms.

Key to the productivity gains arising from convergence are compounded benefits: an

Control:

- Motion
- Logic
- Robotics
- Safety
- PackML
- OEE
- OPC
- I/O
- Vision



Human-machine interface:

- Visualization
- Dashboards
- Video/animation
- Predictive maintenance
- Energy monitoring
- Condition monitoring
- Wireless access
- Remote diagnostics
- Multi-touch functionality

A key attribute of convergence is integration of and access to a broad range of control and HMI functionalities, made practical by Moore's Law.

easier and safer machine to use has better Overall Equipment Effectiveness (OEE). Better OEE reduces energy consumption, which translates to improved sustainability.

Sustainable operation also means reduced scrap, which improves quality, etc. And all these metrics have the net effect of increasing revenue streams and profitability. ■





The future of automation

Into the 1960's cars were simple. It was a time when the shade tree mechanic could literally climb inside the engine compartment, make adjustments and replace parts with the skills of a farm boy. However, regular maintenance tasks such as timing, replacement of plugs and points, valve jobs and the like kept maintainers busy.

By the 1970's and 1980's, things like emissions controls, permanently lubricated drivetrain components and early computers had made cars far more complex to maintain. But they also laid the groundwork for a third generation of vehicles with such tight manufacturing tolerances, advanced materials and sophisticated onboard control systems, that we would eventually change spark plugs at 50,000 mile intervals. And when was the last time you needed a valve job?

Industrial automation has much in common with the evolution of the automobile. What were buttons are now touchscreens. Micro-

processors are distributed down to the input and output (I/O) level. I/O device communications, run on networks that no longer sweat

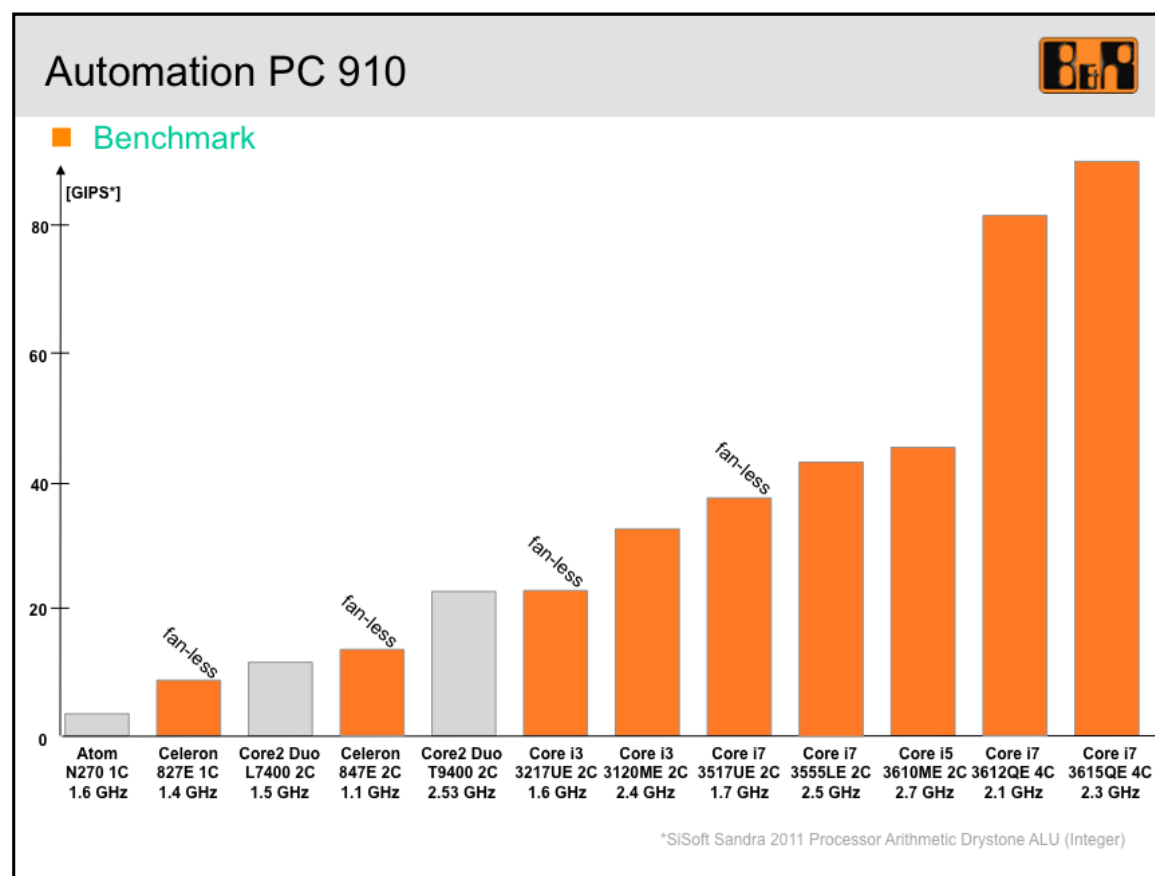
the bandwidth to run I/O, motion, vision, robots, safety and data acquisition together on the same wire. Not to mention the same software project. And everything but safety (by definition) can run on the same processor.

What's happened here? We've followed Moore's Law from the consumer and IT markets into industrial controls.

Yet, legacy control platforms still predominantly offer low volume, dedicated microprocessors instead of the latest Atom® and Core® i5 and i7 Intel® processors. They tend to incorporate proprietary attributes in an era of open systems.

These legacy platforms are now facing pressure from more advanced technologies. Change is inevitable. ■

Automation controllers that follow Moore's Law now offer an incredible performance range compared to legacy PLCs and PACs.



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Corporate mandates for sustainability, global competitiveness and lean manufacturing initiatives require increased throughputs with reduced use of materials, energy, water and other natural resources. Legacy solutions aren't good enough any more.

Challenging the status quo

The most common arguments for maintaining the status quo have included the learning curve to change control platforms, concern over increasing purchasing costs and spare parts to stock, and simply resistance to change.

These arguments have become increasingly diluted to the extent that functional, standards-based control specifications are accelerating among end users. The growing acceptance of advanced technology providers by end users has given machinery builders and systems integrators the confidence to select best-in-class automation technologies to differentiate their products. And it has caused the new class of automation suppliers to experience double-digit growth and establish global footprints.

While it was back in the 1960's and 1970's that 'no one ever got fired by buying IBM' in IT, a semblance of this extreme conservatism still lingers among some industrial automation users. After all, when the primary mission is to keep production uninterrupted, any change at all equates to the perception of risk.

