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OPERATIONAL EXCELLENCE: HOW TO MAKE IT STICK

A compendium of
Continuous Improvement
from *IndustryWeek*

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INTRODUCTION

Lean and continuous improvement have been core pillars of IndustryWeek's manufacturing coverage for decades. The stories and best practices our network of experts and contributors produce have become required reading for any leaders who are serious about growth and efficiency, who value their teams and engagement, and who strive to drive value and eliminate waste through their organizations.

So it is especially gratifying to wrap up some of our most potent and insightful CI pieces for you here. This e-book packages together a full range of industry stories, detailing best practices all the way from OEE and uptime to kaizen and hoshin kanri, from executive buy-in to targeted improvements, and from production all the way through delivery.

These articles are all themed around one central topic: making it stick. These aren't short-term solutions, they aren't get lean quick schemes—these articles lay out the strategies and philosophies required to keep CI and the pursuit for operational excellence alive and active for decades to come.

Travis Hessman
IndustryWeek

OPERATIONAL EXCELLENCE: HOW TO MAKE IT STICK

Two manufacturers share tactics for keeping lean and continuous improvement fresh, growing and top of mind among the workforce.

While age 25 is considered young in human terms, among successful continuous improvement programs within manufacturing companies, that age is almost unheard of for its longevity. Even a decade of success can be difficult to find.

Yet such examples are out there. Freudenberg-NOK Sealing Technologies is this year celebrating a quarter-century of "Growtth," an acronym for its lean implementation program Getting Rid of Waste Through Team Harmony. And manufacturer Belden Inc. has 10 years of lean experience under its belt with every sign of continued program growth.

Both manufacturers actively manage their lean programs to keep their workforces engaged, their programs growing and their businesses reaping the rewards. They share some of their insights with IndustryWeek.

FREUDENBERG-NOK REACHES A MILESTONE

By many measures, Growtth has been a winning formula for Freudenberg-NOK in the Americas. The company reports that it has completed more than 94,000 lean and Six Sigma projects in the past 25 years, representing savings of $414 million, and it has trained more than 130 certified Lean System and Six Sigma black belts. Further, Growtth "remains at the very heart of our organizational culture," says Vicky Jandreau, director of Growtth in North America. "It's become a way of doing business for us, a way of solving problems and building team cohesion."

So perhaps the first lesson from Freudenberg-NOK: Make sure the program is important to the company—and its leadership. Growtth is both.

"There are only three directions you can go in business," says Matthew Portu, president of Freudenberg-NOK Sealing Technologies. "You can go backwards and lose momentum, you can stay the course and hope that's enough, or you can improve, get better at what you do, and grab new opportunities. Growtth defines our company and has enabled us to focus directly on option three for 25 years. It is as important as anything we do."

Lesson No. 2: Don't stand still. The Growtth program of today is not the Growtth of yesterday, and definitely it is not the Growtth of a quarter-century ago. For example, the program introduced just three lean tools and the kaizen methodology when it launched in 1992. Today the number of tools is around 14. And the company's early focus on converting batch production to lean processes has given way in many instances to working more toward process refinements.

Rapid plant assessments remain a staple at Freudenberg-NOK, but even they come under regular scrutiny. The company has long used the assessment to measure its manufacturing plants' level of lean implementation. The plants also are rated against one another, with titles bestowed on the "best" and "most improved" plant.

"A little competition is good. It keeps it fresh," Jandreau says.

The assessment itself is regularly freshened, too. "Each year our corporate team gets together and we tweak the questions to drive people even higher, so that we always push toward that true north objective," she says.

A FOCUS ON LEARNING

As Growtth expands in scope, it is developing into a learning organization. "It's being an organization where we just automatically share best practices. We all strive to help one another become the best we can possibly be. We have a lot of programs in place right now focused on that particular topic," Jandreau says.

Which emphasizes Lesson No. 3: Always be learning. One example is what the manufacturer calls structured best practice exchange days, which were introduced within the past three years. They support the rapid plant assessments.

Mainly lean-tool focused, these exchange days are held at manufacturing sites that demonstrate some of the leading best practices in the company, with attendees given an opportunity to see a real-life implementation of that tool or practice. So, for example, plant personnel from a site that scored poorly on kanban would attend an exchange day held at the plant that scored very well on kanban.

"The hope and the expectation is that this plant would take the [best practice] back to their facility and, as much as possible, do a copy and paste," explains the Growtth director.

The company has averaged approximately 20 of these exchange days annually during the past three years. With a modified approach for 2018, that number is likely to reach 28 next year.

On a related note are several new twists to Freudenberg-NOK's training efforts, which include black belt training on lean systems, Six Sigma and a recently introduced lean administration. Approximately 10 to 20 people are certified each year.

Several years ago the company launched what it calls the "marketplace." As part of the black belt training, certification candidates are asked to present their work at the company's headquarters in Plymouth, Mich. The candidates set up stations and both explain their projects and field questions from leadership in that location.

"It was pretty successful, with a lot of participation from the Plymouth site, and I thought it was extremely exciting for the certification candidates because it allowed them the opportunity to speak to folks they wouldn't normally speak to," Jandreau says. "It was a very interactive time for them."

Which leads to a fourth and final lesson: Use it or lose it. "You can't keep a culture alive unless you're training your people and you empower them to use it," Jandreau says.

BELDEN'S LEAN WORLD CUP

Looking for a clever way to keep your workforce engaged in executing big improvements? Consider the example of St. Louis-based Belden Inc., a global manufacturer of connectivity and networking products. Belden has been practicing lean manufacturing for a decade now, introduced to the system by CEO John Stroup—alumnus of Danaher, where lean has a history that stretches back more than a quarter century. Belden holds an annual Lean World Cup competition.

"We get lots and lots and lots of participation because it's a really big deal to be recognized," says Jerry Rose, Belden vice president of lean enterprise. "It is recognized as a big accomplishment inside Belden."

The competition operates somewhat as you might imagine. Teams from across the company are invited to submit breakthrough processes they achieved using lean methodologies and typically as a result of kaizen event activities. Judges winnow the entries, received as three-page applications, to five or six finalist teams who are then invited to Las Vegas for the finals. There, the finalist teams present their improvements over two days to several sets of judges and via multiple presentation methods. The event concludes with a banquet, where all the participants are recognized, the winning team is announced and trophies are handed out.

"[The teams] are excited about the opportunity to be seen as leaders, to be exposed as good lean practitioners—and honestly, going to Las Vegas and being treated as kings and queens for four or five days is a pretty good incentive as well," Rose says.

