Total Productive Maintenance: Realizing Full Potential through Continuous Improvement

Engaging workers and re-shaping culture at the Kimberly-Clark Professional Mobile Mill
Since equipment reliability is a cornerstone of a lean-production system, there is an understood need in manufacturing to aggressively work to address inefficiencies or wastes stemming from the maintenance of critical equipment. The following discussion focuses on how one mill—facing pressure to improve operational performance, while also addressing behavior and attitudinal barriers—engaged key stakeholders through a lean-based strategy that improved equipment reliability, systematically eliminated waste, strengthened workplace culture and established a comprehensive preventative maintenance program. Through this approach, facility managers were successful in achieving substantial improvements in the mill’s efficiency and safety.

The Mobile, Ala. Mill was built in 1939 and began producing paper in 1940. Kimberly-Clark purchased the mill in 1995. The mill, which employs 600 full-time workers, has five tissue machines, 23 converting machines, a fiber preparation facility, a water treatment plant and a 750,000-square-foot distribution center.
Recognized Need for Performance Improvements

In 2012, facility management identified an opportunity to significantly improve operational efficiency at the Kimberly-Clark Professional mill in Mobile, Ala. The mill was experiencing unplanned stops with machines involved in critical operations, which led to increased maintenance costs, elevated operator frustration and added safety risk.

While the mill's maintenance teams were working hard to get a handle on the issue, they had difficulty identifying problems early enough to prevent machine breakdowns prior to scheduled maintenance. During these down periods, maintenance teams were finding more components broken or in need of repair than expected, thus, the repairs being made only addressed the current condition of the machine versus looking at additional repairs that would be needed in the near future.

Another challenge was that front-line operators who were interacting regularly with critical equipment lacked the training and resources needed to evaluate machine conditions, prioritize potential issues and effectively transfer that feedback in real-time to maintenance personnel. This reactive maintenance approach wasn't working, and facility management realized the need for a better way.

“We recognized that our machine operators and maintenance teams possessed the skills, determination, passion and desire to address our efficiency and productivity challenges,” said Todd Visscher, Mobile Mill Manager. “What our facility needed was a process that channeled those energies towards proactive, focused collaboration and provided a clear path forward for our continuous improvement.”
Following a lean-based assessment of production processes by the facility’s continuous improvement leaders, the mill undertook the implementation of a Total Productive Maintenance (TPM) process. The main objective was to improve machine reliability through the elimination of inefficiency and waste.

The first crucial learning was that it would be essential to increase operator involvement in preventative maintenance (PM) while applying lean methods to both operations and maintenance activities. The ensuing program was implemented in coordination with the facility’s production, maintenance, safety and engineering managers, as well as top management.

Another issue involved addressing a disconnect between operators and maintenance teams. These workers needed more effective collaboration in order to overcome the facility’s equipment challenges. By bridging the gap between equipment operations and maintenance, TPM emphasized teamwork, knowledge sharing, accountability and proper training on efficient workplace practices and proper equipment asset maintenance.

“Our goal was for workers to see the maintenance of critical equipment through a different lens. We wanted them to understand each other’s experiences and perspectives in a way that broadened their approach to equipment maintenance,” said Jeff Warman, Continuous Improvement Lead at the Mobile Mill. “Through engagement, we also were able to gain the necessary attention and buy-in from workers and management.”
To unite teams that had not worked together in the past and to ensure involvement and commitment from key stakeholders, the Mobile Mill team launched a series of team building and training workshops for operators and maintenance teams. The workshops were grounded within four pillars of the TPM process: Autonomous Maintenance; Focused Improvement; Maintenance Systems; and Early Equipment Management. With an emphasis on participation, the workshops helped operators and maintenance teams overcome knowledge and communication barriers.

**Building Expertise**
The Autonomous Care Workshops encouraged operators to perform certain equipment maintenance activities (e.g. cleaning, inspecting, lubricating and monitoring) as part of regular operations. During the workshops, operators were trained to maintain their machines at frequent intervals in tandem with efforts made by maintenance teams. This allowed defects to be identified early and reduced the frequency of unexpected breakdowns.

**Creating a Culture of Continuous Improvement**
The Quick Change Workshops, routine “TPM Pit Stops” and standardized planning educated operators and maintenance teams on waste reduction and continuous improvement. The workshops leveraged both operator and maintenance knowledge of existing equipment and processes to ensure new equipment delivered optimal levels of performance.

**Fostering Trust**
The Focused Improvement Team Workshops built trust between machine operators and maintenance teams. During the workshops, operators and maintenance teams worked together to solve chronic problems and made improvements to machines and operating practices. They learned simple problem solving and performance data could be used to identify root causes and prioritize work.