Now, however, corporate mandates go far beyond simply keeping the line running. Sustainability, global competitiveness and lean manufacturing initiatives require increased throughputs with reduced use of materials, energy, water and other natural resources. And those challenges make change the only path. ■



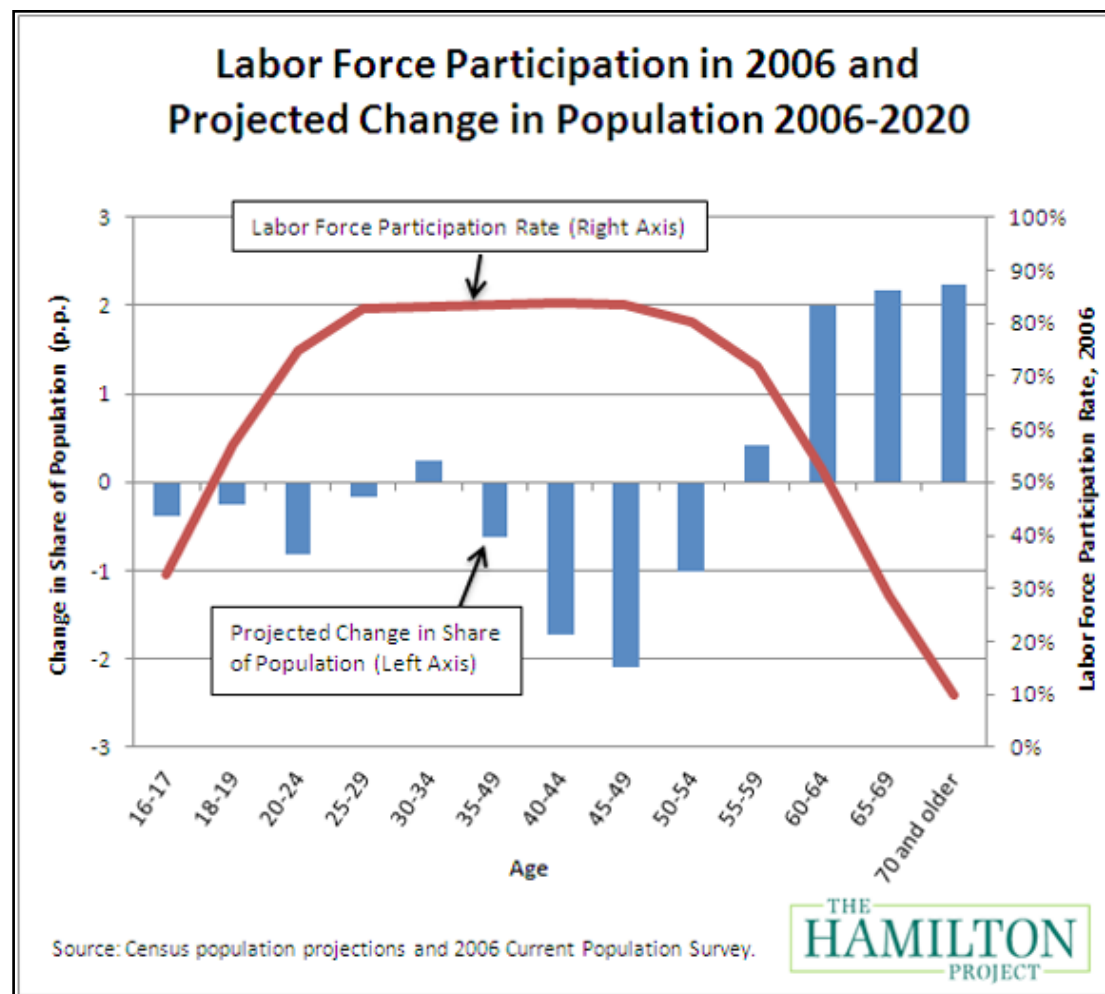


The world's workforce: a driver for change

The need to de-skill manufacturing jobs has become increasingly obvious. In developed economies, it's becoming harder to find skilled machine operators and maintenance technicians despite the promotion of continuing education, training certifications and relatively high wages for job seekers with relatively low levels of education.

In emerging economies, the skills don't exist because the demand is new, so the educational and training infrastructure doesn't exist. The employer must train employees, who increasingly are taking these transferable skills to the highest bidder in markets such as China. For consumer goods makers expecting the majority of their near-term growth to come from developing regions, BRICS and beyond, this is a requirement of strategic significance.

In the short term, lean manufacturing calls for more efficient processes and use of labor. In the long term, the workforce skills gap is projected to become more acute with aging demographics. More effective automation technologies are the answer. ■



The aging workforce will have a profound effect on automation in developed markets, creating the same skills gaps faced by manufacturers in emerging economies today. The answer is increased ease of use.

Chart courtesy of:
<http://www.brookings.edu/blogs/jobs/posts/2012/03/09-jobs-greenstone-looney>,
Michael Greenstone and Adam Looney, The Hamilton Project, Brookings Institution, March 9, 2012



