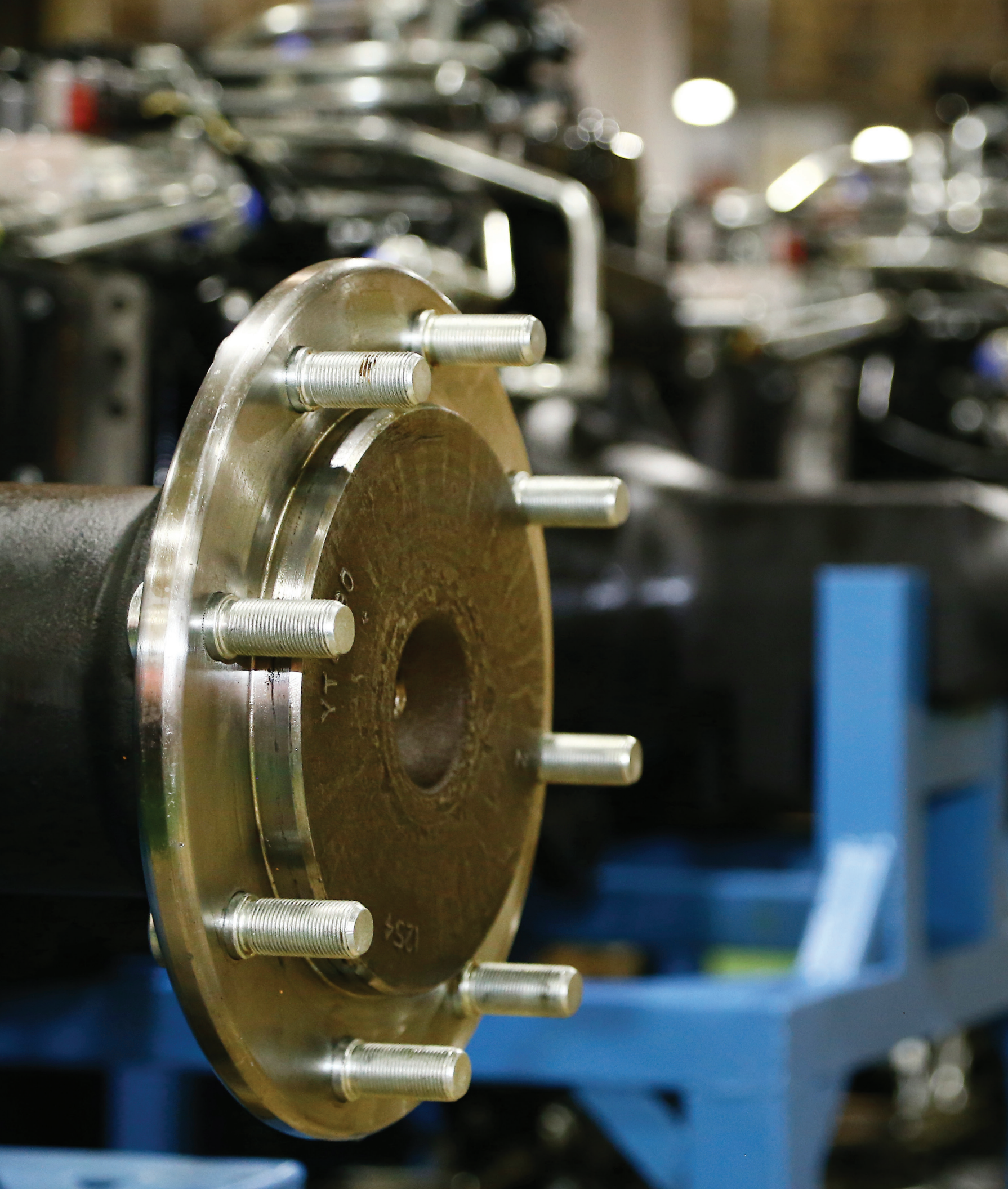




Technology In Industry Report

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Industry 4.0: From Vision to Implementation



Foreword



What are the possibilities of The Fourth Industrial Revolution? We are only beginning to scratch the surface of what is imaginable through Industry 4.0. Today, in factories across the globe, products fitted with sensors are interconnected and sharing information, machines can learn to optimize processes and fix themselves before they fail and robots are working collaboratively alongside human workers.

