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THE CULTURAL SHIFT THAT CAN SAVE LIVES





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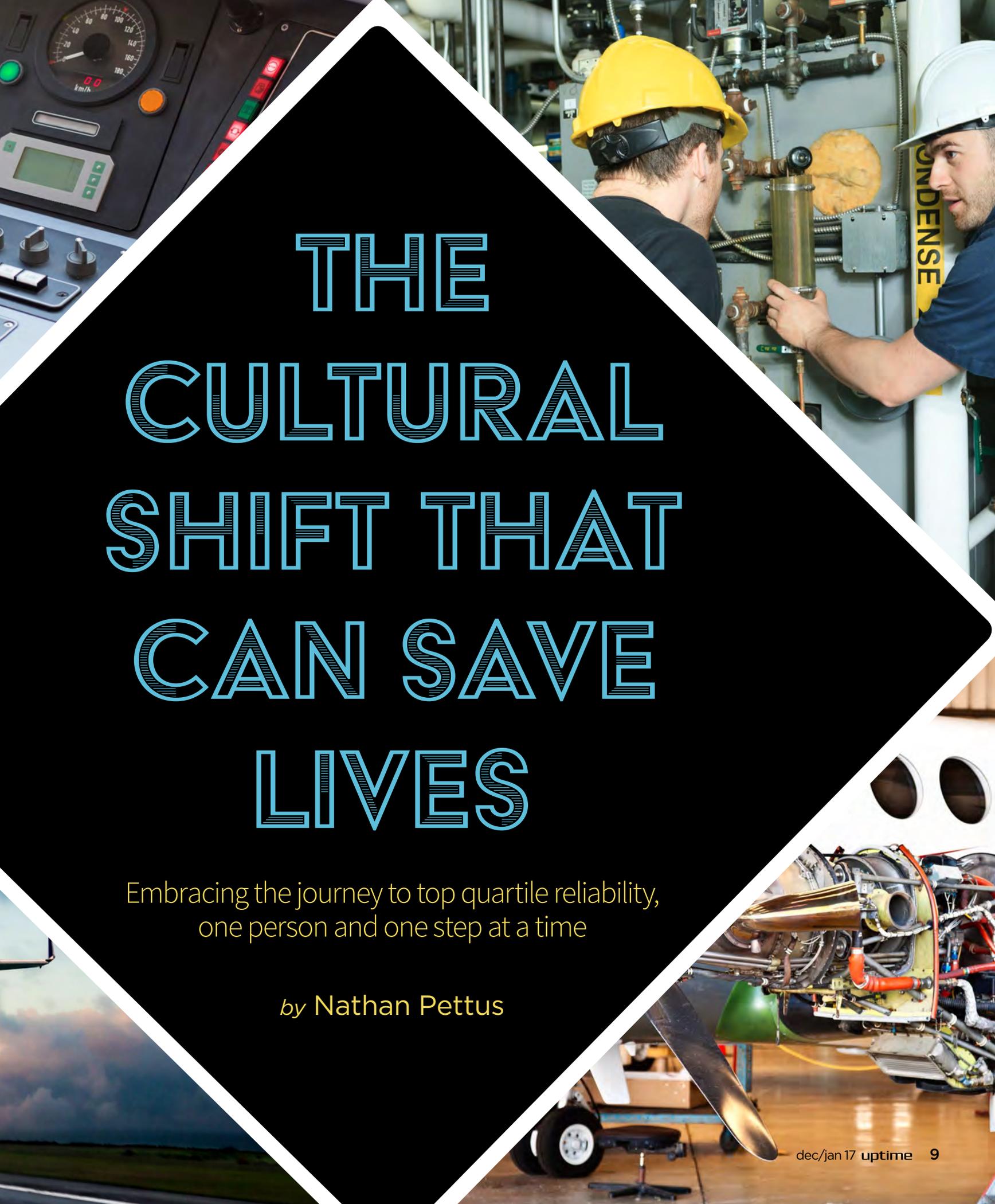
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The RELIABILITY Conference is designed for those who lead, manage and contribute to a reliability and asset management program. Reliability leaders, asset managers, maintenance managers and asset condition management experts will deliver information you can put to use immediately.