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A slippery example

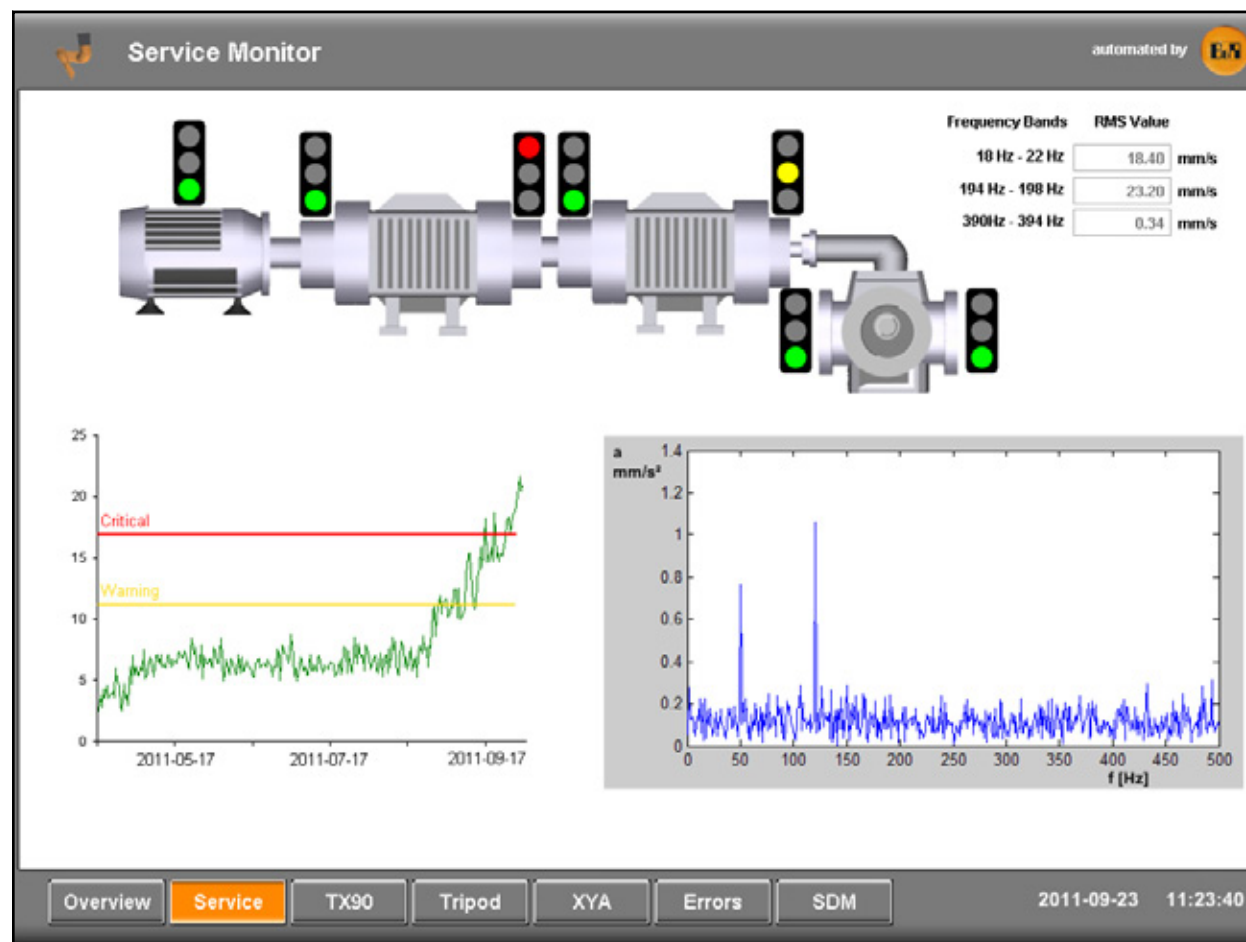
Adapting to workforce issues is a key aspect of mechatronic design principles that roll right into this convergence. As an example, consider machine lubrication systems. Hard-to-reach zerk fittings tend not to get greased. It's a common problem.

So machine builders began to invest in centralized clusters of grease fittings that make the task easier. The next step was to install a motorized pump and automate the lubrication process. The next logical step is to graphically display the level of the lubricant reservoir on the HMI when it is due for replenishment, the only remaining manual task. If the pump or motor burns out, the machine can be disabled and the failed devices highlighted on the HMI with the fault identified, replacement instructions described

by video or animation, and even automated parts ordering.

This is a win-win on many levels. A critical task is largely removed from human error and becomes more consistent, in keeping with Six Sigma and the pharmaceutical industry's Good Manufacturing Practices (GMP). Regardless of whether the operator is skilled or unskilled, it is a labor savings that will be readily recouped. And it's clearly ideal for lean manufacturers implementing vendor-managed inventory.

Ultimately predictive maintenance will call for actively monitoring machine conditions, such as critical bearings, using vibration analysis to detect signs of wear and damage. Condition monitoring technology is available today. ■



Automated systems can simplify tasks such as bearing lubrication while monitoring conditions to implement predictive maintenance, yielding both labor and maintenance cost savings.





How mainstream technologies are changing the face of industrial automation

Everything in an industrial control system used to be purpose-built. In the late 1980's it was felt that for motion networks to be reliable on the factory floor, they needed to use special purpose fiber optic networks, but now most use Cat 5 Ethernet cables. There were even vendor-specific 'flavors' of longstanding industrial standards such as RS-232 and RS-485 serial communications. PLCs were somehow considered different from industrial PCs, which today sport the same industrial hardening, real-time operating systems and IEC 61131-3 compliant programming as purpose-built PLCs or 'PACs.'

(The term PAC was coined by an automation analyst firm to signify that the controls called PLCs could now do more than logic. PAC stands for programmable automation controller, which is at best a redundant statement. The reality is that in the vernacular, the term PLC has come to be synonymous with machine controller. The generic use of the PLC acronym is also recognition that there's a lot more processing power out there than there today, but the familiar name stands.)

Today, the internet sets new standards by which we define



control and communication architectures. We use onboard web servers, internet connections and VNCs (virtual network communications) to diagnose issues, as well as to download and upload data to and from remote locations, using intranets and in-plant Wi-Fi connections for recipe management, production data and

Increasingly, industrial automation systems are taking advantage of mainstream tech, from wireless devices to computer usability or UseEx practices.

OEE data acquisition. We are applying the reliability of Flash® and other solid state memory.

We are just beginning to apply multi-touch screen technology and user experience (UseEx) techniques to improve usability. We are exploring how to apply the engaging aspects of video games and HTML5 programming to interact with machine operators.

This only makes sense. Many contemporary technologies, especially mobile devices, are already robust enough for most for the plant floor. For instance, Atom® processors are heat and vibration resistant. And the computing industry's volumes are an order of magnitude higher than industrial control, so this is where the basic R&D into new technologies is cost-justified. Many of the resulting capabilities, such as VNC, even end up being freeware. ■





What does 'convergence' mean in terms of automation technology?

In a nutshell: one software development environment, one runtime software application, one control hardware module, one processor

(possibly multiple cores), one network, all functionalities. That means human-machine interface, multi-axis motion, logic, robotics,

sensors and vision, safety, energy and condition monitoring, data acquisition, recipe management, diagnostics and operator instructions.

Between ten and fifteen years ago, high speed motion networks did not have the bandwidth to accommodate additional nodes such as I/O and variable speed drives. The device network was separate from the connection between the HMI and PLC, and the separate motion controller might also be on a dedicated connection or the PLC backplane. Safety would be hardwired. Vision would require its own dedicated PC. Data acquisition might be on a non-deterministic Ethernet network or require a 'data concentrator' PLC.

Each robot required its own proprietary controller and a lot of communications software to

synchronize with the machine's PLC. Hardware, software license and engineering costs were significant. Communicating between different controls across multiple networks made the system collectively run slower. And PLCs were not necessarily scalable between low, mid-range and high-end platforms, each requiring their own programming environment and often different motion and I/O hardware.

These scenarios are improving but these platforms are still in wide use, even on new-build equipment. It must be recognized that these limitations are unnecessary in light of available converged technologies.

This convergence has been embraced by a number of advanced machinery builders and has been documented in the trade press. ■



As this video shows, automation technology can be scaled up and down in terms of throughputs and process complexity.