By 2025, Industry 4.0 is expected to generate close to \$1 trillion in economic value. Through Industry 4.0, large manufacturers are becoming more streamlined, efficient, agile and are seeing improved production outputs and increased sales. However, to unlock the true potential of this revolution, all businesses along the supply chain must adapt and implement a digital mindset.

As Michigan's Industry 4.0 knowledge center, Automation Alley's mission is to help manufacturers of all sizes understand the rapid technological changes associated with digitalization so that our state—and our nation—remain globally competitive. This 2019 report, "From Vision to Implementation," is a guide to help your company assess its current position and get you on a path to long-term success: one led by a new business model that's driven by information to spark innovation.

In 2017, our report gauged your readiness for Industry 4.0, in 2018 we gave you the tools to harness its power and in 2019 we are calling you into action.

Just as the way we work is changing, so to is the way we must think about our education system. While Industry 4.0 will eliminate many blue-collar jobs, "new-collar" jobs are emerging. Through this collaborative report, Automation Alley is empowering industry and academia to work together to upskill our current workforce to meet new technological demands while ensuring our children are prepared for the jobs of the future.

Tom Kelly
Executive Director & CEO
Automation Alley

Intel Insights

Industry 4.0: Transforming People, Processes, Technologies & Organizations

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Predictions about Industry 4.0 are everywhere. Autonomous machines will self-monitor and organize their own maintenance. Customized

products will be built on highly flexible production floors that link to inventory systems, with just-in-time delivery of needed parts without human intervention.

But what does it take to get from where most companies are today to a future where these predictions are reality? Intel Corporation has been working with over 400 manufacturers and their ecosystem partners to better understand how this transition actually plays

out—and they’ve discovered some interesting things.

The Power of Vision

First, most of the companies Intel is talking to are following the advice of pundits: Start small. They focus on point solution pilot or proof of concept projects. But even when these projects are successful these islands of excellence are often not scalable because larger integration challenges were

neglected. Companies instead should be following the mantra: Think Big, Start Small. Without a vision for what Industry 4.0 tools and technologies could do for your factory, how can you know whether or not progress is being achieved?

It Takes More than Technology

Another challenge could be dubbed “If I have the technology, problem solved.” For example, a predictive maintenance solution requires an understanding of the forces that impede machine performance. But it requires that the data exist and can be collected in a form useful across systems. Among the companies Intel works with, lack of information in a suitable form, sharable across organizational silos and available in a timely manner were top of mind obstacles to Industry 4.0 transformation.

Data-Driven Culture

A third hurdle to Industry 4.0 transformation is corporate culture. For some, the ROI is too unclear to be decision-ready, particularly when considering risks. While others want to try “something” just to get started and learn. Both thought patterns miss the mark. The problem lies not in how to get started, but in how to grow teams that can define the problem space, assess the options and understand how to gauge value add of any particular solution in terms of metrics that drive operational performance and business value.