The competition also lays waste to the Las Vegas catchphrase, "What happens in Vegas, stays in Vegas." Throughout the event, the corporate communications staff write and post articles about goings-on on the intranet. Belden also captures the Lean World Cup via photography and videography, which is provided to group presidents and other leaders who then can broadly share it. And in 2018, adds Rose, "We're going to socialize it to a much larger degree."

The winning team in 2017 (for activities conducted in 2016) implemented a comprehensive value stream transformation, one whose elements included a set-up time reduction effort on a machining center that delivered dramatic improvements, and the combination of several operations and introduction of a clever poka yoke in an assembly area.

The competition is not limited to manufacturing operations, however. Past teams have included finance, for example. That team submitted an improvement that significantly shortened the time it took to close the end of each month. And a customer service team was among the finalists this year.

The common thread among Lean World Cup entries—from wherever they emerge—is that they represent breakthroughs, Rose says, meaning they can be broadly used across Belden and represent Belden values, strongly improve customer satisfaction and engagement, are repeatable, or demonstrate strong impacts in other ways.

LEADERS COMMIT, BENEFITS ACCRUE

To be sure, the Lean World Cup is not without significant costs, both in time and money. Sending 100 to 120 people to Las Vegas for a week, or nearly that, is not cheap. Further, many of those people are Belden group presidents, vice presidents and other leadership team members, many of whom are judges in the Lean World Cup.

"It's a significant investment in terms of time and money," admits Rose, "because we think we get that much out of it."

Indeed, the vice president of lean enterprise says among the biggest benefits of this annual competition is that it brings a wide variety of teams and functions globally together "to share stories and experiences around their lean activities, their lean journeys."

Even more, he says, it provides the different businesses with the chance to physically see opportunities they may "never have dreamed about doing because they hadn't been exposed to it," Rose says. "There are always significant takeaways that can be used to in other businesses to improve their own internal processes."

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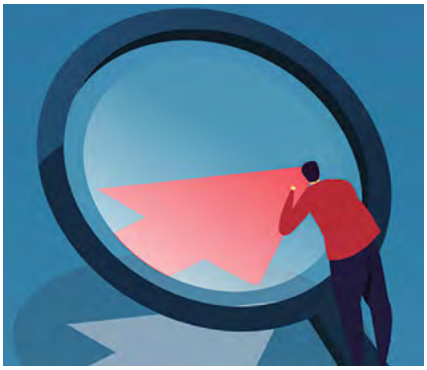
FINDING IMPROVEMENT **IN THE MARGINS**

Look outside your core activities and you may find a wealth of opportunities for improvement.

Continuous improvement means that we look for problems and waste under every rock. We spend most of our time, however, looking at the core activities. We look at core process efficiency because if I can get just a little more out of my core activities, then there is great scale in those improvements. Often, however, we neglect all the stuff on the margins around the core activities.



Yet there are often greater gains to be found in the marginal activities, because they have received less attention than core activities. Just by focusing on them a bit, they can improve.

Shift start is a great example. There are many things that we cram into this period: stopping things, starting things, communicating things, organizing things. We tend to have more meetings right around shift start than at any other time of the day. And yet we either haven't started production or haven't gotten up to full speed yet. Do you measure the time from shift start until you reach full production?

In examining one operation, we found that it wasn't just shift start but the start of the week that had the most to gain. We lost an average of half a shift not being up to speed. Equipment needed to warm up; the line needed to fill. Simply by bringing in six people four hours earlier, we were able to gain more production than with any other improvement.

Meeting starts follow a similar pattern. We might build an agenda and be thoughtful about who to include in the meeting, but then we miss the 10 people sitting around for six minutes (equaling a total of an hour's capacity) waiting for the meeting to start. Analyze the reasons a particular meeting starts late (not all meetings as the causes are too generic). It could be the location, the time, other meetings or other reasons. I've found that once meeting owners actually focus on this, if they honestly face the reasons, they can make solid gains.

New product introduction is one of the more massive handoffs we have, from a range of development activities and resources to a range of production activities and resources. Start by looking at how many problems are solved during new product introduction that could have been solved before the process began.How clean are the handoffs, meaning are there rework loops? And how quickly are problems found and owned, which can be a problem when two different organizations begin to overlap?

New employee orientation can be another underappreciated waste. I don't mean the event of orientation but the process involving everything until the person becomes as proficient at their job as their predecessor. For some simple math, imagine you have 5% turnover and it takes you eight months until someone is proficient. What is it worth to the organization to get that down to four months? Yet once the person is hired and in a job, we tend to consider the problem solved. This involves methodologies such as Training Within Industry, coaching and mentoring for the employee, and clear ownership between HR and functional managers on the related tasks.

If you examine these opportunities, there is a pattern in them. They are all connections, or handoffs. We tend to spend more time optimizing our activities (how we do something) and less time on improving the connections. There are two primary reasons for this. First, they are less visible. We might measure our activities down to the finest level of detail, but the connections usually require more observation to truly understand them. Second, they aren't owned. Activity A is owned by one resource, and Activity B is owned by another. But who owns the connection? Perhaps both, or neither. Lack of clarity in owning the connections means they receive less attention. The connections in your organization are often missed opportunities for improvement. Every handoff is an opportunity for a delay or an error. Eliminate handoffs where you can, and structure and improve them where you can't.

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DAN MARKOVITZ
President, Markovitz Consulting

WHY IT MAKES SENSE (SOMETIMES) TO START WITH HOSHIN KANRI

Strategy deployment is a powerful way to get the leadership team involved in the lean journey.

For a long time, I've been dismissive of organizations that want to start their lean journeys with hoshin kanri, (also known as strategy deployment). When you've got a company where people are not engaged (at best) or suspicious of management (at worst), it seems to me that getting people involved in everyday improvement to make their jobs easier is a better place to start. And when the leadership team sequesters itself in yet another offsite, after which the CEO portentously announces the latest strategic plan (but this time using the Japanese term hoshin kanri to ensure heightened confusion), you've got a foolproof way to foster employee cynicism.

The dreaded X-matrix makes matters even worse. It's bestowed upon workers like the tablets of the Ten Commandments, divinely inspired guidance for the next year. Employees, of course, see it as just another damned chart, but with the special pain in the ass factor of having to crane their heads around like a stork to read it from start to finish, while using a ruler to make sure that they match the right metric to the each initiative. And finally there's the process of "catchball," which for some reason the lean community actually thinks is English. It's not. (Seriously. Did your father ever ask you to play "catchball" with him? I doubt it.) It's Japanese English, and it's not at all clear to the uninitiated what it is. Between the special language and the special tool, I haven't been a big fan of starting with hoshin.

Until now.

Recently, my colleague and friend Katie Anderson pointed out something I've completely missed: that strategy deployment is a powerful way to get the leadership team involved in the lean journey.