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THE CULTURAL SHIFT THAT CAN SAVE LIVES

Embracing the journey to top quartile reliability,
one person and one step at a time

by Nathan Pettus

An interesting statistic reveals that 65 percent of the American population feels certain they are better at math than half the general population. While both ironic and funny, it is also quite telling of how people naturally tend to overestimate the likelihood of positive outcomes compared to less desirable results. It is simply human nature to hope for the best outcome. For the most part, there is no real harm in believing one's math skills are better than they really are. But, when you overestimate the reliability of equipment that you count on every day to perform your various jobs, the results are not just surprising – they can be dangerous.

Relative newcomers to the emerging discipline of reliability likely failed at times to hold themselves accountable to this standard. Looking back on engineering designs you participated in, you probably see now that instead of a reliability approach, you relied on your own personal and hopeful belief

Through these conversations, you begin to realize that you did not actually “get it.” In fact, much like those college textbooks, you may find the subject rather complex, esoteric and, if you're being brutally honest with yourself, a bit confusing. Sure, you understand the terms and jargon, but it simply does not resonate on a personal level. Terms like overall equipment effectiveness (OEE), availability, P-F curves, mean time between failures (MTBF), mean time between repair (MTBR), etc., are all important, but they are engineering definitions. They do not really get to the heart of the matter. They don't resonate with those outside the day-to-day equipment operation, which is what is required for reliability to become a first-class discipline, like safety, human resources, or finance.

To help bridge this gap, take a step back and think in a different, perhaps more simplistic, way. Ask yourself: What does it mean to be reliable at its very basic foundation? You probably use the term almost everyday

“Every decision has **reliability** factored into the final outcome.”

in yourself, others and the equipment's ability to perform. You're not alone in that regard. Just like Americans and their assumed math prowess, probably close to 75 percent or more of Fortune 1000 CEOs would rank their company in the top 25 percent of all companies when it comes to reliability and safety. But, of course, only 250 of them would be correct. Ultimately, safe and reliable operations come through design diligence and careful planning, and these only come through individuals' behavior.

Consider this article a simplistic first step in changing your own behavior. Take a stand and officially holding yourself accountable in this area. It's a challenge you need to take because people's lives may depend on it.

Reliability – A Newcomer's Perspective

There are a number of well-defined disciplines with measurable and recognizable contributions to positive plant performance, among them finance, engineering and safety. Mechanical engineers think they have a firm grasp on what it means to have a reliable design, machine, or system. Quite simply, it should not break before the design criteria specification, whether that might be 1,000,000 fatigue cycles under a bending moment and torque or some other established measurement read learned from one of the many college textbooks. But, when you look at a company that focuses on a customer's reliable operations, you really start to have meaningful conversations on the topic.

with your family, friends and coworkers, so it clearly has a “human” definition and meaning for everyone – simply doing or performing as expected. When a system, person, or object acts as it is supposed to in your mind, regardless of whether you were told or assumed what to expect, you deem it reliable and trust that it will continue to act in the same manner. It's that simple.

Why does this matter? Well, if everyone thought and discussed reliability in this human and simplified light, it would help, even force, all parts of an organization (e.g., operations, IT, HR, finance, engineering, sales, marketing, etc.) to feel connected to a broader mission — delivering on what is expected. This is the concept behind the “Big R” known as reliability. It's looking at reliable operations across the whole enterprise in a holistic way. Everyone and every department plays a role in making their workplace trusted and reliable. This should be a critical goal in every facility because you simply cannot have safe operations unless you have reliable operations. But to achieve that holistic, Big R