Convergence & Empowerment are Essential to Industry 4.0 Transformation

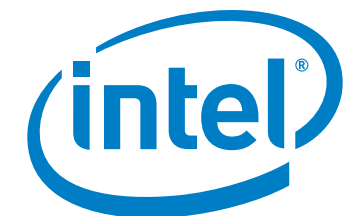
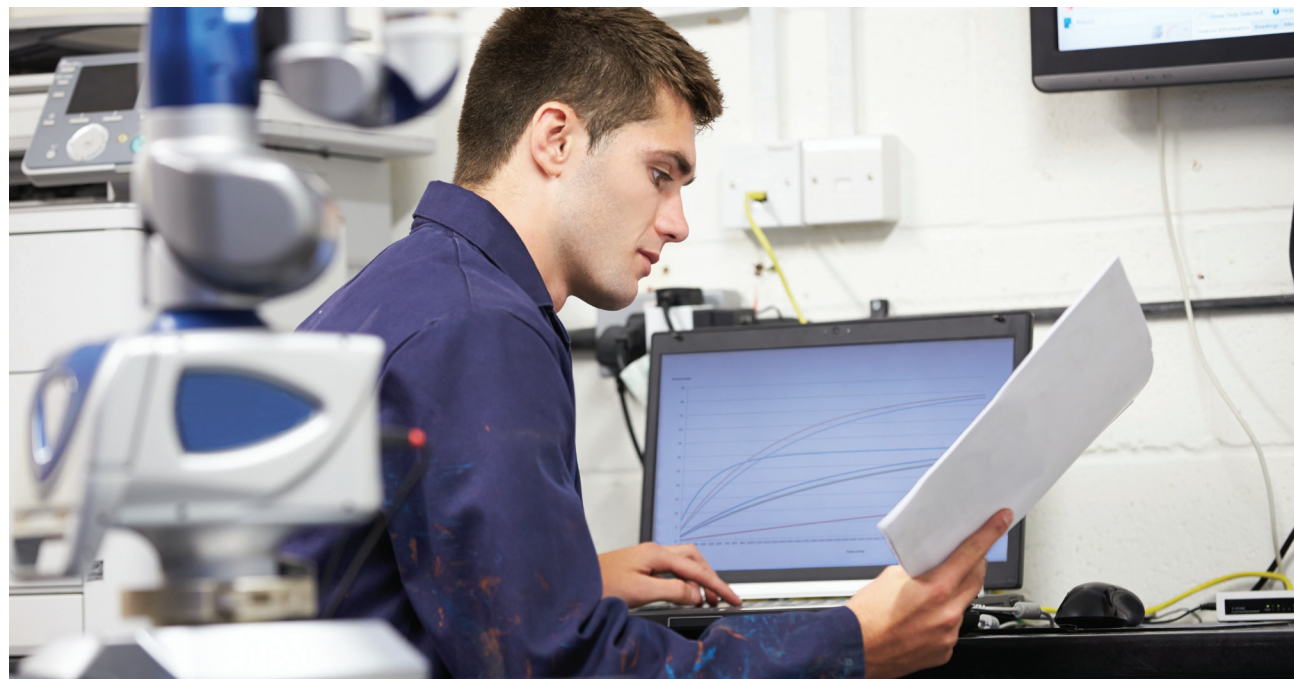
Industry 4.0 success also requires a convergence of cultures. In a transformation being driven by digital technologies, operational excellence and experience (OT) must be merged with that of information technology (IT). Having one without the other results in: (1) great operational ideas that lack the digital infrastructure needed to be sustainable; or (2) advances in IT systems that fail to be deployed in the factory because their value cannot be described in metrics that reflect operating imperatives.

The solution is very simple—but hard to achieve. We must build an organizational culture where IT and OT converge. And it’s not just OT and IT professionals who will need to be involved. Manufacturing expertise resides throughout the factory. While individuals at all levels see a mandate for change, they often do not feel empowered today to discover, test and deploy new ways of working with these technologies. Convergence and empowerment—two concepts that are rarely linked.

Industry 4.0 Requires Organizational Changes

The organizational silos that have supported economies of scale production may not be well-suited to Industry 4.0. The resulting siloed decision-making is often a hindrance in the rapidly changing world of Industry 4.0. A colleague who works with robot deployment noted that the U.S. is well behind Japan in the use of collaborative robotics (cobots). The main reason, he asserts, is that in Japan managers—from maintenance to first-shift supervisors to controls specialists—are empowered with both funding and decision-making autonomy. Without that, he contends, the focus of real problems gets lost in the corporate accounting shuffle.

Companies serious about Industry 4.0 transformation need to embark on a journey that will encompass their people, their processes, their operating technologies and their organization. While the first three have gotten more attention in the past couple of years, it is the latter—organization—that may be the biggest barrier to change.