The 'i' moment

It was well before 2010 that industrial automation strategists began to envision the future HMI as iPhone®, then as iPad®. This 'ah-ha' moment came and passed because no automation supplier was ready to dedicate the R&D resources to so radically simplify their software. And because multi-touch industrial computers didn't yet exist.

Technologists had to satisfy themselves by wirelessly connecting their actual iPhones and iPads to their control systems, proving that they could view and even manipulate their systems wirelessly from just about anywhere – the other side of the machine or the other side of the world.

Plant personnel were no longer tethered to the panels on the machine, including the more maneuverable pendants on coiled cords and the moveable arm-mounted HMI panels. Now they could wander around a large machine or a line without losing touch.

But that was never the end game. The real leap is to make the control system as easy to use and accessible as the elegantly simple navigation pioneered by the iPhone's visual and tactile experience. Now that iPhone and its expanding competition have changed the world's expectations forever, it's time to do the same in automation.

Multi-touch, HD industrial computers are now a reality, in IP65 rated enclosures and ranging in size from not much bigger than an iPhone 5 to two feet wide. Industrial software suppliers are beginning to launch multi-touch applications. The revolution, off to a slow start, has begun.

Does anyone need multi-touch industrial controls? No more than SCADA systems needed realistic graphical process depictions or HMI panels needed more than glowing green, alphanumeric CRT displays. Or electromechanical buttons on grey enameled steel cabinets, for that matter. But why would anyone go back? ■



Industrial multi-touch panels are now a reality and promise to become popular for both practical functionality and perceived value.



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3D immersive animation

Here is a genie about to be released from the bottle. Right now it's too expensive, in the vicinity of a \$40,000 one-time cost per machine. But once the early adopters start loading animated work instructions into their HMI panels, it will soon become an expectation. It's that much more effective than even video, and certainly a quantum leap from today's practice of loading a pdf of the machine manual on the HMI.

It's the ideal technology to overcome educational and language barriers. It is proven to improve both comprehension and retention in learning. It can be developed widely used 3-D CAD modeling software such as Solidworks®. It doesn't generate the visual clutter of video when focusing on specific elements of a complex assembly or task. And it uses computer graphics skills that are popular curricula among undergrads hoping to break into the videogame industry, but that largely go wanting once the designers enter the workforce (making them available for hire by machine builders).

Today, it's unheard of for a machinery builder to have a computer graphic specialist on staff. Instead, controls engineers design the HMI screens the way that their HMI suppliers allow. In the near future, OEMs will let their engineers focus on engineering and hire the specific skillsets to create graphics that reduce the learning

curve for operators, maintenance technicians, integrators and supervisors, not to mention trainers and cross-training.

Let's say an operator needs to perform a format change. The animation lets them reach on screen for the change parts they think are correct, and they get immediate reinforcement whether they are right or wrong. They can roll over sections of the machine to learn what they do.

In the event of a fault, the control program can automatically bring up a series of animated troubleshooting sequences. 'If no, then.' 'If yes, then.' And the system can automatically escalate to a supervisor, maintenance technician, or even a remote contract maintenance provider if the problem cannot be resolved by the operator.

This allows operators to perform a greater range of first echelon maintenance tasks without involving a technician. It takes the judgment call out of the equation. It ensures that the proper parties are made aware of the situation in a timely manner. It resolves the issue in the shortest time possible, based on the machine builder's intimate knowledge of their design. It uses visuals over words, and the words can be in any language for use anywhere in the world, not to mention universally understood symbols.



Animation onboard the machine's HMI provides inherent advantages over both video and still images.

Not that video doesn't have its place alongside animation. For example, instructions for a one-off specialty subsystem might not justify animation. Talking heads, application videos and more benefit from video. It's just that animation opens the door to a whole new level of productivity.

Combine animation with usability on a wide format, multi-touch screen and you have a powerful productivity tool indeed. ■



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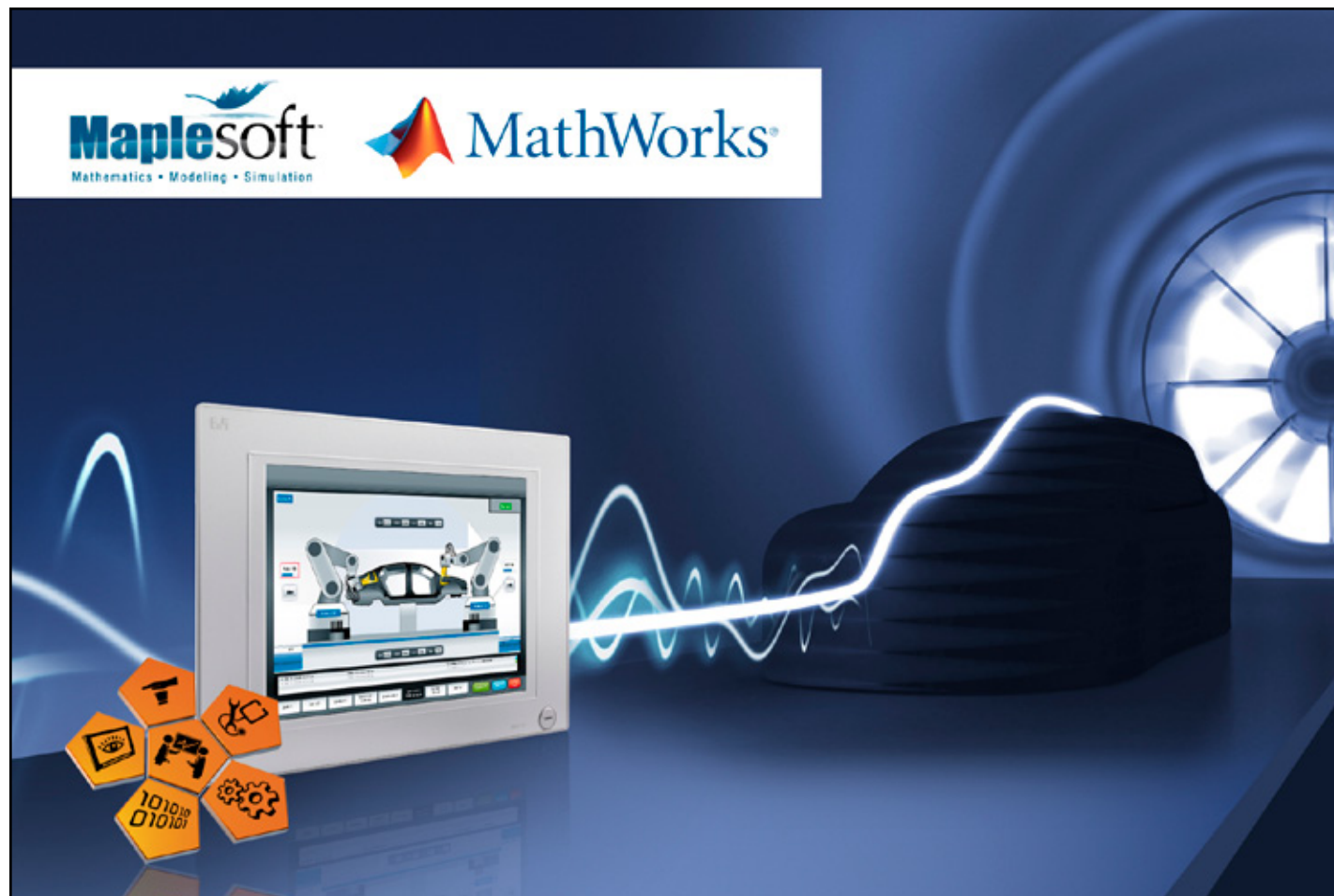
Simulation and code generation

