

Use Lean 4.0 to Tackle Hidden Performance Improvement Opportunity

If you're like many manufacturers, you've hit a plateau with lean. But you're not done improving. Not yet. Lean 4.0 gives you the tools to unlock the next wave of performance improvement – potentially up to 20%.

Key Takeaways:

- Many veteran lean manufacturers have seen performance improvements plateau and are currently gleaning only incremental (1-2%) gains from lean initiatives.
- Lean 4.0 offers a gateway to the next round of significant performance improvements when implemented holistically through a focus on institutionalizing lean across the organization, marrying lean with Industry 4.0, and introducing advanced technologies for understanding and acting on IIoT data.
- A pragmatic, prove-and-move approach to your Lean 4.0 journey is the best way to unlock your full performance improvement opportunity and generate sustainable value for your business.

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Capture 20% More Improvement with Lean 4.0

So, you've been doing lean for years. And you can't argue with the results. But while you saw dramatic improvements initially, performance, productivity, and quality gains have all tapered off. Yet, you know there are still areas for improvement.

Most lean veterans have already captured the low-hanging fruit—minimizing waste and optimizing resources—or what amounts to 80% of the performance improvement opportunity. While it's possible to keep realizing incremental gains with the same old lean, companies that have developed an appetite for continuous improvement and major leaps in performance find themselves wanting more.

The good news is the opportunity exists. For the average lean manufacturer, an additional 20% in performance gains remain untapped. But they are hidden in the inner workings of manufacturing processes where variables like cycle time variances, work method differences, equipment parameters including speeds and temperatures, and minor stoppages all factor into performance, quality, and efficiency and represent opportunities for your next round of significant gains.

When Lean 4.0 is embraced through a pragmatic, prove-and-move approach, manufacturers stand to realize up to 20% additional improvements in productivity, efficiency, cost per unit, and material and labor variances.

The Three Key Pillars of Lean 4.0

Getting at those hidden rewards requires a company to migrate to Lean 4.0. In TBM's view, this involves focused attention in three key pillars of lean 4.0:

1. **100% institutionalizing lean across the organization**
2. **Marrying lean culture with Industry 4.0**
3. **Adopting advanced technologies to understand and address areas of improvement opportunity in business processes.**

All of this can translate into the significant bottom line gains that executives are seeking.

You may have heard the buzz about Lean 4.0. It's coming into its own as a concept, and different professionals have their own takes on what it means. Most agree, however, that Industry 4.0 and connected equipment are central to the idea.

At TBM, we believe the Lean 4.0 opportunity is bigger than just data. Our lens is wider, focusing not only on technical capabilities, but on the real business problems that need to be solved. As a result, we see the next-generation performance improvement opportunity as spanning three equally important areas:

1. 100% INSTITUTIONALIZING LEAN ACROSS THE ORGANIZATION

No matter how lean your business is, there are always ways to do more. The first step in a comprehensive Lean 4.0 migration is to ensure you're not overlooking pockets of your operation where waste remains. Maybe the waste has always been there. Or maybe it's starting to creep back in if you haven't done a lean tune up lately, if new workers haven't been fully indoctrinated into the lean culture, or if seasoned workers are falling back on old habits. With all of the changes ushered in by COVID, now's the time to do a check and make sure previously implemented lean practices are being fully adhered to and leveraged.

Usually, the need for this type of remediation work exists in small pockets of your organization or within one or two specific lean practices. For example, we often see slippage when it comes to root cause identification and robust problem solving. It's worth revisiting those practices and ensuring that everyone understands and is fully participating in the processes. Standard work can slip as well, and the rigors involved in validating the work can become relaxed, especially if documentation is not being regularly updated.

2. MARRYING LEAN CULTURE WITH INDUSTRY 4.0

While you're sure that every lean opportunity you can see on the surface has been addressed, you must also start to look under the hood. This is where connected machines and the data they store come into play. Most manufacturers are not yet capturing this level of data. But it's there, in the details, where you will find the wasted seconds and nuanced inefficiencies that will add up to your next major gains.

In many ways, this is the Six Sigma portion of LeanSigma. Combined with powerful analytics, Industry 4.0 data gives you the level of precise detail you need to continue perfecting your processes, eliminate defects, and thus drive additional improvements in quality and efficiency. Some experts claim that combining a lean and industry 4.0 approach can generate up to 40% in cost reductions over a period of five to 10 years, significantly more than either philosophy can do on its own.¹

3. ADOPTING ADVANCED TECHNOLOGIES TO UNDERSTAND AND ADDRESS AREAS OF IMPROVEMENT OPPORTUNITY IN BUSINESS PROCESSES

While IIoT is central to Lean 4.0, it's not the end game. It's what you do with the data and the insights you glean that ultimately unlocks your next level performance improvements and allows you to solve factory and supply chain challenges within the context of a lean mindset.