Case Study

Flooring Solutions Provider Shaw Industries Breaks Production Records with Splunk IoT

Problem

With annual sales nearing \$6 billion, Shaw Industries Group, Inc. supplies flooring products and synthetic turf to residential and commercial markets around the world. To retain its competitive position, Shaw Industries wanted to implement Industrial Internet of Things (IIoT)-based, real-time factory floor analytics. According to Gabriel Gerges, Shaw's Samples division department manager, the company struggled with an overwhelming amount of data points

and work order data, so much so that it was sometimes difficult to get a good understanding of issues or equipment performance. The company needed to better understand how its machines were running at any point, using real-time data.

Solution

Shaw Industries implemented Splunk Enterprise's IIoT-based, real-time factory floor analytics, allowing data from systems and industrial sensors to provide new business

insights, improving production performance and spurring friendly competition among plant workers.

Implementation

Initially, Shaw Industries adopted the Splunk platform to provide visibility into a new post-consumer recycling facility. Given the ease of ingesting plant data and correlating disparate industrial data streams, additional Shaw manufacturing plants began implementing their own Splunk instances, resulting

in a corporate initiative spanning 37 manufacturing facilities. Today, approximately 300 managers and engineers are trained to write Splunk searches for their machine and enterprise data. Plant managers and production managers consume Splunk dashboards for key business insights.

Outcomes

Since deploying the Splunk Enterprise IIoT solution, Shaw Industries has seen benefits including:

- Improved work order lead times
- Significantly increased sample panel production output
- Reduced energy usage at one facility, resulting in significant cost savings

"We blend IoT and business data," says Erika Swartz, a process engineer in the company's Fibers division. "The biggest value comes when you can put those sources together. I use business information to contextualize process data that previously had no context. This accelerates our time to insight and allows us to answer important questions on key business metrics. Before Splunk, our team spent a lot of time analyzing and combining reports to understand what impacted metrics. Now, we plug our data sources into Splunk and can automate analysis to understand where our opportunities are."

One group that is boosting output with the Splunk platform is the Samples division, which provides the sales force and some retail stores with hardwood floors, resilient laminate, ceramic tile and stone product samples. "At Shaw Samples, we're all about speed and servicing the customer," says Gerges. "One of the most important metrics our department uses is work order lead time — the time it takes to service a work order, from when it is created to the time it ships. Splunk has helped us drastically increase speed to drive our business."

In the past, the Samples division relied on lagging metrics to monitor production. Since the plant provided associates with a Splunk efficiency data dashboard to show real-time production, the plant has more than doubled production with focused process improvements. "Splunk is helping to change the way we do business," Gerges says.

An unexpected benefit of the factory floor dashboard is the sense of fun competition that

has developed. "You might have two operators who are trying to outperform each other, and there's some good camaraderie on the floor now that you probably wouldn't have seen in the past," Gerges says.

At one of Shaw's carpet facilities, Gerges used Splunk Enterprise to analyze energy usage to help reduce energy intensity, which is a company-wide goal. "After a lot of testing, and making data-driven changes by utilizing Splunk, we reduced energy usage significantly," Gerges says.

Overall, by collecting and analyzing manufacturing and industrial sensor data in real time, Shaw has gained new visibility and insights into business-impacting issues like quality and performance.

"For us, transparency of information is important," Swartz concludes. "We have real-time information to make decisions quickly and accurately, and we are providing the same information to people across the business, so that they can make decisions, too."



splunk® >

Case Study

Wind Turbine Leader Vestas Turns to PTC & Digital Data to Help Usher in the Next Generation of Sustainable Energy

Problem

Vestas has been at the forefront of wind energy for 40 years, introducing market-leading wind energy solutions that have driven down the cost of energy and taken wind energy from niche to mainstream. With more than 23,000 employees, industry-leading smart data capabilities and an unparalleled number of wind turbines in service, Vestas is driving the future of sustainable energy solutions.

Building some of the most complex and in-demand offerings in today's eco-friendly world, Vestas was looking to improve a manufacturing process that requires numerous shop floor workers to put together thousands of materials in a critical step-by-step process. With a build process that is so dynamic, their machines require very detailed work instructions that had been traditionally printed on hundreds of pages of paper. An industry visionary, Vestas also frequently

adds the latest technologies into their products, meaning that initial work instructions have to be updated to meet the latest specifications and best practices each time there is an upgrade or an engineering change.