If you're lucky, you have a CEO like Art Byrne, who relishes

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the chance to swing a sledgehammer, move machines and do work at the front lines. But most CEOs, and other denizens of the C-suite, aren't like Art Byrne. Getting them to embrace daily improvement is a struggle, because they want to focus on bigger issues. But because strategy deployment starts out with very high-level thinking—what does the organization stand for, and where do we want to go over the next three years—it's comparatively easy to get leadership to participate. After all, no one in top management wants to miss the big strategic planning session. Miss a kaizen event or a gemba walk, sure. Miss a leadership offsite? Never.

Lean thinkers can use that intellectual (and emotional) foot in the door to gain leadership support for continuous improvement. Eventually, of course, the leadership team will need to embrace daily improvement. But that's a heavy lift for many of them at the start.

I'm seeing this dynamic play out in my own consulting. Last year I struggled terribly—and quite honestly, failed—to get the leadership team at one of my clients to engage. Lean was something for the shop floor and middle management to do. The C-suite felt they were too busy to muck around with daily kaizen. They didn't make lean a priority, and it was business as usual. It wasn't until the CEO of the parent company demanded that they get involved with the lean efforts that they began participating—and then, they started with strategy deployment.

By contrast, one of my current clients has started with hoshin kanri, and not surprisingly, the leadership team is fully engaged and committed. They haven't yet gotten involved in the daily work of lean, but as the improvement projects have been getting fleshed out, they're seeing where and how they need to participate in order to reach their strategic objectives.

Strategy deployment isn't the easiest tool in the lean toolbox. In fact, I think you can make a good argument that it's not the best place to start if you want to drive cultural change throughout the organization. But increasingly, I'm seeing that strategy deployment may just be the spoonful of sugar that helps the lean medicine go down with leadership, particularly in large institutions. And that might be the best reason of all to start with it.

Dan Markovitz is president of Markovitz Consulting, a firm that helps organizations become faster, stronger and more agile through the application of lean principles to knowledge work. He is a faculty member at the Lean Enterprise Institute and teaches at the Stanford University Continuing Studies Program. His book "Building the Fit Organization," just received the Shingo Research Award.

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BOB ARGYLE
Chief Customer Officer, Leading2Lean

WHEN YOU CAN'T COUNT ON NUMBERS

How can 70% (OEE) be superior to a "world-class" rating of 90%?

Grade school math teachers are fond of saying that numbers can't lie. Maybe so, but they can be misleading.

In the case of manufacturing, it is a common standard to measure plant productivity by looking at Overall Equipment Effectiveness or OEE. It is measured by looking at how effective a plant is running in the areas of availability, performance and quality. However, holding OEE as the primary metric of success for a plant can be problematic and even short sighted.

Here is a case in point. On one plant's floor we have a 70% OEE number. On another plant floor we have a "world-class" rating of 90%. It would seem to be an open and shut case that the 90% plant floor is more effective. A closer look shows that just isn't always the case. Let me explain further.

AIMING FOR A TARGET

Pressure is strong from Plant B management to hit a world-class target of 85% or 90% OEE. Achieving that high number is the one, key goal for that plant. Bonuses and incentives have been tied to hitting or surpassing that target, investors or board members are counting on a high number, and plant management careers depend on it. The result is an infusion of stress and worry among workers and managers, which increases and compounds the stress.

The 90% Plant B should have seen the problem. Further analysis revealed that the site spent countless hours analyzing and justifying what things should impact their OEE calculation. In order to keep the percentage high, Plant management decided that meetings, changeovers, manpower shortages and total productive maintenance (TPM) activities should all be treated as non-production time. At the same time, they decided to use demonstrated cycle times to calculate OEE instead of using optimal cycle times. This artificially inflated OEE even further.

You can see the trap. They justified the high number by ignoring vital plant processes and activities. And instead of solving problems along the way, they ignored them in the name of better final numbers. The problems were allowed to fester and grow.

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MEASURED IMPROVEMENT

Plant A reporting 70% OEE, on the other hand, has a different outlook. This company's executives understand the key to true success is surfacing and focusing on the problems as they arise in real time. They set goals based on improvement and the number of problems solved. In their example, an improvement of 10 percentage points in OEE was realized over the past year, moving up their OEE from 60% to 70%. Incentives at Plant A are based on the number of problems solved and improvement percentage points, period. The final number isn't the final goal; improvement is.

Unlike at Plant B, Plant A is taking an aggressive approach in how they achieve improvement. They look at every second of time that the line or process is not running as a lost opportunity. This includes meetings, training, setups, changeover, preventative maintenance, etc. Plant A understands that stopping the line for a team meeting or preventative maintenance is lost time for production. Workers focus on improvements to help decrease the time required to perform preventive maintenance. They conduct efficient and effective team meetings in a timely manner.

By structuring bonuses and incentives more appropriately to surfacing and solving problems, Plant A workers are always seeking to expose weaknesses in the system or suggesting ways to improve the system.

SHIFTING THE FOCUS TO FIXING PROBLEMS

Over many years, OEE has become a key metric for measuring productivity improvement for manufacturers. By setting OEE as the one success metric, OEE numbers are elevated to unreasonable and artificial heights. Manufacturers are trying to hit "world-class" percentage numbers at the expense of overall plant efficiency. In trying to look perfect, they're focused only on what is working, and often ignoring areas that need improvement.

This leads to a circle of inefficiencies. The pressure to reach high, ever-improving OEE numbers motivates plant managers and workers to over-inflate efficiency results or report only positive data. However, when workers are motivated only to reach high OEE percentages, they are not necessarily improving operations. They might tend to justify not properly reporting all production stoppages, or discount line downtime. There's no accountability for solving problems.

Instead, manufacturers need to shift focus to finding problems quickly and solving them. By focusing on improvement, you are empowering workers to look for inefficiencies in production and make corrections, instead of asking them to ignore problems in the name of a false narrative about high OEE.

Given a mindset of constantly seeking to improve, plant management can maintain a focus on accuracy and transparency, which leads to more reliable data. That improved data allows managers to truly solve problems by reducing downtime, scheduling preventative maintenance, and justifying needed capital expenditures.

It's counterintuitive, but true. Focusing on fixing processes, not just posting numbers, creates a culture of continuous improvement that brings lasting change to the manufacturing floor. When management can see the difference and communicate that difference to its employees, a plant floor can celebrate a culture in which accuracy and truth in their data is encouraged and expected. Instead of a vicious circle of trimming data to meet a pre-determined metric, plants have a virtuous circle where accuracy and truth lead to constant refinement where both the plant and its employees achieve accelerated improvement, more efficiency and, ultimately, greater success.

