

Get LEAN

Cut the Fat in Your Shop with Lean Manufacturing

By Chet Marchwinski

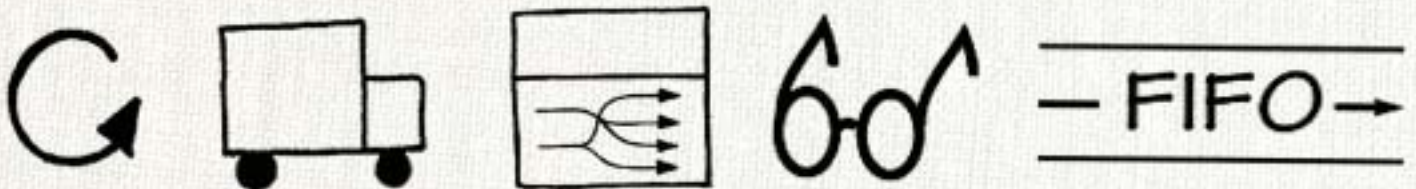
Companies in a variety of industries are reaping big gains from lean thinking through improved productivity, better quality, shorter lead times, less inventory, and better cash flow. These gains aren't restricted to repetitive manufacturing environments, such as the automotive industry, where lean began. Job-shop producers like cast polymer and composite manufacturers can benefit from a lean transformation by making some adjustments for their non-repetitive environments.

But regardless of your shop environment, it's important to realize that lean thinking techniques, such as changeover reduction, mistake-proofing, and Kaizen, are meant to be applied as part of a system—a lean production system that gives customers what they want, when they want it, at the lowest cost, and with the highest quality. When managers cherry pick isolated lean techniques to apply, they implement only bits and pieces of lean and reap only partial benefits.

Instead of keying on techniques, companies should focus on the lean concept of creating continuous flow production, which means items are processed and moved immediately to the next step. Continuous flow pays off with a flood of benefits, including very short lead times, rapid identification of problems, quick communication between steps, increased productivity, higher output, and conservation of resources.

First In, First Out

Make-to-order processes are often mistakenly considered unsuitable for continuous flow processing because the work content involved in making different product types varies too much. In fact, you can approximate continuous flow and achieve many of its benefits in most make-to-order processes by maintaining a First In, First Out (FIFO) flow through the processing steps and carefully regulating the quantity of work you consistently release to that FIFO chain of production steps, notes Rick Harris, Lean Enterprise Institute (LEI) faculty member and co-author of



Value stream mapping icons (left to right): withdrawal; truck shipment; cross-dock; go-see scheduling; and transfer of control quantities of materials between processes in a First In, First Out sequence.



“Creating Continuous Flow” (Lean Enterprise Institute, 2001).

Instead of releasing work in increments of customer orders, Harris suggests that you release work based on a standard, consistent time increment, known as the “pitch” in lean terminology. To do this, find the bottleneck operation in your FIFO chain of make-to-order processes. Then break down the orders, not by customer, but into equal time increments based on the bottleneck’s capacity. The bottleneck process then becomes the “pitch setter” for the FIFO chain, Harris says.

“The result is a much more consistent work flow that quickly highlights abnormalities that interrupt flow, just like continuous flow processing,” he says.

Value stream mapping

Creating continuous flow starts with mapping the value stream for product families. A value stream is simply all the value-adding and nonvalue-adding processes needed to bring a product from raw materials, through production, to the customer. (Nonvalue-adding activities add cost but no value, from the customer’s perspective.)

The value stream map is a paper-and-pencil representation of every process in the material and information flow, along with some key data such as the customer demand rate, cycle times, and machine reliability, among others. Mapping, as explained in the workbook “Learning to See” (Lean Enterprise Institute, 1999), happens in two stages. First, the mapping team follows a production path from start to end, using specific icons to represent the material and information

Lean Manufacturing: A Case Study at AOC Canada in Guelph, Ontario

By Kathy Baker

A lean environment provides a manufacturing facility with value-added and waste-removed processes. All the lean initiatives working together create a visually clean, organized and flowing work environment.

Lean thinking has become an important way to conduct the everyday operations of manufacturing unsaturated polyester resins and gel coats at the AOC Canada plant in Guelph, Ontario. Over the years, the plant had seen continual growth and an ever-increasing product line, contributing to an overcrowded situation. This condition made product and process flow awkward and inefficient. The manufacturing site was looking for improved ways of utilizing space in the warehousing areas. The end result was a window of opportunity to embark upon a culture change throughout the whole facility.