Currently, as part of the product planning team's role, workers have to visit each shop and check that every workflow has the latest information—creating a lengthy review process and unnecessary

travel costs. Adding to this, the archaic process required workers to manually sift through numerous pages of instructions that may not be relevant to their specific job function, further stifling productivity. Also, as with many organizations in the manufacturing space, some of the company's most experienced workers are nearing retirement age and possess a wealth of knowledge that needs to be captured and archived.

All in all, Vestas knew that the methods in place were not sustainable in today's ultracompetitive smart manufacturing world and decided to kick off a search to find a partner who could help them improve these workflows.

Solution

During their search for Industry 4.0 technology, it became clear that the company needed to take a digital-first approach to their manufacturing and reduce their reliance on paper-based instructions. To do so, Vestas is adopting an entirely digital turbine production process—everything from CAD design to manufacturing. The company turned to PTC's ThingWorx Operator Advisor, which equips machine operators with the relevant information they need to identify and complete tasks—including role-specific digital work order information and instructions with rich CAD drawings and videos—all in a single interface.

Implementation

Because of the pre-built, configurable building blocks provided through the ThingWorx platform, the full deployment of Operator Advisor—from conceptualization to hitting the factory floor—will take Vestas less than half of the time if the company was looking to roll out an in-house solution. The company is also hoping that with the build instructions not having to be printed out, it will help remove a large amount of the work of that the product planning team is currently doing.

Outcome

Introducing a technology that provides a multitude of workforce enhancement capabilities to a labor-intensive production ensures Vestas' manufacturing floor employees will have access to all of the information needed to complete their job, digitally and in real-time. This will help ease the impacts felt by the veteran employees retiring and combat the current volatility that the manufacturing space is facing around employee retention.

Additionally, this will have far-reaching impacts on things like safety and reductions in training times as the technology will not only provide the floor worker with the task at hand, but the best way to complete it.

Vestas and PTC's partnership will continue to pay dividends as the company plans for the next generation of smart manufacturing technologies, as only PTC provided the operational data display through digital, 3D, video and augmented reality that they were looking for. With this technology in place, Vestas believes they are set up for success in a factory of the future, with a road map of how they can easily integrate this data with other smart tools and even robots.

Furthermore, and true to its culture, Vestas is also looking to build a sustainable solution on their shop floor by minimizing its ecological footprint through Operator Advisor. The hope is that the technology will also allow the company to remove print and copy machines and countless boxes of paper from all manufacturing sites.



Case Study

Before the Floor: Laying the Groundwork for Smart Manufacturing Success with Configit