Bob Argyle is Leading2Lean's Chief Customer Officer (CCO), and builds partnerships with manufacturers where best practices can be leveraged to help them achieve greater and greater success. Bob brings twenty-four years of manufacturing experience in the automotive industry, and was trained in the U.S. and Japan on the philosophies and implementation of the Toyota Production System (TPS). www.leading2lean.com

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JILL JUSKO
Senior Editor, IndustryWeek

RELIABILITY APPROACH **TO ASSET UPTIME**

Sometimes unplanned downtime is unavoidable. Many times it is not. Hear what several manufacturers and reliability experts advise to keep your machinery operating optimally.

Robots at work are a good thing. Robots at rest when they are supposed to be working are a bad thing. The latter is what General Motors Corp. is getting the hang of preventing, according to the automaker's director of global automation.

Speaking at an April automation conference in Chicago, Mark Franks told the audience that GM had avoided 100 potential failures of robots by analyzing data they send to an external server in the cloud, Bloomberg reported. "If we can avoid a disruption in our manufacturing, we can save ourselves a significant amount of money," Franks said.

It's a comment every manufacturer can agree with. Assets that are unavailable when they are needed, or equipment that performs poorly when it is available has lost dollars attached to it. For example, even as Smart Sand Inc., a producer of raw frac sand, reported improved second-quarter net income this year, the company acknowledged in its earnings report that the numbers could have been better were it not for, in part, unplanned downtime at its Oakdale, Wis., facility. And earlier this year, ARC Advisory Group reported its belief that the impact of unplanned downtime on revenue and profitability in the process industries has been "vastly underestimated." "ARC estimates that downtime costs the process industries somewhere in the area of a trillion dollars a year, " wrote ARC's Larry O'Brien in a blog post.

Sometimes unplanned downtime is unavoidable. For instance, when hurricanes like Harvey, Irma and Maria sweep through an area, manufacturers have limited actions they can take to keep operations up and going. But in many instances, manufacturers can and likely should do more to keep their assets operating in optimal condition. Several manufacturers and reliability experts share their ideas.

JEFFREY SAUGER FOR GENERAL MOTORS

As of April, General Motors had about 25% of its 30,000 factory robots connected to the cloud, boosting the automaker's ability to detect and prevent downtime before it occurs.

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Machine operators perform preventive and routine maintenance (% of plants):

Year	No	Yes
2012	12	88
2013	8	92
2014	21	79
2015	15	85
2016	8	92
2012-16	13	87

Average machine availability rate as a percent of scheduled uptime(%):

Year	Median	Average
2012	95.5	94.1
2013	90.0	89.3
2014	95.9	94.4
2015	96.8	95.7
2016	96.4	94.7
2012-2016	95.9	93.8

Reactive maintenance work, in response to unexpected machine or equipment breakdown (%):

Year	Median	Average
2012	10.0	20.5
2013	20.0	22.3
2014	15.5	23.7
2015	19.6	19.7
2016	15.5	19.7
2012-2016	15.5	21.0

Source: IndustryWeek Best Plants Statistical Profile

MORE THAN MAINTENANCE

If your company or facility points to the maintenance function as the keeper of all reliability-related duties, it is making a mistake. Research shows that just 17% of unscheduled downtime can be attributed to the maintenance function, says Life Cycle Engineering's Brad Cunic, senior vice president of its reliability consulting group.

Given that data point, manufacturers should take note of where downtime opportunities occur. "Defects or downtime are interjected throughout the equipment lifecycle," from the initial equipment design to procurement functions focused on lowest cost versus total cost of ownership, to equipment operators who may be mishandling the assets they run.

"[Reliability is] really a shared function that must be driven from the top of the organization, and that starts with the alignment of key executives," he says. "Most successful companies we see have reliability built into the culture, not just as a maintenance activity. That's where you see sustained performance."

Such is the case at Cargill Inc., a privately held manufacturer whose breadth of products includes animal nutrition, food ingredients, salt and beef products. The manufacturer embraces the philosophy of reliability as a shared responsibility, says Rick Baldridge, corporate reliability excellence process leader as well as a Society of Maintenance and Reliability Professionals board member.

"We strongly believe that production owns the assets, while maintenance owns the capability of the assets. That takes a lot of collaboration," including from such domains as safety, customer quality and process safety risk management, Baldridge says.

"Really, the word is holistic. The best analogy is ... your own personal vehicle. If you see a need to take your vehicle in for anything that it may need, you are the one that ultimately makes the decision of all of the things that they find. And your expectation, I'm sure, is that they are highly qualified and really understand the health of your vehicle, and are able to translate that into a language that you understand, and help you make the right decision as to what you are going to do," he continues. "The one thing they will never be ahead of you on is what you expect out of that vehicle, what is your operating context of that vehicle. And that's why production needs to be the one that owns the assets. There's absolutely no difference with physical assets in our facilities."

Such collaboration isn't easy, which is why Baldridge also stresses the importance of communication. "We have a very comprehensive integrated approach to reliability, and not any single thing is going to get us to our overall objectives. However, if there was a shiny bullet... it would be change communication."

CREATE A SOLID FOUNDATION

"The more you can minimize downtime, the more you can improve throughput and quality," said the operations manager of Intertape Polymer Group's Danville, Va., facility during an IndustryWeek visit to the 2016 IW Best Plants Award winner.

It's a sentiment echoed by Ron Englehart, continuous improvement practitioner for Intertape's operational excellence program, the Intertape Performance System. The implementation of IPS revolves around model machines, those identified as the most critical to the business, and begins with machine cleans to improve performance and reliability.

"Foundationally we are looking to engage our workforce, and we do that through the model machine cleans. The model machine clean is a means of getting cross-functional teams together and improving our associates' training and knowledge about how that equipment operates day in and day out," Englehart says.

"As most people know, when you are dealing with inconsistency and instability in your equipment, it's just the tip of the iceberg of the true cost to the operation, so you have a lot of hidden things beneath the surface, whether it be safety, quality, delivery, or morale as a result of inconsistent uptime," he continues.

Of course, Intertape augments the people side of reliability with technology. For example, at its greenfield sites and for other critical applications and support equipment, the company has implemented SCADA systems and plant apps that look at downtime tracking. These allow the manufacturer to set trigger events and generate reports to indicate where downtime events occur or where there could be reoccurring events. Intertape also employs artificial intelligence software both as a predictive analytics tool and to fine-tune process parameters.

Such technologies at the company's facility in Blythewood, S.C., have helped boost uptime there from 92% to 98%.

"I need stable equipment in order to produce consistent product on time. If you are not monitoring your equipment for predictive failure, then you are going to be doing it on an unplanned basis, so what we are trying to be able to do is give ourselves planned outages to control uptime," Englehart says.