Mathworks has its Matlab and Simulink, allowing engineers to flow seamlessly between design, simulation and control programming. This has been a holy grail in the CNC world, where STEP NC has long promised to link CAD, CAE and CAM.

The processing and network horsepower to make this happen are here. The will to move from legacy programming methods takes two catalysts, both currently active: a changing of the guard and a drive for the next big gains in cost productivity.

Convergence of other applications can reduce coding and data entry in other ways. For example, software development environments can interface with applications like ePlan to simplify development of wiring diagrams and to automatically generate bills of materials. ■

Technologies are commercially available to simulate machine models and automatically generate real-time control code to emulate system behavior. New designs can be tested before a prototype is actually built.





The HMI becomes the dashboard

As the control platform transitions to an industrial PC with a hard real-time operating system, virtually any standard computer programming language can be supported. As HMI incorporate more sophisticated diagnostics, users will not typically need to access code for troubleshooting, recipe changes or process optimization. They will parameterize graphical, menu-driven selections instead.

This is one of Nestlé's key initiatives in The Organization for Machine Automation and Control (OMAC). They do not want maintenance technicians to manipulate the code written by machine builders for their packaging lines. Machine builders agree. At worst it creates service issues and high warranty costs for the OEM and downtime for the user.

Instead, Nestlé is leading the charge to perform most tasks from the HMI. This means that machine builders must increase the functionality of their HMI software.

This will lead to another level of HMI development in which functions that were once viewed as lines of code will now become interactive dashboards that are parameterized and perform the complex tasks behind the scenes. ■

Dashboards like this motion control interface will make integrated control technology easier to use.





Applying UseEx to the dashboard

User experience, or UseEx, describes the discipline that applies computer usability, briefly mentioned earlier, to graphical user interface design. Computer usability brings together concepts such as the iPad, with fewer clicks across a 16x9 format, the ability to keep the original page on screen while bringing up new pages on

the right (instead of scrolling through screens), and professionally designed graphical user interfaces (GUIs) that are intuitively functional without becoming distractions.

These are mainstream skills to get the most from the mainstream technologies now available to industrial HMI. Early

adopters are now adding computer graphics graduates to their development teams. They are consulting with UseEx consultants from the computing industry.

Instead of controls engineers being drafted to design icons or select them from libraries of the same old two-dimensional objects, graphic designers are developing realistic yet elegantly simple, easy to recognize buttons, sliders, device images and process illustrations. And they are tying animation and video into their dashboards to maximize their effectiveness.

Arguments that such graphics are only cost-justified on high end control applications are now being disproved. Cost competitive multi-touch industrial panels are now being produced from as small as 7 inches to as big as 24 inches.

Consider the user experience of a good app for the small screen, and compare it to navigating a well-designed website on a full-sized screen. They are each scaled to their use, but they use many of the same graphic devices. To increase familiarity, the small screen control dashboard might even be designed in a portrait format, channeling the look of the operator's smart phone and tablet. ■

The advent of multi-touch panels from 7" to 24" allows a full range of machinery to benefit from enhanced computer usability, for a better user experience (UseEx).





Intellectual property protection

For decades, PLC source code has been exposed, allowing anyone with access to modify it (potentially causing problems) and even steal it. Compiled code provides a serious speed bump for intellectual property thieves, and there are now even more powerful safeguards against accessing code.

Machine builders want to protect their IP and avoid unnecessary service calls and warranty costs. Users need to be able to troubleshoot and therefore 'own' the code. Users and integrators both need to be able to add timers, photoeyes and other methods of synchronizing machines and process from multiple vendors. Pharmaceutical users need to be able to validate the software to comply with government regulations.

Increasingly users do not want their technicians in the PLC code unless absolutely necessary, recognizing the potential liability, downtime and costs of corrective action.