Problem

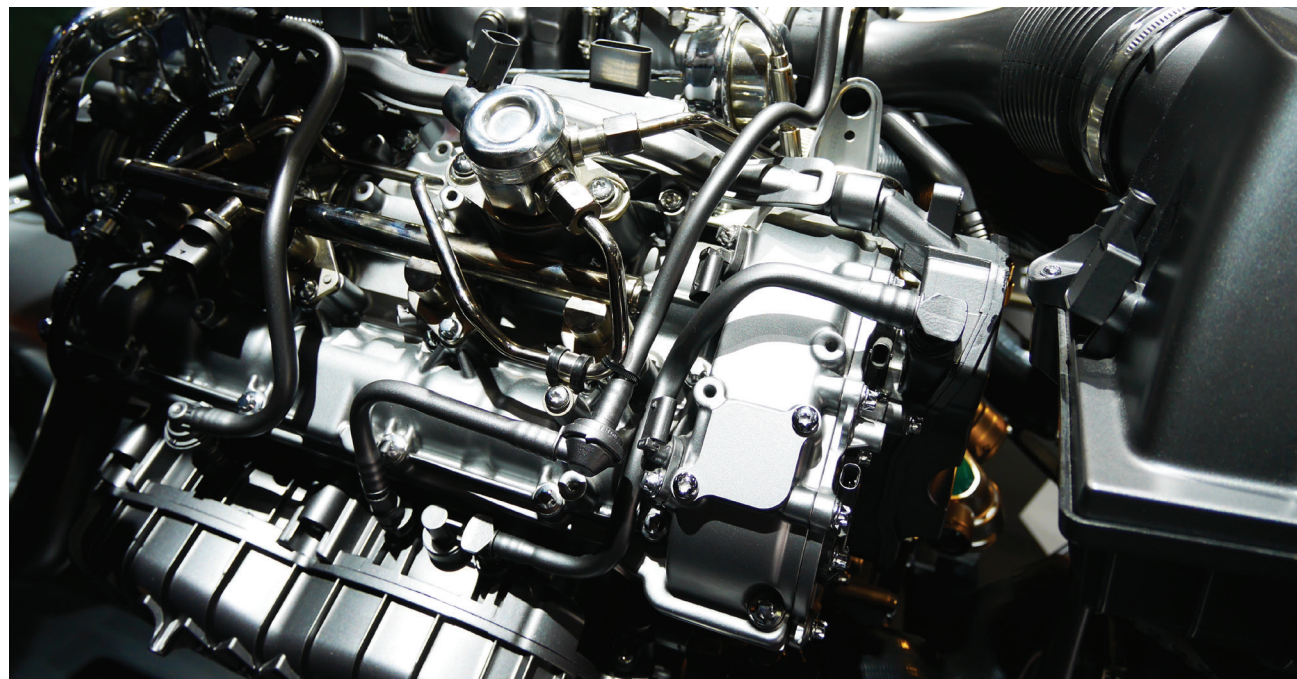
A global Fortune 500 manufacturer leads the field among its competition, but its U.S. Motors and Generators business unit wanted to do more.

This company offers an enormously wide breadth of configurable products. It was a challenge for them to maintain stocked product and nearly impossible to maintain the flow and integrity of one-off orders.

It was taking the company 10-12 months to build a product that would only be purchased once, and often, six months into the build process someone had to speak up to say, “we can’t build this product.” Thus began a debate between functional units. Who calls the customer? Who pays for the lost time and materials? And most importantly, how did this happen?

It happened because engineering, manufacturing

and sales operated in different silos. Engineering relied on one configurator to help design products, but production relied on a different configurator, and sales relied on yet another configurator. The result was confusion, errors and fights between departments. That meant costly mistakes and an incredibly high time to market. In a global manufacturing environment delivering 1.5 million products per day, this landscape was financially and operationally unacceptable.



Solution

The business unit knew that solving this problem was necessary to move forward in the future and so they began an initiative called Smart Simplicity. The project aims to unleash the full potential of existing Industry 4.0 initiatives, but to do that, the company had to first solve the configuration challenges.

Implementation

With Configit’s help, the business centralized all configuration rules into a single repository that feeds multiple ERP, PLM, sales and customer systems.

Each department came together to define all elements of a product. These elements are then standardized into a central location. With this setup, an element is authored once, defined once, and stored once, then accessed by all other systems.

For example, a feature is authored and defined once then stored in Configit Ace. Once its been created, the feature is then consumed and becomes a standardized option or choice. That option or choice can then be pushed to SAP and becomes a characteristic or value. That characteristic or value is exactly the same as what was defined and stored in the very beginning, it’s simply been pushed into the appropriate system and given the appropriate nomenclature.

This pattern continues on to feed a product configurator. Now, a sales-

person is creating a quote. Because the rules were established up front and have been consistent throughout each system, the salesperson is selecting options that have already been validated. It’s impossible for the salesperson to quote a product that manufacturing can’t build or engineering can’t design.

Outcomes

The benefits are now gigantic. With a centralized repository of rules, a customer is given an accurate, real quote the first time. For this global manufacturing leader that meant that teams were able to reduce time from configuration to manufacturing from six months to four weeks. They’ve experienced zero order errors and realized a 45% improvement in collaboration between R&D and sales.