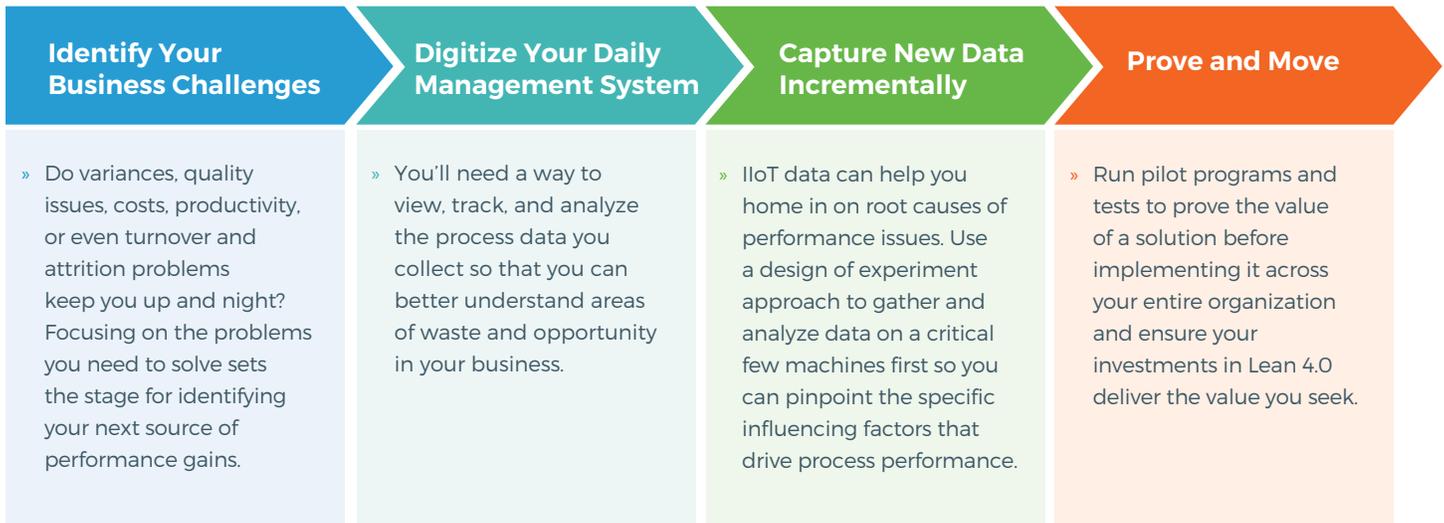
Technology and automation will play key roles here. Here are a few examples:

- Combine IIoT data with video and potentially AI to truly understand factory floor issues. IIoT data can tell you that a machine is jammed, but it does not tell you why. Using video can help you understand the root cause of the problem.
- Feed IIoT data into an analytical engine with process performance data (i.e. throughput, productivity, and quality) to understand if a true business impact is derived from making changes based on the IIoT data.
- Use digital standard work and connected worker solutions to capture key process knowledge and provide a solution to efficiently and effectively train new employees and expedite learning curves.
- Adopt automation, robotics, and co-bots as enablers to eliminating certain elements of manual work or reducing variance in cycle times and quality outputs.

This sort of technology pairing clearly has tremendous potential to take your machines and processes from efficient to near perfect, opening the door to the significant performance improvements you seek. Thanks to rapidly advancing technologies, these utopia-like solutions are becoming increasingly affordable and available.

Getting Started with Lean 4.0: A Practical Approach

A comprehensive approach to Lean 4.0 is the key to identifying and understanding hidden areas of waste and opportunity in your business processes that will help you capture your next major improvement gains. But as with any other innovative idea, it shouldn't be adopted just because the capabilities exist. Implementing Lean 4.0 in a way that pragmatically addresses specific business issues will ensure your investment pays off and delivers sustainable value.



FIRST, IDENTIFY THE BUSINESS ISSUES

TBM is currently helping an industrial high-performance fabric manufacturer begin its Lean 4.0 journey. We've worked with the organization for more than a decade to implement LeanSigma practices and embed a culture of continuous improvement. The results have included double-digit quality improvements year after year, improved productivity and inventory turns, a reduction in maintenance downtime by 71%, and increased equipment uptime. These sustainable operational improvements have allowed the company to grow topline revenues while deferring more than \$2 million in CapEx.

Despite these gains, the company has continued to experience material variances to the tune of several hundred thousand dollars every month. Multiple minor or short stoppages on several lines were starting to add up and drive OEE down into the 70-75% range. The company recognized the need for a deeper level of data and analytics to help understand the resolve the problem.

NEXT, TAKE FULL ADVANTAGE OF THE DATA YOU HAVE

Starting with these business challenges in mind, phase 1 of our solution will include digitizing the daily management system to capture, display, and analyze existing equipment parameter data from several of the manufacturer's lines

We've mapped out the following approach:



Phase 1

- Digitize the daily management system to capture, display and analyze existing equipment parameter data from several lines currently experiencing minor stoppages and lower OEE.



Phase 2

- Launch a design of experiments approach to begin collecting and analyzing data from additional pieces of equipment.