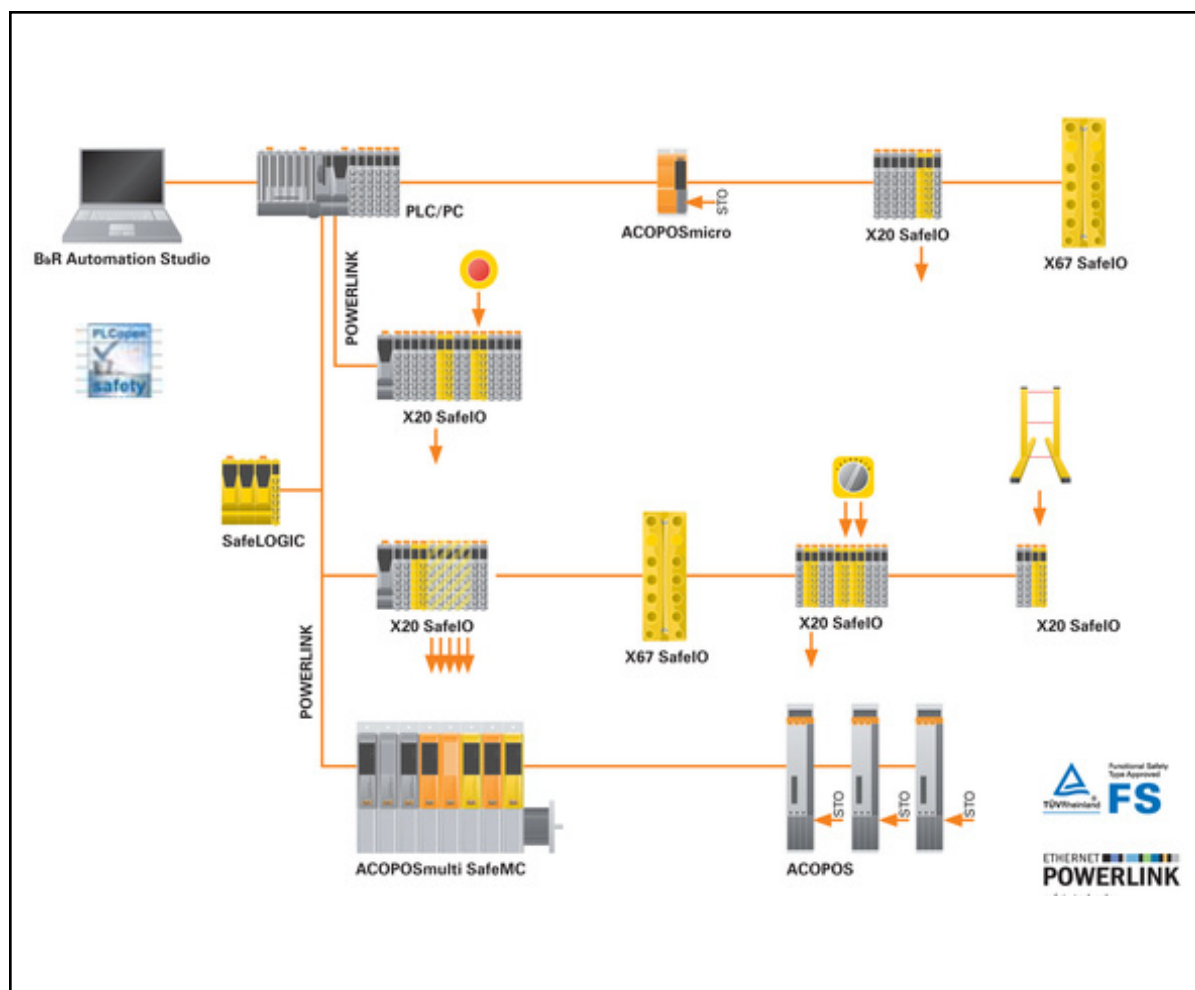
What's the answer? One is a 'sandbox' in which limited access to code is provided for all the right functions, coupled with increased security for the intellectual property that gives an OEM their competitive advantage in an increasingly mechatronic design environment.

Another is an RFID tag reader that assigns different access levels depending on the qualifications of the tag's holder. This is a more practical alternative to passwords that are inevitably passed around and written on sticky notes stuck to the HMI. ■



RFID access control is just one of the technologies available to protect intellectual property in automated systems.



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With networked safety, the same Ethernet cable controlling machine modules and machines across an entire line also functions as the safety network, connecting safety processors, safe drives and safe I/O, replacing hardwired safety PLCs and safety circuits with a much higher degree of functionality.

Safety = productivity

It used to be that safety was about regulatory compliance, avoiding liability and simultaneously adding cost to a machine. Those days are in the past. With the latest networked safety technologies, a safer machine is a more productive machine.

Of course, a safe machine has less down time and higher OEE. A safe worker isn't absent from the job. Machines that aren't e-stopped are subjected to less potential damage.

But a machine or line with networked safety represents a new level of productivity. That's because instead of minor shutdowns, it might only encounter minor slowdowns. And not stopping a line is the best thing you can do for throughput.

Networked safety follows the new safety norms coming from Europe. It doesn't require control power to be removed, instead it provides zoning and

safe torque, safe speed, safe robotics – allowing mechanical systems to operate in safe modes while a human intervention occurs.

Imagine a continuous process, such as a snack food fryer or plastics extruder, that must be shut down to clear a downstream jam. What if the line could be slowed down instead of stopped, perhaps with no more accumulation than originally designed in? And what if an operator could safely enter a robotic envelope to remove a damaged pallet or corrugated case blanks?

Now imagine that the robot arm can keep operating, but at a speed slow enough, torque low enough, and envelope restricted enough that it will not touch the human, and even if it did, it would not harm anyone?