But the Smart Simplicity project aims to do even more. With its new configuration solution in place, the business unit can implement Digital Models. Teams will be able to look at a configured product from design to production and have visibility into the product as it’s made by a Doosan machine. Everyone will be able to see the flow of products through the

floor and the manufacturing team can now re-order the flow based on product configuration, allowing for the most efficient build and assembly processes possible.

Beyond this, the Smart Simplicity project plans to implement the digital twin, an initiative that was previously impossible. There were simply too many engineered-to-order products sold to effectively introduce the digital twin. But now, because all configuration data is standardized, centralized and connected, a digital twin can be created at the time of quote.

With both a digital twin and digital model in place, the global manufacturer can realize huge efficiency gains. Engineering no longer wastes time designing an impossible product, manufacturing no longer stops the assembly line because a product can’t be built, and sales no longer calls the customer to say that his order has to be updated and will now be six months late.

By starting at the beginning of the product lifecycle, this manufacturing leader was able to lay the foundation for its Industry 4.0 initiatives to be as successful as possible.

Configit®

Case Study

Sweet Harvest Foods Enlists Marco for Cloud & other IT Solutions

Problem

If your company had an overnight merger and suddenly grew twice its size, how would your IT department keep up? Brian Pleschourt, IT director at Sweet Harvest Foods, had to answer that question. He faced rapid growth when a larger company purchased the organization. “Instantly, we more than doubled in size, adding a California and Michigan location, combined with our two Minnesota locations,” he explained.

Sweet Harvest Foods is a worldwide leader in honey procurement and

distribution. The company is one of the largest processors of 100% pure, all-natural honey with offices in Minnesota, California and Michigan. They distribute their products—honey, molasses, and agave—to food manufacturers, national retail and grocery chains and food distributors. Their approach allows for supply chain transparency, traceability and consistent quality of products.

Even before Sweet Harvest Foods’ swift expansion, Pleschourt was the lone IT staff member. “I was the only person, so I was busy. Fortunately, I partnered with Marco six months before the merger. I wasn’t aware of

the merger but was planning for future growth.” With about 30 years of IT experience, Pleschourt originally needed assistance with only some Tier 2 and Tier 3 level aspects. “I needed support for things that were outside my knowledge. That’s why I went to a hybrid solution. I liked the flexible support offerings.” Marco assisted him for specific IT recommendations and provided service for the tougher problems.

Solution

Pleschourt worked hands-on with Tier 1 level IT solutions, acting as the Support Desk for Sweet Harvest

Foods. After transitioning into multi-locations with multiple domains, he needed help implementing best practices. So Pleschourt added Marco’s Support Desk full-time, which now remotely services all four locations across the country.

Implementation

Marco’s expert Support Desk members assist Pleschourt and his co-workers using their various skill sets. “Having Marco as my IT department with full Support Desk allows me to know that if I need a network expert or an Microsoft Exchange expert, they are available to me.”

Marco’s Managed IT services assured Pleschourt that his growing company could adapt to the changes, mitigate risk and standardize systems. His consulting systems engineer was instrumental in the planning and implementation of new hardware, firewalls, switches and servers. Marco also added Backup as a Service (BaaS) and private cloud (IaaS), plus helped find ISPs for reliable internet. The Marco team installed teleconference rooms in a Minnesota location as well. “Right now, all four sites have Cisco Meraki, redundant firewalls, redundant internet and redundancy in switches. We implemented each project for the migration and standardization across all platforms.” Marco and Pleschourt wanted to eliminate single point of failure with the back-ups and store data in one secure spot.

Besides Marco’s aid, Pleschourt appreciates the quality of the chosen Cisco products. He said the visibility and remote management of the firewalls, switches and access points have proven to be extremely advantageous.