**Standardizing Work**
The 5S Application Workshops trained participants on how to standardize, organize and stabilize work areas and machines. The 5S process (sort, set, shine, standardize, sustain) helped create a visual workplace where custom signs and labels prioritized information and eliminated confusion. Systems also were created to identify, order and execute planned maintenance.
“Our TPM process enhanced engagement and instilled a sense of shared accountability across all levels of our operations.”

Performance Success in Lean

Since the implementation of the TPM process, there have been major gains made in machine maintenance, workplace efficiency, rate of operation, and workforce engagement and safety. In a comparison of yearly averages for 2012 and 2013, there was a more than 40 percent reduction in the occurrence rate of major and minor machine stops within the mill’s fiber processing facility. Similarly, the mill’s tissue converting equipment experienced a 22 percent reduction in machine stops within the first six months following TPM implementation.

Mill leadership also observed a substantial improvement in preventive versus reactive maintenance. Operators were more engaged in helping maintain the machines they worked closely with, allowing maintenance teams to focus on more effective PM tasks. As part of an Autonomous Care Workshop, operators found 75 defects and immediately resolved 28 of them during the workshop. During a subsequent 5S workshop, the team identified and resolved 12 safety issues and created three new standards. These experiences gave workers greater confidence in their roles and led to decreased frustration about machine performance.

“Our TPM process enhanced engagement and instilled a sense of shared accountability across all levels of our operations. By optimizing our workforce and resources, we have maximized production and done more with less,” said Andy Carr, Equipment Asset Team Leader at the Mobile Mill. “These changes have driven substantial gains in efficiency and waste reduction, while also helping our machine operators and maintenance teams work smarter and safer.”

Occurrence rate of major and minor machine stops within the mill’s fiber processing facility

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Over 40% reduction in one year
With a reduction in the number of non-standard interactions with equipment, the mill experienced a reduced total reportable injury rate (TRIR), from 0.42 in 2012 to 0.15 in 2013. In acknowledgment of its commitment to safety improvement, the mill also was awarded its first-ever Crystal Eagle in 2013. The Crystal Eagle award recognizes facilities that obtain one year of working injury-free.

Through similar approaches to create exceptional workplaces across its global business, Kimberly-Clark Professional has delivered dramatic improvements in production performance. Combining proven lean manufacturing principles with industry best practices, there has been an overall equipment effectiveness (OEE) improvement of more than 25 percent and a waste reduction of approximately 50 percent. There also has been a more than 20 percent reduction in maintenance costs due to the elimination of inefficiencies.

GLOBAL IMPROVEMENTS

+25%
Overall Equipment Effectiveness

≈50%
Waste Reduction

+20%
Reduction in Maintenance Costs
Reflections on the TPM Journey

Looking back at the Mobile Mill’s success in implementing the TPM process, there are a few key takeaways for others exploring their own continuous improvement journey: exercise patience and think big picture; recognize that one size does not fit all; and empower workers through engagement.

As part of any facility’s continuous improvement journey, patience and persistence are necessary. There will always be a time for internalization and transition as part of any change in culture or behavior. It’s important to take the long view. Even small, incremental changes can have a dramatic long-term impact. Take, for example, the simple change of creating a visual workspace by introducing proper labeling and organization. This 5S process allows workers to easily find needed materials and information using visual points of reference—reducing the amount of time needed to complete a work task so workers can focus elsewhere. Imagine what 15 minutes saved in lost time per worker, per day over several years would mean to your bottom line.

Every manufacturing facility is different; therefore, the implemented TPM process needs to be responsive to a location’s specific challenges. This approach ensures operation and maintenance teams can connect implemented actions to desired outcomes. Likewise, this allows workers to have a better understanding of how the principles and tools of lean manufacturing are helping them excel at their jobs as they work smarter and more safely. The result of this approach is increased worker acceptance, participation and engagement.

Finally, engagement is critical to achieve optimal operational performance. With engagement, workers have a renewed sense of purpose and empowerment as they recognize their role as vital contributors to a facility’s success. When all stakeholders are focused towards minimizing inefficiency through the elimination of waste, optimizing productivity with problem solving and demonstrating accountability around consistent goals, facilities prosper. By involving their entire workforce, managers can tap into their facility’s full efficiency and safety potential.

For help uncovering hidden opportunities to combat waste and to learn how efficiency and safety go hand-in-hand, visit www.KCProfessional.com/wiperwalk.

Key Takeaways

1. **Even Small Changes can have a Big Impact**
2. **Recognize that One-Size-Does-Not-Fit-All**
3. **Empower Workers through Engagement**