"In the end the technology that we are putting in place allows us to plan the downtime on our terms instead of the equipment's terms."

TESTING NEW TECHNOLOGY

Using technology to aid asset uptime is nothing new. Computerized maintenance management systems, vibration analysis, ultrasonic monitoring and other predictive maintenance technologies have had a place at the reliability table for some time. What has changed is the amount of data that can be collected (it has skyrocketed), the price of sensors (a downward trajectory), the introduction of artificial intelligence and machine learning—the sheer promise presented by big data, the IIoT and other transformative technologies.

Cargill has dipped its toes in the IIoT water with its condition-based maintenance. Land O'Lakes Inc. is piloting enterprise manufacturing intelligence in its feed business. General Motors has more than tried on technology. According to Bloomberg, about a quarter of the automaker's 30,000 factory robots are connected to the cloud. That connectivity enables GM to reduce its spare-parts inventory, thus tying up fewer dollars, by detecting when parts are going to wear out, according to the automation chief.

Such advances are likely just the beginning. GE sees the future and it is digital. "When we think about the industrial company of the future, it is still going to build machines, but these machines are going to have the capacity to respond with greater speed and insights than anyone ever imagined," GE CEO John Flannery said during the company's recent Minds + Machines event.

And Andy Kopp, technical director at Myrtle Consulting Group, outlines what he says will be the exciting story in asset uptime—the transition from predictive maintenance to prescriptive. What that means is not only will digital tools gather and analyze data, but they will also suggest the best course of action to take based on the analysis and automatically set that action in motion. Heady stuff.

It could be easy to get caught up in all the excitement of new technologies to boost your equipment reliability efforts. Life Cycle Engineering suggests a measured approach.

"Our philosophy is start with the end in mind — the business results that you need and work backward. First, determine what assets have the biggest impact to your value stream and then what failures are most likely to occur in those assets and what is the most effective mitigation method used to eliminate, detect, or remediate those failures. Then, what are the early signs of failures in those assets?" Cunic said. "What critical control points should be monitored and what are the set points or the alarm, and who should receive those alarms? And how do you ensure that the right people, materials, and procedures are in place to respond? Then you determine what data needs to be collected and analyzed and by whom to promote this continuous improvement of the entire process."

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BILL BAKER
President/Owner, Speed to Excellence

SO WHAT IS "LEAN" ANYWAY?

Ask these four questions to determine if your company is on a Lean Transformation or just doing a Lean project.

I've been involved in manufacturing since 1967, initially as a manufacturing engineer in a precision machine shop and later managing multimillion dollar programs. Not to brag on myself, but I've met many smart people!

Initially our goal was limited to meeting quality requirements, by getting through quality inspections and testing in order to deliver on time that month. It was a pretty simple life then, but we didn't know it.

A little later, I managed the manufacturing services department of a geophysical exploration company, and my boss asked me to analyze the flow of our hydrophones and ocean-going seismic cables. Not knowing what he meant by flow, I went to our final assembly area to look around. This was way before Gemba was a word we had heard.

I found that, yes; we were building in batches because of the large setup times—and my boss knew that.

So began my career of looking for continuous improvements.

Now, quite a few years later, we have all used the broad words for change such as Lean, continuous improvement, Toyota Production System, and before that Total Quality. Still, despite the widespread use of the terms, I'm concerned that perhaps they are being used without a full understanding.

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Toyota has been given a lot of press and acknowledgement for their approach to creating TPS, and rightly so. But in today's implementation of Lean, how many organizations buy into the total culture change that TPS and Lean really require?

It seems to me that, too often, companies run a pilot in their assembly or machine shops to see if it works. If they get good results, they train a few manufacturing employees on 5S, 3P, Poke Yoke, the seven wastes and all the other tools we know.

Usually if done well, there are immediate cost savings from reducing waste, so Lean tools are expanded across the manufacturing department. Cost savings become the key metric looked at by management. But after a few years, the low hanging fruit has been diminished and cost savings plateau or recede. Then management asks, "Ok, we've done Lean, what's next?"

This is what I call a "manufacturing lean project," which can lead to short term gains, but no transformation.

Let's look at what a Lean Transformation entails. By looking at TPS, the two pillars it is built on are easy to identify:

CONTINUOUS IMPROVEMENT

- Part of the culture and expectations
- By everyone, every day
- In every department, from the top down
- Management goes to the Gemba to view the work being done

RESPECT FOR PEOPLE

- Management asks questions as a form of mentoring, so that workers decide for themselves what is best.
- Each worker is unique and should be treated with respect and helped by management to fulfill their capabilities and dreams.
- Communication to all about the companys' goals, plans and results assures that everyone is on the same page.

These two pillars are true to Lean as well. Many lean practitioners may not understand that the "Respect for People" pillar is the basis for everything else—trust, motivation, continuous improvement and outstanding performance.

It's a big step to adopt a Lean strategy as the Lean Management System for the entire company, but it's important that everyone has the same goals and expectations, i.e., one language. For example, management should be teaching the Lean classes and frequently inspecting for both continuous improvement and respect for people every day! Then everyone knows it's important.

SOME ENLIGHTENING QUESTIONS ABOUT A LEAN TRANSFORMATION

1. Does everyone in the company understand that this is a long-term commitment?
2. Does the company have a Lean Management System in place that defines these expectations and live by it daily? Research identifies this as a best practice for companies that have been on the Lean journey for 20 to 30 years.
3. Does management have standard work? Yes, this includes top management, marketing, engineering, purchasing, quality and everyone else.
4. Is the company continually looking at the customer's needs today and tomorrow? For example, is the company willing to change what works today for what will work tomorrow?

Ask yourself these four questions to see if your company is on a Lean Transformation or just doing a Lean manufacturing project.

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LARRY FAST
Founder & President, Pathways to Manufacturing Excellence

ASK THE EXPERT

HOW MANY KAIZEN EVENTS SHOULD WE DO EACH YEAR?

I don't like the arbitrary assignment by management that each department or value stream will conduct X number of kaizen events per month/year.

QUESTION: HOW MANY KAIZEN EVENTS SHOULD WE DO EACH YEAR?

Answer: It depends. It depends on how many improvement events you need to meet your performance improvement commitments for the year. It depends on how many you can properly resource. It depends on how many of your projects require scarce resources, e.g., process engineers, maintenance techs vs. what lower impact projects can be done principally with hourly associates.

Rather than set goals based on the number of kaizen events being done, I much prefer the goals be set in the language of business—cost improvements, inventory (working capital) reduction, etc. For example, value stream managers might set a goal for supervisor and hourly led kaizen events at $50,000 cost and inventory improvement for the year. When one project is complete, then start a running record of the results, tee up the next priority and keep going with additional events until you exceed at least $50,000.