Outcomes

- Reliable IT support and cloud services
- Expert strategic planning consultations
- Flexible technology options

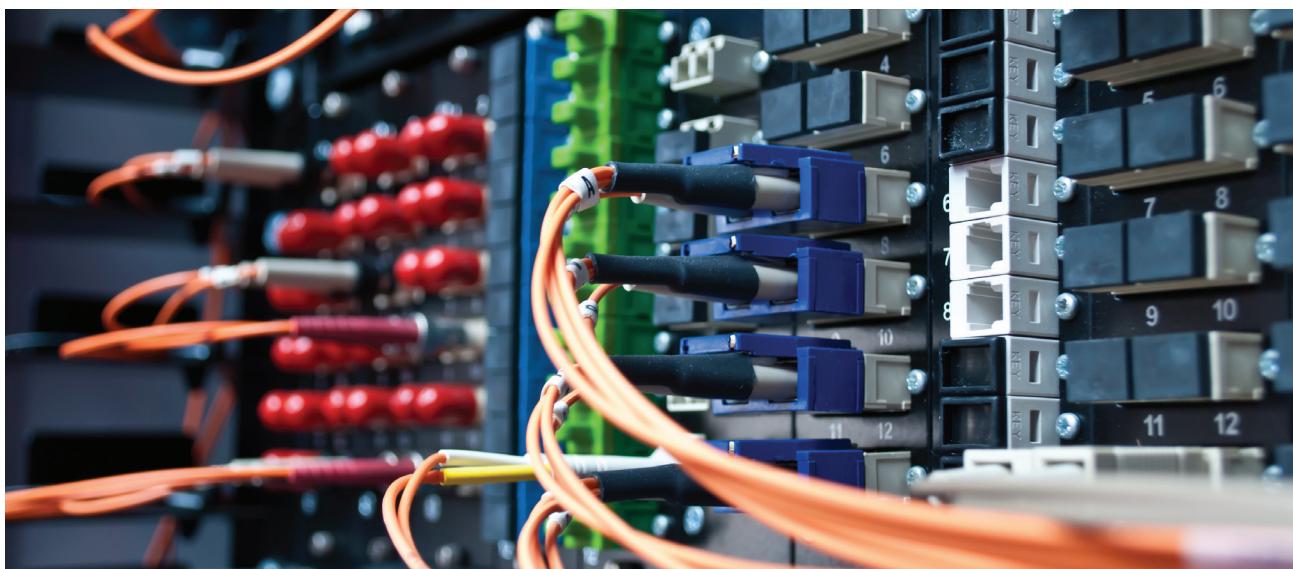
Although some IT directors or IT staff members may feel threatened by bringing in another company, Pleschourt said he never felt hesitant to partner with Marco. “I think a company still needs an IT leader. Marco is my IT department. I’ve never felt endangered by the fact that I’ve brought Marco on board. I was drowning in work and needed a partner.”

Although the IT field can be unpredictable, and technology is always changing, Pleschourt said Marco has helped solve problems when his anxiety level rises. He explained that he has been able to

reach the right people and escalate requests. “You can’t anticipate everything that is going to happen on a project; Marco excels at being very responsive to change.” He added that the implementation process, from the first contact to planning to installing, went smoothly.

Now, Marco is helping Pleschourt merge their domains into one. He plans to continue working with Marco for further projects, and of course utilize the Support Desk. Pleschourt even offers feedback to Marco through a Leadership Counsel, a group of customers who provide feedback about Marco’s products and services to enhance clients’ experience.

“I recommend Marco, and a lot of it has to do with the fact that you have a deep bench of experts. I’m very satisfied. Marco doesn’t present itself like an IT subcontractor. I feel we are true business partners. We share responsibility,” Pleschourt said. He brainstorms with Marco team members to discover the most fitting solutions to meet his needs, and that has helped Sweet Harvest Foods succeed.





About Automation Alley



Automation Alley is a nonprofit manufacturing and technology business association and Michigan's Industry 4.0 knowledge center, with a global outlook and a regional focus. We connect industry, academia and government to fuel Michigan's economy and accelerate innovation. We offer programs, resources and knowledge to help our members grow and prosper in the digital age.

Our Mission

The mission of Automation Alley is to position Michigan as a global leader in Industry 4.0 by helping our members increase revenue, reduce costs and make strategic decisions during a time of rapid technological change.

Our Vision

Michigan is the leading applied technology and innovation state in the world.

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