



Putting Lean Principles in the Warehouse

By Doug Bartholomew

While lean principles and practices have been widely adopted in manufacturing over the last couple of decades, their use in the warehouse and distribution center environment has been somewhat slower to catch on.

For that reason, executives at Menlo Worldwide Logistics in San Mateo, CA, saw an opportunity to leapfrog the competition by embracing lean in its outsourced warehousing and receiving operations. The company embarked on a sweeping initiative five years ago with an eye toward transforming its 16 million square feet of warehouse space across the globe using lean principles pioneered in the [Toyota Production System](#).

“The leadership of our company decided it was an important commitment to make for the company and its customers, and if we did it in earnest, it could be a competitive advantage,” says Gary Kowalski, COO and the company’s lean champion. “We are using lean as a pretty effective sales tool, and it’s starting to work. We are winning customers because of our lean approach.”

Menlo Worldwide at a Glance

- Menlo Worldwide Logistics, LLC, 2007 annual revenues \$1.3 billion
- Subsidiary of Con-way Inc., publicly held \$4.7 billion freight transportation and logistics company
- San Mateo, CA, headquarters
- 4,692 employees
- More than 200 operating locations worldwide

To ensure that Menlo’s commitment is sufficiently broad and not dependent on a single person or department, the company established a lean board made up of about half a dozen executives and managers who represent the company’s key functional areas.

A former head of production control at NUMMI, the Toyota/GM joint venture automotive manufacturing plant in Fremont, Calif., Kowalski takes the view that transportation and warehousing must be tightly linked. “The more lean you are, the more integrated view you have of transportation and warehousing,” he explains. As with manufacturing, the goal of applying lean practices in the warehouse is to speed material flow, drive out waste, and reduce inventory.

But make no mistake, implementing lean in the warehouse isn't the same as putting lean in a manufacturing plant. Of course the lean principles and practices don't change, but here lean is being used to transform processes that are warehouse-specific.

A lean warehouse operates in a similar overall fashion as a traditional warehouse, except that its methods for how work gets done are different. "We do the same things as any traditional warehouse, but how we execute these processes are very different," Kowalski says. In other words, Menlo's warehouse employees perform many of the same warehouse tasks, such as receiving, putting away, storing, picking, and shipping.

Menlo's warehouses perform warehousing and distribution tasks for a variety of customers. Some are depending on Menlo to solve a nettlesome logistical problem, such as a recent acquisition that has thrown their supply chain out of whack. Others simply want to outsource some or all of their supply chain activities. As Kowalski explains, "Our job is to go deeper, to work with that client to understand where their other sources of opportunity (to eliminate waste) are. We give them a vision of what to do and how to do it, and then we show them where they can get some quick wins with some upfront results to get them started."

The payoff is clear for Menlo's customers. For example, a large manufacturer of loaders and excavators decided to outsource its warehousing and inventory support operations to Menlo, which opened a new manufacturing support center near the heavy-equipment company's plant. Menlo and the manufacturer jointly designed a new solution using a principle called "line-side back." The new process included a reworking of how parts are packaged and presented to operators, and even the design of the racks used to convey the parts to the work cell.

In the first five months after implementing lean with Menlo's help, the manufacturing company was able to boost inventory accuracy from 60 to 99 percent; slash the value of inventories by 26 percent; reduce parts shortages by 90 percent, and eliminate 95 percent of its expedited freight costs.

Following the Parts

Menlo's more than 100 warehouses vary in how far along they are on their lean journey. Perhaps farthest along in its use of lean among the company's family of warehouses is Menlo's three-building, 300,000-square foot facility in Fremont, Calif., just across San Francisco Bay from the company headquarters in San Mateo. Because of its proximity to Silicon Valley, the Fremont facility's customers are almost all high-tech firms.

The Fremont warehouse bears the internal company lean achievement level of a "stabilization" facility, while a newer facility may be termed an "awareness" site. "As we migrate to lean, we're redoing all our warehouses for lean," Kowalski says. "We evaluate each warehouse to determine where they are on their lean journey."

Farthest along, though, may be a bit misleading, because Menlo managers stress that even the Fremont warehouse has a ways to go. The reason, they say, is that implementing lean

in [logistics](#) -- as it is in manufacturing and any other industry-- is an ongoing process. “Lean is a challenge for logistics,” says Christopher “Kip” Shepard, senior logistics manager at the Fremont site. “A lot of the same concepts are there, but the environment is different from manufacturing. That said, we’re learning as we go. We’ve just scratched the surface.”