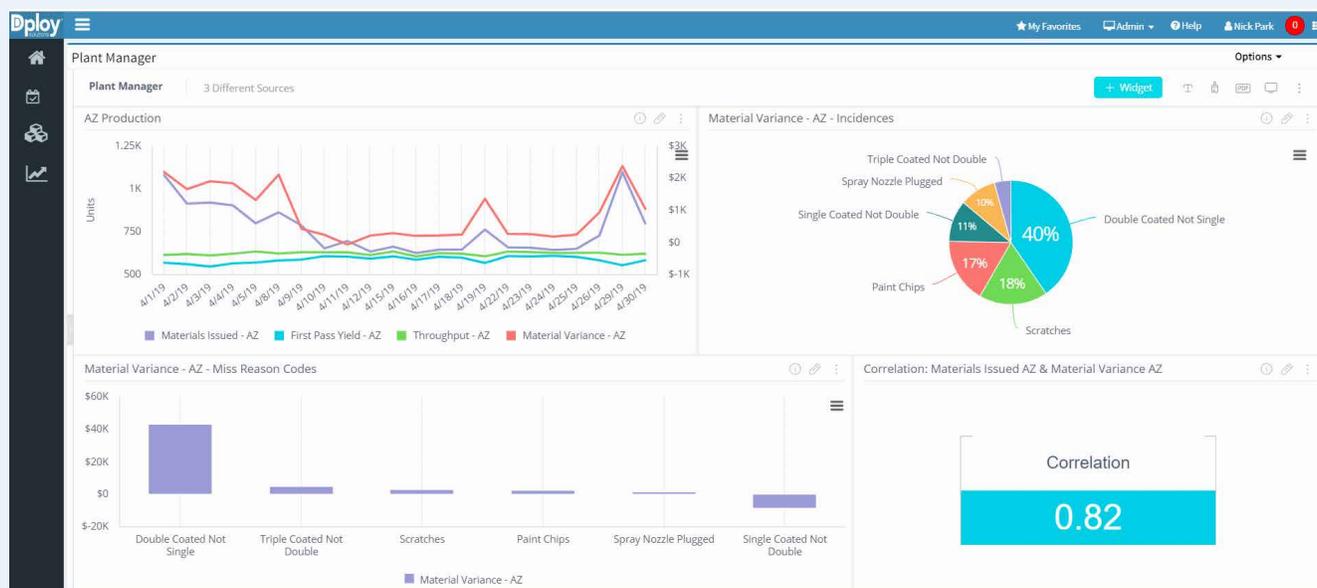


Phase 3

- Involve predictive analytics to stay on top of machine health and predict impending failures.

FIGURE 1

Example of Data Capture from PLCs and Root Cause Analysis



Material variance analysis displaying reason code charts for missed targets as shown in Dploy Solutions, digital manufacturing software.

currently experiencing minor stoppage issues and lower OEE. While a number of smart machines were already capturing data on programmable logic controllers (PLCs), it was only stored for 24 hours and available intelligence wasn't being leveraged. By integrating the data with **Dploy Solutions digital manufacturing software**, business leaders will have the ability to conduct root cause analysis and understand if and how equipment settings such as speed, temperature, pressure, flow rate, and material thickness settings affect operational performance metrics such as throughput, quality, and productivity (See Fig. 1). The goal is to arrive at the optimal settings for the most efficient and effective process outcomes.

For this manufacturer, we estimate a 5-10% performance improvement opportunity using just the currently available data. This could generate more than \$1 million in annual savings while freeing up capacity to support future growth, thus deferring significant CapEx investments.

COLLECT AND ANALYZE ADDITIONAL DATA, A LITTLE AT A TIME

In phase 2, we will launch a design of experiment approach to begin collecting and analyzing data from additional pieces of equipment. Starting with a few critical

machines, IIoT sensors will be placed and data will be analyzed to identify meaningful correlations and pinpoint specific variables and influencing factors that contribute to process performance problems.

In essence, this is the $f(X)=y$ of the Six Sigma philosophy, and the experiment will continue until all critical areas of the process are explored. The beauty of this methodical approach is that it identifies what really moves the needle on specific issues and prevents drinking from the firehose, becoming overwhelmed by data, and missing the key insights.

FINALLY, PROVE AND MOVE

Lean 4.0 is a journey. Taking it a few steps at a time and ferreting out what will drive significant improvement in your business is the key securing your next major gains. With the industrial fabrics manufacturer previously mentioned, phase 3 of the journey will involve predictive analytics to stay on top of machine health and predict impending failures. By first working to optimize equipment and lines and then turning attention to keeping those lines running, we're addressing the immediate issues and then building out the solution, thus generating the greatest possible value for the business at each phase.

Your Next Significant Performance Improvement Is Waiting

For many manufacturers that are already lean on the surface, the time for Lean 4.0 is now. Most manufacturers still have room for major improvements. Going deeper into your manufacturing and business processes to identify and address sources of hidden waste is the key to realizing those gains. If your business is looking for its next major leap in performance improvement, a practical, pragmatic approach to Lean 4.0 can get you there by systemically addressing the specific business issues that are holding you back.

¹ When Lean Meets Industry 4.0

<https://www.bcg.com/publications/2017/lean-meets-industry-4.0>

SPEED WINS EVERY TIME

TBM specializes in operations and supply chain consulting for manufacturers and distributors. We push the pedal down in your operations to make you more agile and help you accelerate business performance 3-5x faster than your peers.

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