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Seize the IIoT in Just 3 Steps

Good news! You don't have to start from scratch.

But here's what your maintenance and operations teams should be doing to prep for IIoT success.

Today it's pretty hard to pick up an industry trade publication or Google anything related to manufacturing and not find an article on the promise of the industrial internet of things (IIoT). Combine the IIoT with advancements in cloud computing and cyber-physical systems (autonomous smart physical assets), and the experts say the stage is set for new manufacturing realities to evolve. Gartner's Emerging Technology Hype Cycle put the IIoT firmly at the "peak of inflated expectations." Despite the hype, we will be – or are – bearing witness to the beginning of what many are calling Industry 4.0, the next industrial revolution.

Those old enough to remember carbon paper, overhead transparencies, fax machines, and phone booths as critically important business tools will no doubt be optimistic. The IIoT promises to redefine or add to the capabilities that organizations must master to be competitive, and it promises to do so sooner rather than later. Rest assured that it will have considerable impact. Accenture estimates it could add $14.2 trillion to the global economy by 2030. Is your organization ready?

That said, no one can actually deliver on the complete IIoT vision today. This is the stuff of tomorrow's competitive landscape. Although vendors have been working for more than two decades to develop and perfect smarter instruments, realizing the full promise across a much broader set of assets will require significant collaboration, development work, and the establishment of a great many new standards.

However, organizations should not use this as an excuse to wait to get started on better leveraging data from connected assets. There is a great deal you can do to ensure that your organization doesn't go the way of the dodo bird. While industry players negotiate the standards required to enable the promise of the IIoT and Industry 4.0 and IT teams work on organizations' information "plumbing," maintenance and operations teams have an opportunity to do some very important foundation work.

I'LL HAVE MY DATA BIG, MY FACTORIES SMART, AND MY MACHINES CURIOUS AND CHATTY

Forget synergy, rightsizing, future-proofing, and a host of other terms. The new buzzword bingo cards sport terms such as big data, machine learning, and virtual twin. After unprecedented IT spending in the late 1990s, by 2005, many senior executives were taking a hard look at IT spend and demanding better returns. Despite this, the risks of chasing new and shiny IT things – to your organization's detriment – are as real as they were back then. The organization's focus should be balanced between new IT capabilities and leveraging legacy investments, not just IT investments.

Your plants do not have the benefit of the same kind of trade-up offered by cell phone providers that allow customers to upgrade their phones every two years. IIoT solutions must enable the previous century of capital investment if they hope to see timely adoption, so while your data is big and getting bigger, don't let that consume

all of your focus and attention.

Organizations have significant historical and real-time data that, with advanced analytical tools or machine-learning capabilities, can lead to improved but often incomplete understanding of your assets. You can close some information gaps, but one must also ask, "What am I missing?"

Pervasive sensing (think connected sensors almost everywhere, embedded or otherwise) is one of the keys to realizing the promise of the IIoT. Connected devices are critical and are growing in use, but according to a 2015 PricewaterhouseCoopers report, only one-third of U.S. manufacturers use smart devices in manufacturing and operations. This leaves a large gap in what's needed to optimize reliability, safety, efficiency, and ultimately financial return. For companies that are limited to legacy sensing investments, most of which were made decades ago to meet minimum automation requirements rather than lifecycle value optimization objectives, the benefits of the IIoT will be significantly limited and challenged in many cases to pay for themselves.

The good news is you aren't starting from scratch. Your organization has already made investments in sensing that will support realization of the IIoT's promise. Our experience setting up equipment health monitoring solutions would suggest that roughly 60% of the instrumentation needed for critical assets already exists. So we can start there.

Step 1:
KNOW WHAT YOU HAVE

Or, stated more accurately, find out what you have. Do not underestimate the importance of knowing what you have when it comes to developing a winnable proposal. A solid inventory will give you a head start with prioritizing new needs and identifying where legacy instrumentation investment supports the future vision.