Fremont, CA, Facility Lean Initiative Benefits (over 3 years)	
Productivity improvement per year (range)	4.96% to 8.13%
Picking error reduction (always been above 99%) annual improvements (range)	.004% to .09%
Inventory accuracy (always been above 99.985%) annual improvements (range)	.0046% to .0078%
Safety: lost-time accidents reduced annually (range)	2.5% to 5.65%
Warehouse space saved annually (range)	8.55% to 14.65%

Most Menlo Worldwide Logistics warehouses have multiple customers, so there is no “one size fits all” process or activity inside a Menlo facility. “When we think about lean, it all starts with the customer,” Kowalski points out. “We look at their order to final destination. One of the key principles of lean is to go out on the floor and go follow a part.”

Menlo’s lean initiative actually begins with an evaluation on the customer’s manufacturing floor. Starting with input from operators on the finished product assembly line, Menlo staff then design the optimal material flow from plant to warehouse to end customer. “We give them a vision for what to do and how to do it, as well as ways they can achieve some quick wins with upfront results,” Kowalski says.

The logistics firm then designs the ideal layout for parts in the warehouse, emphasizing safety and efficiency, while establishing optimal material flows for warehouse activities such as picking, staging of goods, packing, and shipping. Menlo uses [value-stream mapping](#) to identify opportunities to eliminate wasteful steps. The company holds monthly kaizen events in all its distribution centers.

Each facility manager is expected to not only understand lean principles, but he or she also is responsible for putting lean practices to work on the warehouse floor. “We expect him or her to understand lean well enough to recognize it and to teach it to their associates,” Kowalski says. Every month, each warehouse is evaluated based on its lean performance -- i.e., projects completed, as well as its plan to implement a new set of lean projects in the coming month.

To document both the monthly plan and the progress against it, each Menlo facility must develop and take steps to adhere to a “continuous improvement roadmap,” otherwise known in the Menlo world as a “30-30 Form.” For example, the April/May 30-30 form for the Fremont warehouse includes seven initiatives completed in April, and seven slated for completion in May. Some of the lean efforts completed in April were:

- reduce Safety/Lean teams to fit new layout;
- continue training with team leader on their new areas;
- working with new temp agency to familiarize them with lean concepts. Lean 101 Training provided to On-Site Reps;
- continue go look go see’s of remaining warehouse;
- moved HP direct department to new location at the Fremont facility;
- implemented Smart Dock for top 10 SKUs in customer’s product line;
- implemented container yard management for customer’s product line.

Similarly, the lean projects slated for the coming month were:

- move Latin America Department to different location;
- evaluate forward pick locations slotting criteria;
- evaluate for customer product line Smart Dock SKU mix and use new web tracking tool for container management;
- review support staff hours and use cross training as a means to transfer support hours into productive hours;
- evaluate operational constraints as a result of consolidating from 2 – 400K square foot buildings into one building;
- start redesign of Building One layout;
- office supplies kaizen event.

The whole idea here, of course, is that what gets measured gets done. Each warehouse has established a monthly “diet” of lean tasks and activities that its staff has committed to follow, while documenting the results. As is the case with lean projects in other industries, the kaizen events come from the employees’ own ideas and analyses of their activities and processes.

Redesigning Activities

Kaizen events in the warehouse environment are basically the same as kaizen events in manufacturing, except that the work processes on which they are focused tend to be different. Instead of finding ways to improve the efficiency of materials flow to a welding station, for instance, in the warehouse a continuous improvement event might be relocating a banding machine to a more efficient location for that activity.

The goal is to optimize the flow of materials by redesigning warehouse activities such as picking and kitting, staging of goods, and how goods are actually packed, trucked, and sequenced for delivery. Menlo depends on value-stream mapping -- essentially mapping the flow of information and physical goods through a warehouse and then taking the process apart and redesigning it to be more streamlined.

Kaizen events are performed by teams of employees who do the actual work, with a manager or supervisor acting as facilitator. The teams take apart the activity to see how each step is performed, looking closely for further opportunities to streamline by eliminating unnecessary effort, movement of materials, and other waste.

In one kaizen event implemented at the Menlo Fremont warehouse last March, the goal was to reduce the work-in-process time and de-trash time in re-supply. A seven-member employee team led by team leader Balwinder Thamrait analyzed the process of picking, packing, moving, and unpacking materials in an on-site clean room for customer Lam Research, a maker of semiconductor manufacturing equipment.

Adding the time it took to perform each step, the team found that it took 25.86 minutes to complete this work process. The team analyzed the process, looking for ways to eliminate unnecessary effort and reduce the time it took to perform the various steps. By using lot sizing and essentially combining two tasks at the picking stage, the team streamlined the process. By eliminating the cardboard packing and unpacking of parts by performing the de-trashing of nonsensitive material at the picking site, the process was slimmed to 4.94 minutes. The total cost savings per year was \$44,003.62. “With every kaizen event we measure how long the current process takes and how long it takes afterward,” Shepard says. “This enables us to understand the time and cost savings relevant to that project.”