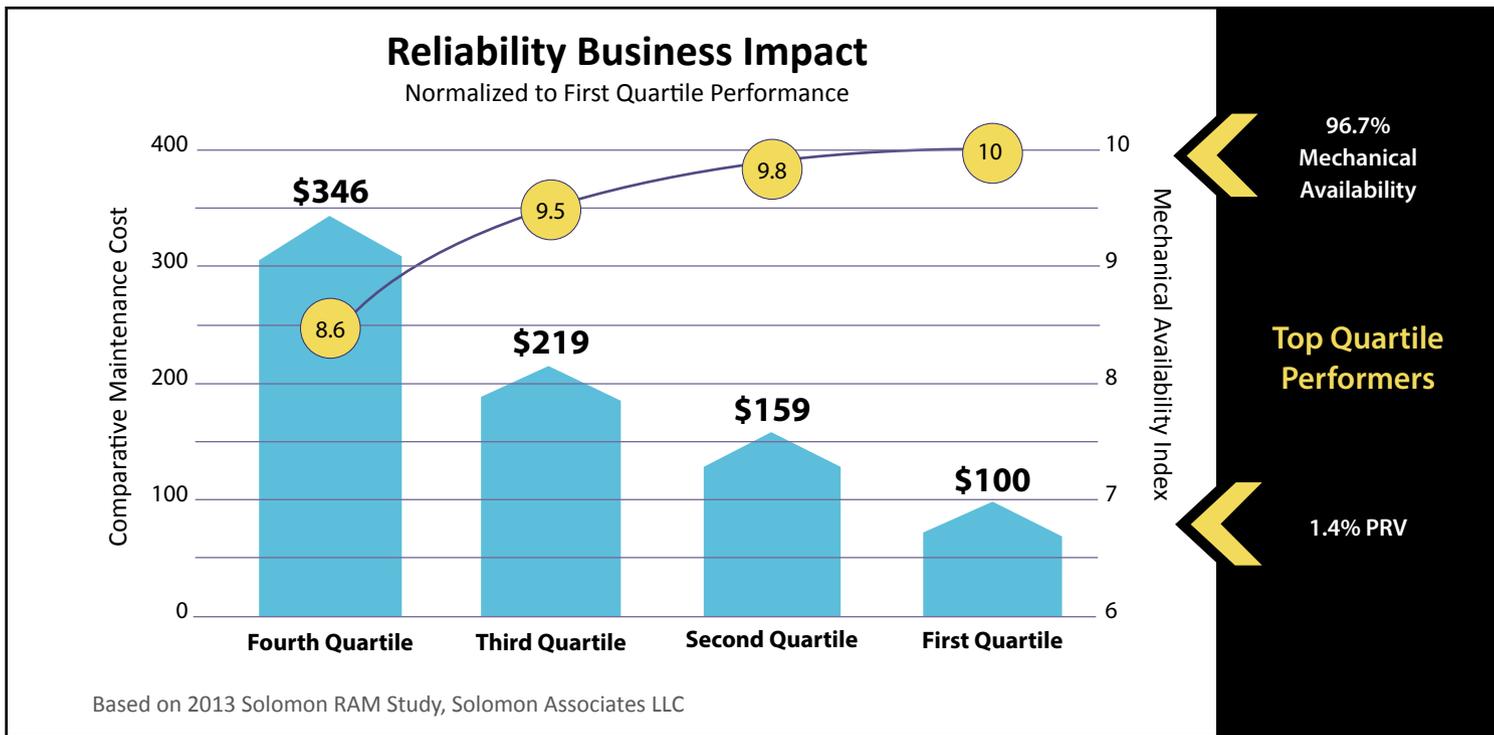


Figure 1: Double the benefit, reduce costs and increase production through Big R

reliability, you first have to start in small ways, say “little r” reliability. Implementing both Big R and little r reliability is critical to performing in the top 25 percent of your industry peers, or achieving top quartile reliability.

Big R – A Holistic Approach to Trustworthy Operations

Most plants would be satisfied with a few departments focused on improving reliability. So, why must reliability become a true discipline for *everyone* in an organization? Because people are terrible at managing unexpected, transient conditions. For example, most people drive their cars to and from work every day without incident.

But, if a tire were to blow out at 70 mph, how many people would manage the situation adequately to keep themselves and passengers safe? Probably, a few more would think so than actually could. When an unexpected, fast acting situation occurs,

most people do not actually respond as well as they think they would. Couple that with the fact that over 50 percent of safety incidents in process industries occur in the 10 percent window of time when production equipment is shutting down or starting up (i.e., transient conditions). It's not a coincidence that 80 percent of airline fatalities occur during takeoffs and landings.

When the unexpected happens, people get hurt. It is only through reliable systems working as designed where you can prevent the unexpected. But, this is broader than just avoiding a mechanical breakdown.