That sounds simple enough, but in practice it is generally far from simple. Most plants' master equipment lists were developed over many years by multiple contributors. Those contributions were not frequently focused on developing an accurate inventory. Rather, much of the equipment hierarchy was probably created just to facilitate ordering parts, capture costs, or fulfill some other workflow-driven requirement. As a result, the CMMS is generally not the repository for an accurate inventory of the organization's assets. But even if your organization has recently completed a major master data cleanup, there's value in confirming the quality of what you have documented against what's in the plant.

Piping and instrumentation diagrams (P&IDs) can be

equally suspect. If your plant has any age on it, chances are that the P&IDs do not accurately reflect the scope of the organization's assets. A rigorous and disciplined management-of-change process might mean you have a better start than most, but in many cases, P&IDs and CMMS master equipment lists contain an incomplete and potentially flawed inventory.

Your people can be a treasure trove of information. Many of your mechanics and operators likely are carrying around in their heads a considerable inventory of the plant's assets just from being around the equipment for the past 30-plus years. (If a large number of your experienced, knowledgeable mechanics and operators have recently taken up residency in central Florida to work on their bocce and golf skills, however, you may have already missed that opportunity.)

If your master equipment list is in rough shape, you'll want to start working on remedying that situation. For some plants, this will be a significant undertaking. It may well require physically walking down the complete asset base to document what you have. The good news is that there is a pretty strong business case (even without the IIoT benefits) for doing this work. According to our research and Doc Palmer, average wrench time in industrial settings falls between 25% and 35%. Effective planning and scheduling facilitated by quality asset master data can increase this to as high as 65%. Effectively doubling the capacity of organization to do work or cutting the labor content of your maintenance work in half will justify a considerable amount of data cleanup work.

In addition to evaluating the quality of your master data, you'll want to look at your historical data – both process and transactional data. If a core tenet of the IIoT is deriving more insights from your data, then data quality will impact the value and frequency of those light-bulb moments. Data quality is a bit of a circular logic problem. We tend to not use data that we know is inaccurate, but then its poor quality exists because we don't use it. Understanding where your data quality issues are will help you understand where your processes and performance management system might need some improvement or discipline.
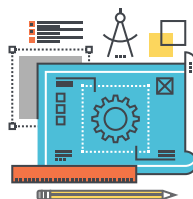
Step 2:
UNDERSTAND HOW EACH ASSET DRIVES (OR FAILS TO DRIVE) VALUE

The digital transformation of plants and factories promises many benefits. Most are associated with optimizing availability and reliability. Filling the gap in sensing to support this transformation requires knowledge of the risks

to equipment availability and reliability. It requires knowledge of how and why assets fail and ultimately what's critical to drive enterprise value.

However, measuring or even defining value for your operations is not always as straightforward as one might think. Often, the easy part is understanding an asset's potential impact on cash flow (costs and revenue). Operational risk and uncertainty can have a significant impact on shareholder value as well. One need look only at the shareholder impact of the Deepwater Horizon incident on shareholder value for affected companies. Likewise, there's a host of dotcom enterprises that demonstrate a history of negative cash flow but enviable valuations, so clearly there is more to value than just reducing spend or expanding revenue.

The good news is you don't need to prepare a valuation. Also, there are proven approaches, based on reliability best practices, to help you develop the needed appreciation of how your assets impact value. These are criticality analysis and development, reliability-centered maintenance analysis (RCMA), failure modes and effects analysis (FMEA), and root cause failure analysis (RCFA).

Criticality analysis is an often underappreciated activity. Too often, gut feelings are considered as effective as employing a disciplined, quantitative approach. But if you ask five people, you'll likely get five different answers on asset rankings. Alternatively, with all the retirements that have happened in the past couple of years, you might get two different answers and, from your recent hires, three puzzled looks. There are several reasons why an organization should do a criticality analysis. As this relates to setting a foundation for IIoT, it's worth focusing on a few points.

To paraphrase Winston Churchill, the value of the plan is in the planning. Criticality development can be similar. While the end product has tremendous value, the process of reviewing the asset base and identifying how systems and equipment contribute to or affect safety, environmental quality, product quality, production, and ultimately plant economics will provide valuable insights on the business drivers for improvement and investment. Why is this important? If you are going to grow, you'll need to justify some investment.