In another kaizen, Menlo warehouse staffers worked with a high-tech customer to design a set of metal racks that could secure its computer servers for safe transport between the manufacturing plant and the warehouse. The racks facilitate quick removal by warehouse associates, who install the client’s security devices into the servers and add its name to the front of each unit.

Besides value-stream mapping and kaizen events, Menlo’s Fremont warehouse also utilizes other lean tools, including [Five S](#) workplace organization, visual controls to support improved operational processes, and alternative tooling.

The Five S approach -- sort, straighten, sweep, standardize, sustain -- is fundamental for any lean culture to thrive, and the warehouse environment is no exception, except that Menlo substitutes “sweep” for “shine.” Not only are the floors and overall work area all but spotless at Menlo’s Fremont warehouse, but the associates are constantly on the lookout to detect any misplaced materials or other waste lying around. In fact, performing a Five S criteria check is a monthly requirement for every kaizen team of associates.

Accountability

As is the case with any lean transformation, one of the most important ingredients essential to success is training. “We trained at the site manager level first,” Kowalski says. The company created its own lean training program, focusing on value-stream mapping, kaizen events, adherence to Five S, and visual controls to support associates’

understanding of the flow of work processes. “For visual controls, we use signage, floor striping, signs showing where products belong, and other visual tools,” Shepard says.

Besides receiving lean orientation training, each new employee in the warehouse is assigned to work with a current associate who serves as both a helper and a teacher. “New associates learn from the kaizen events and also from working alongside their helper/teacher,” Shepard explains.

The key to Menlo’s accountability for its lean initiative is the monthly 30-30 report prepared by each warehouse, delineating lean activities for the prior month and goals for the upcoming one. “It’s essentially a scorecard that each of our locations must present,” Shepard says. For instance, a typical warehouse improvement plan will include a project to trim cycle time, streamline the returns area, or expand some aspect of lean training for new hires.

To follow up and make sure each facility is on track to fulfill its lean goals, members of the company’s senior management hold a conference call every month with the warehouse managers. “They ask you if what you did in the last 30 days matched what you said you would do, and then they want to hear what you plan to do with lean in the next month.”

When starting with a traditional warehouse that hasn’t yet tried lean, Shepard says Menlo staffers will first do a value-stream mapping exercise, and then brainstorm to see where improvements can be made and which processes are best candidates for shedding the most waste. Next they will plan a kaizen burst comprised of a series of kaizen events to be completed over the next six months to eliminate waste in the various warehouse processes and activities. Finally, they will match the results against a future plan they had mapped out showing the warehouse processes with the waste eliminated.

In order to implement lean in a new warehouse, Shepard says all associates at that site are given the basic “lean 101” training program the company has developed. “This includes Five S training, an understanding of visual controls, value-stream mapping, and kaizen training,” he says.

Next, the site manager will work with each team to realign equipment -- strapping machines, conveyors, and other machinery -- to reduce the amount of movement of materials and unnecessary effort. Each facility also is assigned a “red tag” team of associates. “Their responsibility is to decide ‘do we need all this stuff and what can we get rid of,’” Shepard says. Next follows a value-stream mapping exercise spelling out a kaizen roadmap for the next six months. Finally, to get started, he says, “You need to have an inaugural kaizen event.”

As most lean practitioners know, all this doesn’t happen in a matter of months, or even a year. “Lean doesn’t happen overnight,” Shepard points out. “But these are the steps you take to get a warehouse started down that road.”

The sustainability of the lean initiative is another big issue at Menlo, as it is anywhere companies have adopted these principles and practices. Each company must come to grips with how to sustain the employees' interest in continually seeking ways to improve work processes. At the same time they need to guard against employees either losing interest in the program or worrying they might streamline the work so much their jobs are no longer needed.

“The sustainability of lean is very important,” agrees Shepard. “In our experience we have found that when you have people participating in and making the changes in the work at their level, you have their ‘buy-in,’” he says. “Once you have buy-in, the sustainability is usually a lot better. That, and careful cross-training of associates ensures that you will maintain the process gains you achieved earlier.”

The company has built the lean mentality into the warehouse culture at Fremont so that employees don't think twice about finding new ways to be more efficient and work with less wasted effort. Nowhere is this more evident, Shepard says, than in the company's kaizen program. “When you put a person on a kaizen event, the peer pressure gets to them and they have enough pride and ownership of that process or improvement to make sure it's both done and maintained in the future,” he adds.

Go See

Rather than having work teams examine their own work processes, Menlo rotates its kaizen teams to look at the work flows in other departments. On these “go look go see” tours, a group of associates will go to a new work area, examine it, and then discuss their findings and ideas for improvement with the area's supervisors. “The idea is to have a new group of people look at these processes with a fresh set of eyes,” Shepard explains.