The AOC corporate office in Collierville, Tenn., called upon The Access Group (TAG) in Tennessee for guidance in the effort of improving its operations. TAG provided its experience of taking lean principles, such as 5s and Kaizen, and using them to improve processes without encountering high costs, in most cases. The practice, known as lean manufacturing, is a production system built upon the principle of continually adding value to a product through its machines and processes with no wasteful steps or delays.

Gimme five

The 5s process delivers a workplace that is organized and efficient. A cleaner workspace provides a safer environment as well as a good visual picture to promote business. Implementing 5s takes commitment from senior management, effort and persistence. It is necessary to consistently follow the principles in all areas of work.

The principles of 5s are:

- **Sort**—Decide what is needed in the area and dispose what is unnecessary;
- **Straighten**—Set in order items required to perform work;
- **Shine**—Cleanliness of area, equipment, racks, etc.;
- **Schedule**—Standardize; maintaining the first three principles; and
- **Sustain**—Disciplined culture; the need to practice and repeat the principles until they become ways of life.

On a roll with Kaizen

Kaizen is a deliberate application of looking at work processes with common-sense thinking. Kaizen events are meant to improve a process in a short period of time with little-to-no money involved, as it makes improvements to what you already have. All initiatives require 100 percent management support and empowerment of the group to make things happen.

Lean manufacturing in action

The questions became how to identify and correct what causes interruptions, and what it takes to bring it to a smooth, value-based process flow. TAG worked with the plant personnel and taught the skill-sets of how to plan and attack problem areas in a team-oriented environment. This enabled the vehicle for positive change.

The first round of 5s and Kaizen (see Chart 1) were completed at Guelph in the warehouse area in March 2001 by a team of seven employees, all from different disciplines and management levels, including employees from the area of focus.

(“A Case Study...” continues on p. 38)

flow. This is the current state map. Next, the team quickly creates a future state map of how value should flow. The final step is to create and implement a plan for achieving the future state.

Value stream mapping helps teams of engineers, managers, and operators identify every process in product-family value streams, separate value-adding processes from the wasteful ones, and determine how to eliminate the root causes of the waste. Only then is it time to apply the techniques. Now the team knows what

lean techniques to apply and where to apply them for maximum impact.

Mapping differs significantly from tools such as process mapping or layout diagrams because it includes information flow as well as material flow and a detailed representation of how your facility should operate to create continuous flow. Value stream mapping is a way to create a vision of a leaner future state that you can then gear all of your lean activities toward achieving.

Job shop mapping

“Drawing the information flow on the value stream map of a job shop typically is much more involved than the actual production flow,” says Drew Locher, an LEI faculty member who teaches companies how to use value stream mapping. “The problem that people in this industry and in many job-shop industries have is that the information flow is more involved than in a repetitive industry because the job shop map usually includes preproduction work such as quoting and estimat-

ing,” says Locher, who has helped composite manufacturers implement lean.

“The prep work of getting the correct measurements, processing the order, and conveying that information to the production area is critical,” he says. “What we usually get into is how do people get the order information: Are they using the right form? Are they using check-off forms? Do the people who are using the form know how to use it? Maybe the form needs visual reminders to assure that the order is oriented the right way? You might view it one way and someone else might view it another way, and the next thing you know, a beveled edge gets put in the wrong place or a hole is on the wrong end. Those are the kinds of things we look at a lot.”

Other improvements in prep areas could involve moving operations closer together to make communication easier, faster, and more accurate. **CPC**