The other important contribution that criticality makes to building a solid foundation is that it will serve as something of a road map. A criticality analysis provides priority and informs the level of rigor required in the next part of Step 2, reliability engineering. RCMA,

FMEA, and RCFA are proven approaches that will help you identify new sensing requirements to detect or prevent these failures. As a positive side effect, you'll also eliminate non-value-adding activities and improve your return on maintenance in the process.

Step 3 (OR IS IT 0?): BUILD YOUR PLAN AND BUSINESS CASE

It wasn't so long ago that quality was all the rage in manufacturing industries. Phil Crosby's "Quality is Free" was required reading, among other books mandated by many employers. While it's easy to appreciate the many lessons Crosby's book had to offer, the most powerful contribution may have been the title. In many ways, it's equally true with reliability. But as with many free things, you still have to show up to be able to claim your prize. Showing up in this case means implementing what you've learned from the previous steps.

For those who feel stuck in an endless "do loop," it's worth noting the chicken-and-egg nature of this business case. Sometimes you just need the funds to do the work to justify the funds. Many of you, after reviewing the first two steps discussed above, have come to the realization that your situation will require some level of upfront investment and therefore justification. If you find yourself needing to front-load the business case development step, rest easy. The returns for investment in reliability best practices are generous and well-documented (see "Turning Enterprise Asset Management into Real Earnings Per Share" by Robert DiStefano and Scott McWilliams).

The aggressiveness and success of your plan will depend on how well you develop your business case and connect the recommendations to risk reduction and improved cash flow. This isn't necessarily just an exercise in math. A business case is a decision-support tool. In some organizations, it's more about the math. In others, it's as much an exercise in social engineering as it is a mathematical exercise. Building organizational momentum and support for investment is frequently more effective than investing in iterative math exercises. Executives are more likely to buy into a positive NPV (net present value) if there are a host of people standing up to say they'll deliver the benefits.

Existing leadership support will also impact the size and scope of the initial business case. If your execs are

already pointing to IIoT as a part of their corporate strategy, it may be time to go for broke and budget big. On the other hand, if you expect significant pushback, then a more targeted pilot or proof of concept may make more sense. Support the process in whatever way it makes sense in your organization, but don't underestimate the importance of building organizational support and alliances.

As you do this, it's probably worth broadening your approach to include influencers outside the usual maintenance and operations suspects. Many of your IT organizations already have money to spend and are making investments in the IIoT. It's not a bad idea to brush up on your IT language skills and make some new friends. It'll be worth your time and attention to know and influence how IT believes sensing will impact realization of their IIoT visions. If IT is too busy chasing shiny or cloudy things to appreciate the importance of collaboration and the role of sensing in enabling the IIoT, then perhaps a diet of fallen fruit, crabs, and shellfish (favorites of the dodo) would be appropriate.

As for the plan itself, there are too many variables to address here. But there is one key point of guidance worth covering. Engineers tend to focus exclusively on technology, and they ignore the balance of the holy trinity of consulting (people, process, and technology) at their peril. If you hear Shoeless Joe Jackson whispering through the cornfield outside the plant, then by all means, charge ahead. The rest of us will have to close the loop. To ensure that you realize the business case, you will need to redesign your processes, skill requirements, and potentially the organization to leverage the addition of new information.

Whether you believe the hype of IIoT or not, you can count on significant change in the not-too-distant future. Some would have you believe that the IIoT will render obsolete what we've known for the past quarter-century about driving reliability improvement. On the contrary, the IIoT will not only enable those best practices, but also will make them mandatory to compete. Regardless of whether you believe in silver-bullet solutions, remember one thing: Even the Lone Ranger had sights on his guns and didn't aim with his eyes closed.

Organizations that have strong reliability programs in place will be better positioned to take advantage of what the IIoT has to offer. Their superior knowledge of their assets will ensure that they aim their sensing investments where they'll have the greatest impact on value. Those that don't will find themselves on the losing end of a widening gap between top- and bottom-quartile performers – if they don't suffer the dodo's fate. ⊗

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