This is the new world of safety. ■





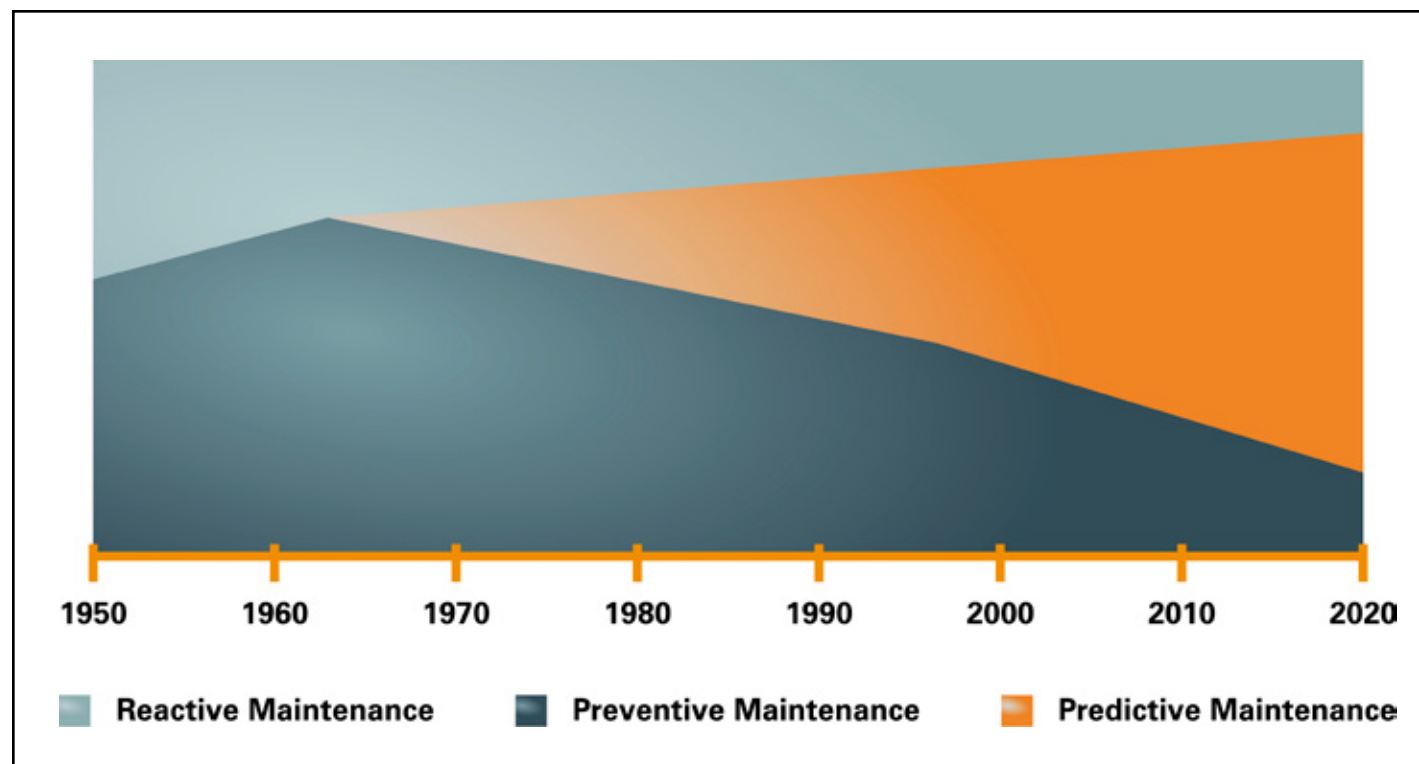
Predictive maintenance

The difference between preventive and predictive maintenance?

A better understanding of when a system will fail, how, and what needs to be done when to prevent it. Simple preventive maintenance is typically based on measuring things like B10 bearing life, cycles and hours of operation. Preventive maintenance doesn't know, it assumes.

Predictive maintenance includes feedback and analysis to identify behaviors leading to failure before they happen. Actively monitoring the condition of bearings will pinpoint unusual wear, for example. Monitoring of motor torque (current) and temperatures have long been used to indicate potential problems. But dedicated sensors can provide a host of information about abnormal vibrational forces. Tied into the control system, scheduled maintenance can be performed to avoid the disruption of unscheduled preventive maintenance or repair of a failure.

This information can now travel over the same network and share the same processor and control software as the rest of the machinery. ■



Condition monitoring can also take place over the same Ethernet cable controlling the machinery, making predictive maintenance programs a more practical reality.





Integrated control – the basis for convergence

Fact is, communications between machine controllers, robots, vision systems and other third party devices typically account for 30% of the control software. And this is often duplicated by each machine builder even though they are using the same third party device suppliers.

Integrated control reduces the proliferation of discrete controllers on a machine, using a powerful state-of-the-art machine controller instead.

For example, a dedicated industrial PC has been provided by vision suppliers to do image processing. Today, an IEC compliant function block may be all the interface required to do the processing on a centralized, Intel powered machine controller.

One example of integrated control is a new POWERLINK interface that connects vision systems over the machine control network to the industrial PC running the machine, eliminating the need for a dedicated vision PC. It's a very practical example of convergence.

Robot controllers have predominantly been proprietary 'black boxes.' Early attempts to adapt legacy PLCs or PACs to robot control have generated slow-running kinematic routines. Adding industrial PC modules with dedicated robotic software makes the PLC appear to be performing high performance robotic kinematics,

but in reality it's still two programs running on two controllers—a costly alternative.

Going back to Moore's Law—running an integrated robotic function on a highly capable integrated hardware and software platform—changes the equation for good (and for better) ■





Why OMAC matters

The Organization for Machine Automation and Control began in automotive manufacturing in 1994, specifically with a white paper co-authored by General Motors, Ford and Chrysler. At that time, OMAC stood for Open, Modular Architecture Control. It supported standards- and PC-based controls. Sound familiar? In 1995 the OMAC Users Group was formed.

Fast forward to 2000, and the Motion for Packaging Workgroup was formed. While the original Machine Tool Workgroup focused on computer numerical control (CNC) metalworking applications, the new packaging group began by focusing on general motion control (GMC) which, at the time, had been steadily gaining ground in mechatronic packaging machinery design circles. Today the scope of the OMAC Packaging Workgroup has greatly expanded and is merging with the parent Organization's overall manufacturing mission.

Since 2010, led by Nestlé and embraced by companies such as Arla Foods, Boeing, John Deere, MillerCoors, PepsiCo, Pfizer and Procter & Gamble, The Organization has developed a comprehensive approach to standardization that is destined to include the HMI template described earlier, along with standardized networks, programming, state model and modes, tag naming conventions, and even a universal User Requirements Specification (uURS).

The business strategy driving this standards initiative, in a word, is globalization. Multiple and de facto standards in developed markets, combined with a dearth of standards in emerging markets, pose a cost-prohibitive barrier to globalizing manufacturing and packaging operations. OMAC member companies recognize that more than ever before, effective automation strategies need global standards.

More information is available at www.omac.org. ■



The Organization for Machine Automation and Control is developing, adopting and promoting the use of international standards that enable innovation and overcome proprietary barriers to productivity.





The authors' perspective

B&R Industrial Automation has prepared this white paper to provide the global manufacturing community with a critical path to increasing productivity to the next level.

B&R Industrial Automation has also embraced The Organization for Machine Automation and Control, with B&R personnel serving on the OMAC Board of Directors and as the Chair of the Packaging Workgroup. The company has incorporated the OMAC architecture into its control architecture.

Commercially, B&R's comprehensive automation product line has enabled the capabilities described in this paper. It offers a competitive solution to other automation suppliers based not on proprietary systems, but on its value proposition instead.

This is the market strategy of a challenger that reinvests a large percentage of its revenue into research & development. As a global, privately held technology firm on a rapid ascent, B&R has

reached a threshold where legacy competitors relying on proprietary systems are becoming less relevant to automation users as they remain conservative yet demand new sources of cost reduction and marketplace advantage.

The following recommendations are presented as supplier-agnostic criteria for vendor evaluation, nevertheless criteria that B&R Industrial Automation feels confident in its abilities to meet.

RECOMMENDED ACTIONS

1. Conduct an audit of current and prospective automation suppliers

Begin by identifying your current automation suppliers (even companies with strict vendor specifications typically have exceptions to their own rules operating in their plants because non-specified suppliers provide unique and necessary advantages in particular applications).



Automation convergence will have a direct and profound impact on the upcoming generation of manufacturing systems, yielding top and bottom line advantages in the global marketplace.