Interestingly, in the same batch of new questions received from IW, there was this question: *Are there any popular measures that you dislike?* If yes, then why?

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And here's my answer to that one: I don't like the arbitrary assignment by management that each department or value stream will conduct X number of kaizen events per month/year. I've been in operations where the shop floor was committed by personal objectives to conduct 20 kaizens a month. Too many events going on in a compressed timeframe can have negative effects on service and cost, not to mention the fact that there may not even be a measurable outcome that positively affects the business.

HERE'S A SUMMARY OF MY TYPICAL EXPERIENCE WITH THIS TOPIC IN FACTORIES I VISIT.

• Quick changeover events that require at least a 50% improvement lead the way in terms of effectiveness. An excellent payback, e.g., less than one year, almost always results due to reduced cycle times, reduced waste, reduced inventory, improved flow, improved service.

• On the other hand, I too often see teams giving the same vigor to saving $1 bills as that required for saving $thousands. These are typically motivated by the arbitrary "gotta do X number of kaizens this month" mentality. The $1 team gets stuck and before you know it, scarce resources such as engineering, maintenance, etc., are pulled in ad hoc if they weren't already assigned to the team. Too often these projects, even if done successfully, don't move the needle on factory performance or are simply scoped to be beyond the capability of the team.

• My thinking on small projects as noted above is this: If you have an hourly workforce who has been properly educated, trained and mentored through a pilot project, then inspire them to pursue projects on a scale they can manage to deliver the smaller but still important improvements being sought. Kaizen events are a great way to help hourly people learn to work in teams, communicate more effectively, make a difference in their value streams and learn to think, work and behave differently. Over time and repetition, they become the culture change that we all seek. Just don't mistake what you're doing for the robust productivity projects that are necessary to "make the numbers." They typically require a much more sophisticated problem-solving process with higher skilled (scarce) resources.

• In all cases, after a small kaizen event or a major productivity project, make certain that you close the loop on the process changes. This is the second biggest issue I often see, i.e., that "the paperwork" isn't done in a timely way--if at all. For example, a formal engineering change notice (ECN) process either isn't in place or else the hourly folks and others who need to be using it don't know how. Sometimes I've found where they didn't even know there was such a process. This is a supervisory issue. If the process has been changed in any way during the event, the loop must be closed. For example:

• Ensure that any process changes have been updated into the authorized, formal system, e.g. bills of material, routers, job instructions. What's your standard work for this?

• A review of the changes must be made right away with everyone who is affected by the changes, e.g., all operators involved with the same processes must receive a report on the outcome of the project and be retrained as appropriate on all shifts. What's your standard work to do this?

• Accounting must be in the formal sign-off loop on the ECN to be sure costs have been updated right away in the system for productivity tracking and accurate reporting.

• And don't forget this: If you have sister plants that use the same processes, be sure to share your documentation on the successful project with them. Invite them to your plant to see the work you've done and to do a deep dive before taking the process to their own plant for implementation. This kind of global thinking will help the whole company get better, not just your shop. Ask your visitors to reciprocate and share their successes with you as well.

In summary, kaizen events can play an important role in making changes on the shop floor on a controlled scale that can be accomplished by the hourly workforce. However, be sure that these events don't take the place of a robust productivity improvement process that yields needle-moving results found on the income statement and balance sheet. And please, no arbitrary goals on the number of events. Commit to doing however many events it takes to make the numbers you've committed to. Simply collect the ideas, prioritize them based on business impact, scope them to be managed by hourly employees and a mentor on the smaller ones with the manufacturing/quality engineers leading the major projects. Finally, always complete the system documentation, training, etc., within one week of the kaizen, and sooner is better. Every day matters.

"Your lean process should be a lean process."
— Author Unknown

"……Little is done to track performance, being busy is often mistaken for being strategic and a lot gets done with little accomplished."
— Ernie Spence

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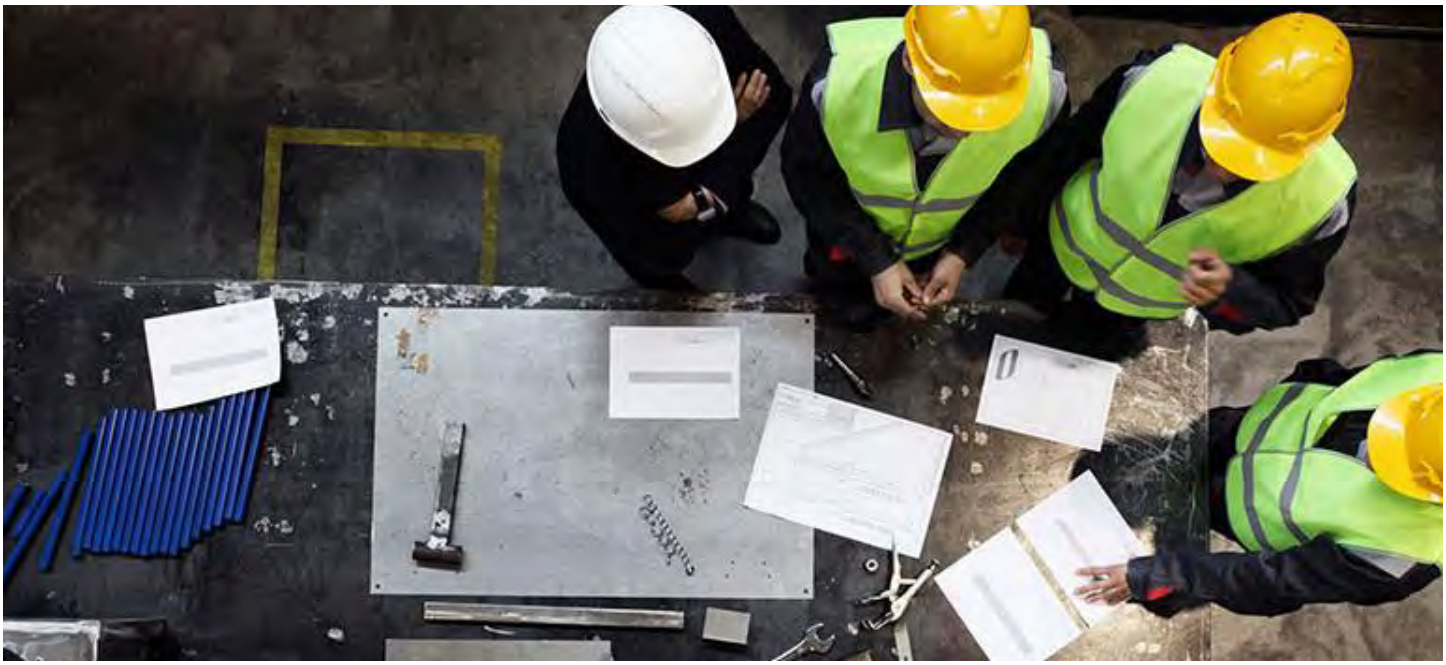
TIM MCLEAN
Managing Director, TXM Lean Solutions Pty. Ltd.