The primary ways that a lean warehouse differs from a traditional one, Shepard explains, are the lack of any bottlenecks in its basic processes, as well as an obvious transparency in the flow of work processes. “In a lean warehouse you're not seeing any bottlenecks in the work,” he says. Also, there is no unnecessary transportation of materials from here to there and back, no wasted motion by workers. Finally, there are no piles of excess finished goods, and few, if any, defects. “These are muda -- waste,” Shepard says. “You won't find these in a lean warehouse, because they've found ways to eliminate them.”

Another way to tell the difference between the lean and the traditional warehouse is that the flow of work is readily understandable. “You as a layman could come in and start up a task and know the flow of the product without anyone telling you.”

For More Information:

Menlo Worldwide Logistics, LLC -- Founded in 1990, Menlo Worldwide Logistics specializes in integrating all functions across supply chains, from sourcing of raw materials, through product manufacturing, to the distribution of finished goods.

www.menloworldwide.com

The Lean Enterprise Institute (LEI) runs monthly regional workshops on basic and more advanced lean tools and lean management, including [Lean Supply Stream](#), [Lean Warehousing Introduction](#), and [Lean Warehousing Implementation](#).

You can read complete descriptions of workshop content with the latest dates and locations at [LEI's training page](#). LEI workbooks and training materials – all designed to de-mystify what a sensei does - show you what steps to take on Monday morning to implement lean concepts. Visit the [LEI product catalog](#) to see the resources available for supporting lean transformations.

Glossary

(Adapted from the [Lean Lexicon](#))

Five S

Five related terms, beginning with an S sound, describing workplace practices conducive to visual control and lean production. The five terms in Japanese are:

1. Seiri: Separate needed from unneeded items—tools, parts, materials, paperwork—and discard the unneeded.
2. Seiton: Neatly arrange what is left—a place for everything and everything in its place.
3. Seiso: Clean and wash.
4. Seiketsu: Cleanliness resulting from regular performance of the first three Ss.
5. Shitsuke: Discipline, to perform the first four Ss.

The Five Ss often are translated into English as Sort, Straighten, Shine, Standardize, and Sustain.

Lean Logistics

A pull system with frequent, small-lot replenishment established between each of the firms and facilities along a value stream. Lean logistics requires some type of pull signal (EDI, kanban, web-based, etc.), some type of leveling device at each stage of the value stream (heijunka), some type of frequent shipment in small amounts (milk runs linking the retailer with many manufacturers and the manufacturer with many suppliers), and in many cases, various cross-docks for consolidation of loads along the replenishment loops.

Three Ms

Muda, Mura, Muri -- Three terms often used together in the [Toyota Production System](#) (and called the Three Ms) that collectively describe wasteful practices to be eliminated.

Muda is any activity that consumes resources without creating value for the customer. Within this general category it is useful to distinguish between type one muda, consisting of activities that cannot be eliminated immediately, and type two muda, consisting of activities that can be eliminated quickly through kaizen.

Mura is unevenness in an operation; for example, a gyrating schedule not caused by end-consumer demand but rather by the production system, or an uneven work pace in an

operation causing operators to hurry and then wait. Unevenness often can be eliminated by managers through level scheduling and careful attention to the pace of work.

Muri means overburdening equipment or operators by requiring them to run at a higher or harder pace with more force and effort for a longer period of time than equipment designs and appropriate workforce management allow.

Toyota Production System (TPS)

The production system developed by Toyota Motor Corporation to provide best quality, lowest cost, and shortest lead time through the elimination of waste. TPS is comprised of two pillars, just-in-time and jidoka. TPS is maintained and improved through iterations of standardized work and kaizen, following PDCA, or the scientific method.

Development of TPS is credited to Taiichi Ohno, Toyota's chief of production in the post-WWII period. Beginning in machining operations and spreading from there, Ohno led the development of TPS at Toyota throughout the 1950s and 1960s, and the dissemination to the supply base through the 1960s and 1970s.

The concepts of just-in-time (JIT) and jidoka both have their roots in the prewar period. Sakichi Toyoda, founder of the Toyota group of companies, invented the concept of jidoka in the early 20th Century by incorporating a device on his automatic looms that would stop the loom from operating whenever a thread broke. Kiichiro Toyoda, son of Sakichi and founder of the Toyota automobile business, developed the concept of JIT in the 1930s. He decreed that Toyota operations would contain no excess inventory and that Toyota would strive to work in partnership with suppliers to level production. Under Ohno's leadership, JIT developed into a unique system of material and information flows to control overproduction.

Value-Stream Mapping

A simple diagram of every step involved in the material and information flows needed to bring a product from order to delivery. Value-stream maps can be drawn for different points in time as a way to raise consciousness of opportunities for improvement. A current-state map follows a product's path from order to delivery to determine the current conditions. A future-state map deploys the opportunities for improvement identified in the current-state map to achieve a higher level of performance at some future point.