Trustworthy equipment requires everyone to design, plan and act in a predictable way. That is why looking at reliability more broadly matters. Certainly, there are obvious business and financial benefits from operating a plant more reliability. But most importantly, implementing Big R reliability across the enterprise will keep people from getting hurt. This way of thinking is also the true determining factor for achieving top quartile reliability.

“ It is only through reliable systems working as designed where you can prevent the unexpected. ”

The Airline Industry – Your North Star

There is good news for those in the process industry. There are shining examples of entire industries that have gotten the Big R approach right. Foremost is the commercial airline industry. Think about the last time you flew on an airplane. As the plane accelerated down the runway and lifted off, were you tempted to take a quick nap? The fact that most people would even consider this speaks volumes about how much they trust that entire industry.

Planes do crash and when they do, the first reaction most of the time is to assume pilot error.¹ Actually, most of the time, it is pilot error. How can this be true when there are literally millions of parts to an airplane, many of which could cause a catastrophic failure? Yet, people still board their flights and, for the most part, trust with 100 percent certainty that they will get where they are going in one piece. Why?² Because planes are actually as reliable as

anything you deal with in your daily life. There is a very simple reason why this is so — the folks at Boeing and Airbus, in fact the entire industry, take a Big R look at their enterprises.

According to those who have worked in the airline industry, from the very first new employees orientation, the importance of their role in overall human safety through reliable processes is a cultural institution. Every decision has reliability factored into the final outcome. Procurement thinks about reliability when it negotiates supply contracts. Human resources ensure potential hires have a certain inherent quality to care about their role in the big picture. Even finance factors reliability into its quarterly reports. Reliability is just part of the culture. This is Big R. It's what your organization should strive to mimic because the human benefits are substantial.

Having an inherent culture of Big R can overcome industry turnover. With the large number of impending baby boomer retirements, it is feared that the number of industrial accidents are going to escalate at an unacceptable and alarming rate. Experience can mask a lot and allow seemingly reliable operations in very unreliable environments. When the experienced baby boomers leave, their knowledge is unsustainable unless you have institutionalized Big R.

All the Benefits of Big R

Obviously, any benefit pales in comparison to those that impact human safety. But, there are some measurable financial benefits to taking a holistic approach to reliability. Achieving top quartile performance through reliable operations can be called a double return on investment (ROI) driver.

This means working on reliable operations for your facilities creates two (double) positive financial benefits.

Figure 1 shows that plants in the top quartile spend only 34 percent on their maintenance budgets compared to their peers. This is counterintuitive, but true nonetheless. Reliable plants do not need to fight reactive-based fires, which, as you know, cost a ton of time and money. Top quartile facilities proactively address only those assets that need attention and they do it in a

planned, intentional way. This saves money and the data proves it. Spend less on maintenance and have more reliable equipment, a true win-win.

Additionally, top quartile performers see about 16 percent more production each year than those in the bottom 25 percent. When talking about facilities that produce millions of tons of product a year, this obviously has a huge financial impact to their bottom line. Often times, top quartile companies do not necessarily document or track these impacts unless some internal audit or ROI analysis exposes it, but the benefit is real and consistently proven across all verticals (e.g., oil and gas, power, refining, chemical, pulp and paper, life sciences, etc.). Facilities that approach reliability holistically excel and their performance persists long term. Whenever you read about a plant closing, which is usually depicted in the press as due to cost structures or inefficiencies compared to peer facilities, you have to wonder if those jobs could have been saved if someone had looked at the overall reliability program. In some cases, one could assume the answer is yes.

But, the financial impacts are just the icing on the cake. What is really important is that anyone can walk into any factory or process facility around the globe and feel as safe as they do when they board an airplane. Organizations have a way to go, but a Big R approach is the path forward. It is an undisputed fact that plants with the highest availability due to reliable equipment also have the best safety records. The two go hand in hand and correlate explicitly.

It all goes back to reducing unexpected transient situations. Keep things in steady state and generally humans can stay out of trouble. However, getting there is non-trivial and involves all workers. When every employee in every conversation thinks about reliability to the same degree as others do about safety or cost controls, you will achieve this level of trustworthy operations. Then and only then can leaders or stewards say they have achieved their goal of reliable and safe facilities. It's a matter of conscious capitalism, an act for safety's sake that also has the benefit of making more money. You can't get much better than that.