ACHIEVING PERFECT DELIVERY WITH A LEAN SUPPLY CHAIN

Identify and address these underlying drivers of poor delivery performance: long lead times, poor forecasting, and ineffective product management.



What does it take to deliver what your customer needs, in the quantity he needs, on time, every time? It should simple. It really is the most fundamental requirement of any manufacturing or distribution business. So why do so many businesses find on time, in full delivery so hard to achieve?

Even if you think you are doing well, you might be kidding yourself. On time in full delivery (some companies call it DIFOT—delivery in full and on time) is perhaps the most abused metric in business (next to profit of course!). Due dates get shifted, tolerances get allowed and lead times get imposed on customers. If you want to know how good your business' delivery performance is, there is only one person to ask—your customer. Chances are, you may get an unpleasant surprise when the customer's perception of your service does not accord with you own. Meeting the customer's expectations—the exact expectations, not what you think they should be, then becomes the starting point of improvement.

MOST COMPANIES I SEE FALL IN TO ONE OF THREE CATEGORIES:

1. Achieving poor delivery performance.
2. Customers are dissatisfied with your delivery performance, even when your own metrics show you are performing well.
3. You achieve good delivery performance at an unacceptably high cost to your business or by imposing long lead times, penalties for poor forecasting or other restrictions on customers.

So how do you improve on time in full performance, without sending your business bankrupt? This is a big topic, that I address in my latest book, "On Time In Full: Achieving Perfect Delivery with a Lean Supply Chain" (Productivity Press, 2017). However, in this article I am going to address what I think are some of the underlying drivers of poor delivery performance so that you can identify these in your own business.

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LONG LEAD TIMES

Lead time is the enemy of good delivery performance. This includes the lead time to process an order, the lead time to replenish goods from your suppliers, the lead times to manufacture and distribute your goods, and the lead time to pick and pack an order. Every day that you add to lead time will add inventory and will increase the risk of failing to deliver on time.

So how do you reduce lead time? The key to reducing lead time is to really understand it. You do this using a value stream map. You will develop a future state map that will highlight the practical steps you can take to reduce lead time in across your whole supply chain. These might include creating continuous flow in your manufacturing operations using lean techniques, addressing the root causes of supplier lead times, eliminating waiting time at ports and cross docks, and taking links out of your distribution chain.

UNDERSTANDING DEMAND AND SUPPLY AT THE RIGHT LEVEL

Achieving on time in full delivery is as simple as getting an accurate forecast, isn't it? It would be, if such a thing as an accurate forecast actually existed. We have as much chance of forecasting the demand for our products as we have of forecasting the weather. Many businesses try to have an accurate forecast down to the level of individual SKUs out to the full replenishment lead time of the business (often three to six months). I would argue that you will never ever get a forecast that is accurate to this level, this far out. Therefore you make do with an inaccurate forecast and paper over the errors with inventory. I spent fruitless years trying to make this work with a series of ERP systems, and I have also heard many a committed but frustrated supply chain manager cry "If only sales could give us an accurate forecast."

You do need a forecast; it's just that you need to be realistic about at what level you can forecast and what you can do with a forecast. When you think about the weather, it is useful to know that January will be colder than September and that July will usually be hot and dry. This information allows you to make long-range plans about travel, clothing, gardening and any number of things. Likewise, a high-level monthly forecast of your demand at the level of value streams or (at most) key product families is extremely useful in helping your business achieve on time delivery.

This kind of forecast allows you to plan your capacity and labor. It also enables you to engage your supplier in long-term discussions about how much they will need to supply.

What I am talking about here is a sales and operations planning process, or S&OP for short. Many supply chain experts present S&OP as a "high level" tool, something you might think about once the basics are in place. I disagree. I see S&OP as one of the fundamental building blocks of an effective supply chain. S&OP is often made very complex with dozens of meetings and huge decks of metrics. However, at its most fundamental it involves three key steps that any business can do:

1. **A Demand Review:** This is a meeting between sales and supply chain about what are the expected changes in demand over the next 12 months compared to the previous month's forecast. The output of this review is an agreed high-level monthly forecast and a list of the assumptions behind that forecast.
2. **A Supply Review:** This is a meeting between operations and supply chain to discuss the ability of the business to meet the forecast that sales has agreed to. This will highlight the need for increases in production capacity and labor required to meet the forecast demand. It should also highlight the ability of key suppliers to meet this demand. The output of this review is a set of recommendations for investments, hiring (or downsizing) and supplier actions to meet the forecast demand.

3. **The S&OP Meeting:** This should be a final review and sign off of the forecast and supply recommendations involving the key leaders in the business. It needs to look out over the whole 12 month forecast horizon, with a focus on the next six months, rather than focus on the next month. It is good to review past month's performance, but make sure the main focus of the meeting is on the future and not the past.

A simple S&OP is quite easy to set up and will really transform how you plan for your business.

EFFECTIVE PRODUCT MANAGEMENT

It is easier to ensure on time in full delivery of 100 products than it is 10,000. Many businesses I see show poor discipline in product management allowing for a proliferation of product lines and a "long tail" of slow-moving items with erratic demand. The fewer products you have, the easier they will be to manage and the better on time delivery you have. Of course, if you NEED 10,000 line items to service your market, that is just a reality you must cope with; however you should always challenge the "tail." To improve product management there are some simple steps you can follow:

- Every product or group of products in your business must have someone responsible for product management. This person should be responsible for deciding which products get introduced and which are deleted and when.
- You should always analyze your sales and inventory to know which products are contributing to revenue and profits and which are not. Those that aren't should always be challenged as to whether they should remain or be deleted.
- Before any new product is introduced, a business case should be prepared outlining what this new product will deliver to the business and including what products might be replaced by the new product.
- Your business needs a robust process for the ramp up of new products and the run out of old products to minimize obsolete stock when products are upgraded.

SUMMARY

This is only a brief introduction to the factors that drive on time in full delivery. However, hopefully it provides you with a bit of inspiration to start looking at your own business. Remember, there are no perfect answers for your supply chain. There will always be a compromise between inventory, cost and delivery. Supply chain is a highly contested area, with experts zealously promoting one solution or another as "the answer." My suggestion is start with the problem – on time in full delivery – and then pragmatically select the tools and techniques that give your business the best outcome. Whether you have a "Class A" supply chain or are truly "lean" is less important than whether your customers get what they want, when they want it in the quantity they want every time.