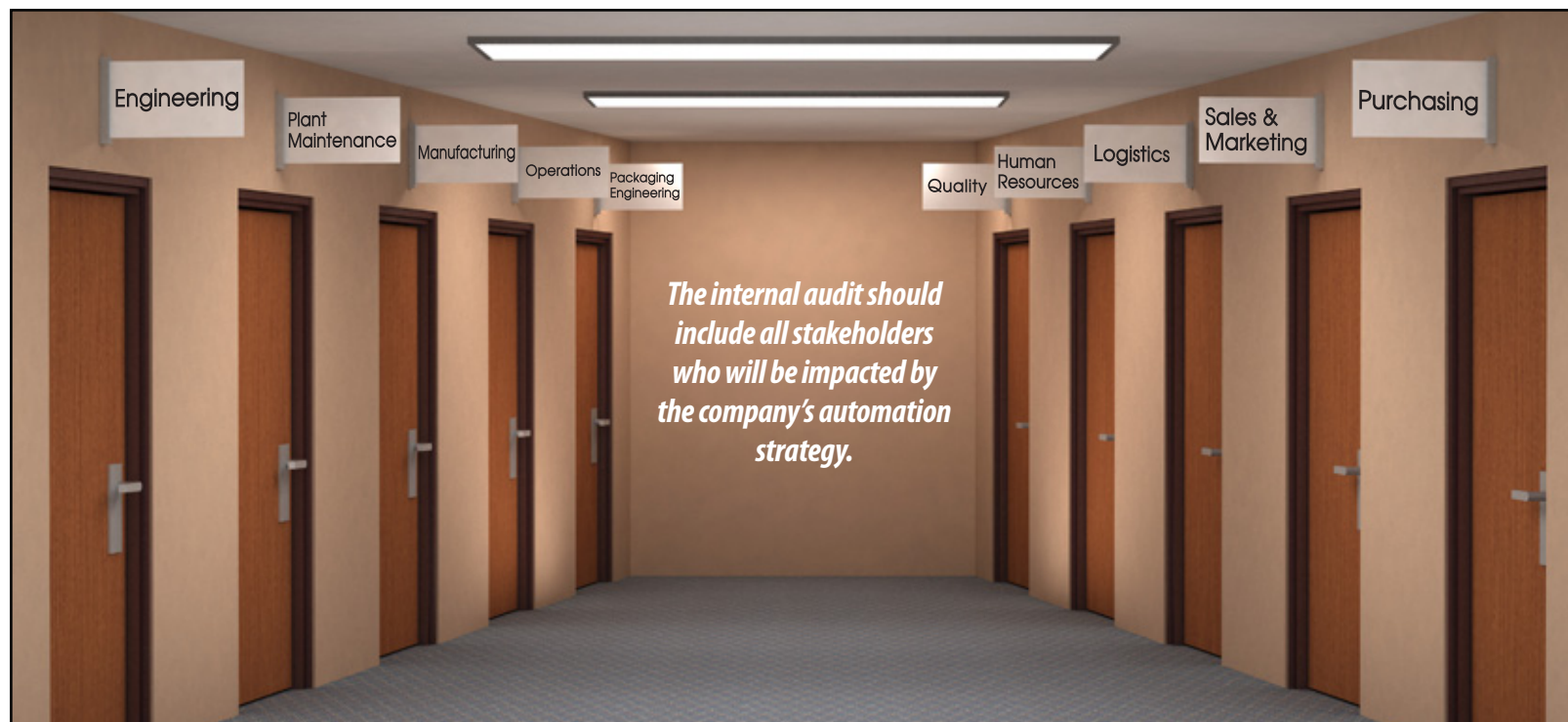
Next, consult with your most progressive equipment suppliers. Share your vision of convergence with them. Do not enter a financial discussion at this time, simply define the capabilities you seek.

Then ask your equipment suppliers what automation suppliers they would recommend to achieve convergence and why. Progressive machine builders routinely evaluate suppliers' capabilities and even offer them as standard to customers without restrictive specifications.

The importance of this last step cannot be overemphasized, as *very often equipment manufacturer Sales will not jeopardize a sale by proposing a non-specified control solution that Engineering has found to be superior.*

Some firms engage a third party consultancy in the automation space, two prominent firms being ARC Advisory Group (www.arcweb.com) and IMS Research (www.imsresearch.com).

The result will be a shortlist of automation suppliers to evaluate.



2. Conduct an internal audit

Identifying current suppliers may appear to belong in the internal audit, but it is chicken-or-egg. The purpose of the internal audit is to gather information to conduct the external audit.

The internal audit will identify both the motivations and the functions that drive change

and those that cause resistance to change. It will identify bottlenecks and opportunities. The results will help understand the perceived risks and advantages of both sides. It will help prioritize change and develop a roadmap.

Include all stakeholders in the audit, not just Engineering, Manufacturing, Plant Maintenance,

Operations and Packaging Engineering. Equally important but too often not included in a discussion of manufacturing technology are Business Unit P&L-responsible managers, Purchasing, Sales & Marketing, Logistics, Quality and even Human Resources. All are impacted.





CLOSE

The screenshot displays the OMAC (The Organization for Machine Automation and Control) website. The header includes the OMAC logo and a tagline: "OMAC is the organization for automation and manufacturing professionals that is dedicated to supporting the machine automation and operation needs of manufacturing." A search bar is located on the right. The left sidebar contains a navigation menu with categories: General Information (About OMAC, Membership, Meetings & Events, Press Room, Contact Us, My OMAC Login), OMAC Workgroups (OMAC Packaging Workgroup (OPW), OMAC Machine Tool Workgroup (OMW)), and Technical and Promotional Collateral (Presentation Resources, Members-Only Documents). The main content area features several news items: "OMAC WORKSHOPS DRAW CROWDS TO CINCINNATI" (2013-05-28), "OMAC WELCOMES CORPORATE MEMBER MILLERCOORS" (2013-04-23), "OMAC PACKAGING WORKGROUP INDUSTRY SURVEY" (2012-08-05), and "NESTLE ARTICULATES PACKML'S BENEFITS" (2012-07-19). A "News Archive" link is also present.

A small investment in OMAC corporate membership gains access to important standards and best practices.

3. Become a corporate member of The Organization for Machine Automation and Control

This is a small investment in a 501(c)6 organization to cooperate with peers, automation technology providers, standards bodies and systems integrators to develop and drive adoption of global standards.

4. Evaluate automation suppliers based on key criteria for future-proofing your business

Today, automation is intrinsically tied to key performance indicators (KPIs) driving corporate objectives ranging from operational gains to time-to-market. It is therefore imperative that automation functionalities be evaluated in a three-step process to connect

these functionalities with their impact on manufacturing operations, and manufacturing's corresponding ability to support corporate goals.

Basing automation platforms on international standards creates transparency on multiple levels that eliminates dependency on a sole vendor. It is entirely possible to accept a practical number of preferred automation suppliers, nominally three or possibly four.

This appears to be a manageable balance between the overall number of automation suppliers to support, and extracting maximum competitive advantage from an automation supplier base. It should be noted that being based on international standards, it is much simpler to replace a preferred supplier should the need arise. ■