Little r – Changing the Mind-set One Step at a Time

Okay, so it has been established that everyone should care about their work in driving reliable, trustworthy outcomes. That's great, but everyone also

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has their own jobs to do and those jobs require employees to perform tactical, everyday tasks. This is where the concept of little r reliability comes in, by realizing that big changes come from small changes. The butterfly effect is real. A small disturbance in one area can have dramatic, unforeseen impacts down the line.

This is good news because no one in a large company could ever make a difference otherwise. There are many examples where one person started a major change in company dynamics from a seemingly small initiative. You have probably heard stories of a single individual taking a small step (e.g., an entry level procurement clerk asking for improved reports on supplier quality metrics) that leads to major changes in overall company policy. Little r reliability is about taking a small step, no matter how seemingly tactical or even insignificant, toward broader trustworthy operations.

Starting small is really important. Often times, if you try to focus on the big picture, you just never start. No one would take up running by signing up for a marathon. You run one mile first, then two, and so on and so on. Eventually, you run a marathon. When the small goals seem achievable, you are more likely to be successful achieving your bigger goals.

Reliability is no different. Perhaps some companies can start with the big picture in mind and leverage the vision of a CEO or other leader to transform the entire business in one fell swoop. Most facilities will need to take smaller steps, such as working the oil analysis process into some documented order, or ensuring there is a reliability training system in place for human resources to educate employees. Each and every tactical progression sets an example and has potential for positive impacts beyond the initial intentions. Who knows what one of those newly trained employees might go on to accomplish in the journey towards Big R reliability!

The important thing is for all employees to believe that reliable operations mean you are safer and more profitable, and from time to time, each of them can take a stand to improve reliability. Don't just take the cheapest option, take the most reliable option. Don't just walk by a pump, find out if that pump is critical to the overall operations of the plant. If it is, make sure it is part of a proactive reliability program.

A Shared Challenge and Path Forward

You have likely heard the Albert Einstein definition of insanity: “Doing the same thing over and over again and expecting different results.” Change requires change. If those in the process industry are going to make their plants and facilities safer and more profitable, they, as individuals, will have to take a stand. You have to stand up in meetings, in e-mails, in conversations about how having reliable, trustworthy operations is important and matters.

This is not difficult, but it is also not trivial. Everyone has too much to do already and this is yet another thing to worry about. However, reliability does truly impact so many facets of the overall business that it is worth the time. And, in reality, it is not that difficult. Simply ensuring in the next budget cycle that there are line items to repair or improve older equipment, or selecting new vendors based on quality metrics versus just price are two small examples of how you can start this journey.

In the end, reliability can be broken down into five simple steps:

- 1 Understand what you have (i.e., what equipment and processes exist in your facility or business);
- 2 Know the current state (i.e., health) of that equipment or process;
- 3 Recognize what that state tells you to do (i.e., what action should be taken?);
- 4 Take that action;
- 5 Repeat.

If everyone looks at jobs, facilities and companies with this simplified model, the result would be a much more reliable, predictable world. One that is more profitable, but much more importantly, one that is safer.

Endnotes

1. While there are many sites providing plane crash statistics and attributing the main cause to pilot error, www.planecrashinfo.com provides a very detailed summary of causes dating back to the 1950s. The site specifically notes that even when weather or mechanical error plays a part, it is pilot error that is ultimately to blame.
2. “Is it safe to fly?” (<http://www.garfors.com/2015/03/is-it-safe-to-fly-dangerous.html>) and based on aviation statistics reported by The Economist in “Danger of death!” (<http://www.economist.com/blogs/graphicdetail/2013/02/daily-chart-7>), the average of fatal crashes in 2010-2014 worldwide was one in 2,925,000 flights, or 0.000034% risk.



Nathan Pettus is the Vice President and General Manager of Emerson's global Reliability Solutions business, first joining Emerson in 1998. Nathan provides leadership to Emerson's machinery health technologies and services, delivering improved safety and availability to Emerson customers. He recently expanded his leadership role to include a wider range of reliability technologies and services. With the end goal of helping customers achieve top quartile reliability in their facilities. www.emersonprocess.com



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