Tim McLean is a lean consultant, author and presenter. Tim's two books, Grow Your Factory, Grow Your Profits: Lean for Small and Medium Sized Manufacturing Enterprises and On Time In Full: Achieving Perfect Delivery with Lean Thinking in Purchasing, Supply Chain and Production Planning have both been published by Productivity Press. Tim will be in the U.S. from October 9-12, so if you are interested in learning more please go to txm.com/contact-us.

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PETER SUSCA
Principal/Owner, OpX Safety

THINK LEAN
TO MAKE SAFETY SIMPLER

These three practices will improve the effectiveness and efficiency of your safety approach.

Having spent most of my career in safety and operations leadership positions, it's clear to me that many organizations make safety more of a burden than necessary.

No leader wants employees to get injured at work, but sadly and quite often, the cost of safety (e.g., additional time and capital spent for material and equipment) gets in the way of making good decisions. When the cost of safety becomes a burden to the organization, the safety approach begins to suffer.

Wouldn't it be nice if there were a way to reduce this "cost," add more value and achieve the level of safety required? Well, there is a way…the answer is by making your safety approach more efficient.

Recently a company that we work with asked us to assess the effectiveness of its safety approach. To gather the data, we traveled to many of its sites around the world and interviewed about 800 employees and 100 first-line supervisors. One of our supervisor questions was, "How much time do you spend on safety?" Most of the supervisors interviewed agreed that they spent at least 60% of their day on safety-specific activities such as safety observations, incident investigations, training, completing forms, making presentations and data entry.

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When we presented this information to the management team, the safety professionals were happy while the operations folks were not as pleased. If your company is in the business of making things or providing a service, then spending 60% of your time doing something else is not going please your operations management, customers or investors.

Having lived in both the safety and operations leadership worlds, I understand both perspectives. The solution, of course, lies somewhere in the middle. That middle ground is achieved through a common understanding of how to be both effective and efficient at safety.

Here are some practices to improve the effectiveness and efficiency of your safety approach:

1. INTEGRATE SAFETY INTO OPERATIONAL AND SUPPORT PROCESSES.

If safety is "bolted on" to your organization and the way you operate, realize that everyone has a wrench. To foster integration, operational leaders may need to help their safety professionals become more operationally savvy. Specific examples of safety integration can include:

Include the hazardous energy control (lockout/tagout) process in the work order and/or work instruction. This creates a more efficient and integrated work process where maintenance staff are less likely to forget the requisite safety measures. Therefore, doing the job well means doing the job safely.

How many of your folks hate to conduct a job hazard/safety analysis (JHA or JSA)? Part of the reason is that it's perceived as "extra." Perceptions of extra work, time, paperwork, etc., contribute to poor decision-making. Integrating the JHA expectations into operational standard work will make safety and the work process more effective and efficient.

For example, the first of the three elements in a JHA is the task list. This should be part of the work instruction, job plan or defined in a pre-job meeting. Having to determine how the work will be performed by requiring the completion of a JHA is evidence that the overall job planning process is weak.

Whenever possible integrate safety training into work process training. For example, if your organization conducts job/task-specific training (and refresher training), then include the required Hazard Communication elements in that training rather than making everyone attend a "generic" hazard communication training session. The hazard communication elements such as job-specific chemical hazards and protective measures will be more germane and seen as part of the task, and the knowledge will be transferred in a more sustainable and cost effective manner.

2. MAKE "SAFE" MORE APPARENT AND VISUAL.

Though it may require a safety professional to determine how to make the process safe (e.g., compliant with requirements, low risk), it shouldn't take a safety professional to keep it safe. If you make correct safety (e.g., expected workplace conditions, body positions and activities) visually apparent, then it will be easy for anyone to identify non-conformities. When you make correct safety visually apparent, everyone becomes a safety leader. Here are the steps:

- Define the right way (condition, body position, etc.). For example, what should the pressure gauge read when the process is healthy?
- Recruit those in your organization with process knowledge and creative energy (See No. 3 below) to design the visual cues.
- Create visual cues that make it easy (for anyone) to see what right looks like. Provide examples such as color coding and photos/diagrams of the right condition, position, etc. Remember, the goal is that anyone walking by can determine if it's right or wrong.
- Use people with no process and technical knowledge to check your work.

3. MAKE THE PROCESS THE SHORTCUT. USE YOUR EXPERT "HACKERS" TO DESIGN THE PROCESS.

It is human nature to shortcut. We've all on occasion cut diagonally across the grass instead of following the longer route defined by the sidewalk. When safety measures become

impediments to production or are perceived as extra and employees decide to omit a step or create a work-around, the results can be tragic. Short-cutting, such as skipping safety steps or using the wrong tool for the job is often found in the chain of causes for injuries and fatalities.

If you have discovered "custom" job aids in your workplace (e.g., tools made by employees and markings on operational controls) it's an indication that short-cutting is present. When these shortcuts are discovered, it's imperative that operational leaders ensure that the root reasons are identified and included the process design and redesign initiatives.

To get ahead of floor-level process hacking, have the hackers help design the process. That's right, make the process the shortcut, by design. One of the principles that I learned early in my leadership career is that you can't put energy into people. Unfortunately, for various reasons, some of the most energetic and purposeful people will be found working against the system. Law enforcement agencies have been able to find value in savvy lawbreakers for years, taking the best computer hackers and putting them to work in cyber security and investigations.

To move people from the "dark side," start by acknowledging their energy, capacity, savvy and ingenuity. Include these folks in process design/re-design teams and give them a stake in making the process the shortcut and shortcut-proof.

Provide the team with your organization's quality, operational excellence, safety, etc., performance expectations and challenge them to make the process both safer and more effective/efficient. Validate the new approach with inexperienced employees during the most challenging operational periods. For example, if safety seems to take a back seat at the end of the month when your product gets shipped, this is a good time to test the shortcut-proofing of the process.

To give one of these principles a try in your organization, create a small working team, provide guidance and support, build consensus on a pilot project (a simple one), generate some success and momentum, and then stand back.

Peter T. Susca is the principal/owner of OpX Safety, a firm that helps companies improve operational excellence by using safety as an organizational health bellwether. Peter has 35 years of experience in environment, health and safety (EHS) and operations leadership positions in large multinational and midsized manufacturing, service and construction organizations. Peter is regularly engaged in coaching leadership teams, building effective processes and presenting at professional and industry conferences. He can be reached at opxsafety@cox.net or www.opxsafety.com.

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