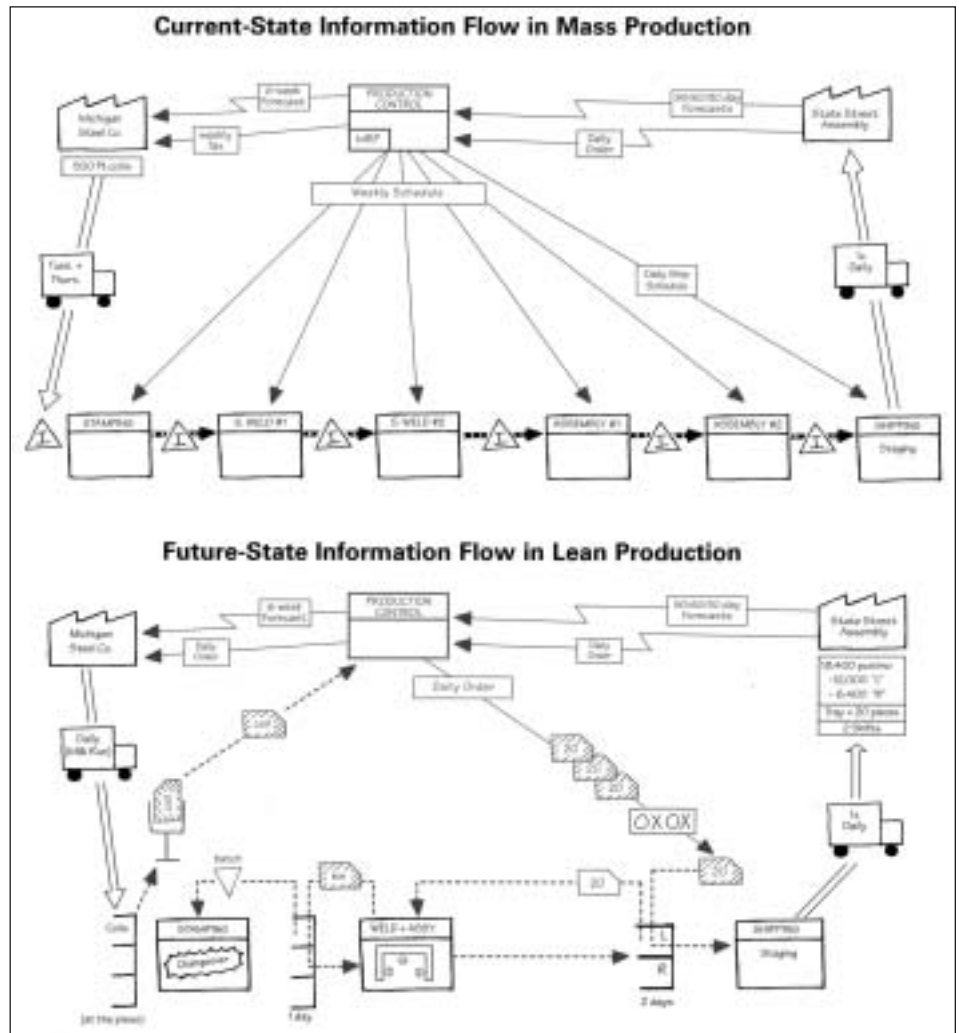
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The LEAN Thinking Process

Dan Jones and James Womack introduced the five-step lean thinking process in their book “Lean Thinking” to guide managers through a lean transformation. Its principles are:

- **Specify Value** - Define value from the perspective of the final customer. Express value in terms of a specific product, which meets the customer’s needs at a specific price and at a specific time.
- **Map** - Identify the value stream, the set of all specific actions required to bring a specific product through the three critical management tasks of any business: the problem-solving task, the information management task, and the physical transformation task. Create a map of the Current State and the Future State of the value stream. Identify and categorize waste in the Current State, and eliminate it!
- **Flow** - Make the remaining steps in the value stream flow. Eliminate functional barriers and develop a product-focused organization that dramatically improves lead-time.
- **Pull** - Let the customer pull products as needed, eliminating the need for a sales forecast.
- **Perfection** - There is no end to the process of reducing effort, time, space, cost, and mistakes. Return to the first step and begin the next lean transformation, offering a product that is ever closer what the customer wants.

Source: www.lean.org



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Additional reading

"Learning to See" is an easy-to-read workbook that teaches you how to see complete value streams and design an improved future state flow. Available from www.lean.org.

"Creating Continuous Flow," the follow-up workbook to "Learning to See," provides the practical thinking and tools for designing, implementing, and improving continuous flow in operator-based cells and lines. Available from www.lean.org.



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Storage racks before (left) and after (right) Kaizen. The Kaizens helped improve space and reduce travel time.

“A Case Study...” from p. 21)

The first step was to complete a 5s, a very disciplined process of sorting and cleaning up the area to a very high level. The idea of bringing the area up to this level of housekeeping (more or less clearing out the weeds) before attempting a Kaizen is critical. You cannot see the flow of work if the area is in disarray. This effort resulted in a place for everything and everything in its place. Purchasing can identify stock needs much easier, and operators can quickly find materials. The lean process created 1,264 square feet (79 pallets), a gain of more than 10 percent more space. Two years later, this area still continues to implement and

sustain the improvements made at that first Kaizen.

Our second Kaizen focused on slow-moving raw materials. The difference between the first and second Kaizen is that we discovered more than one area of improvement during the second one, a big win for us. The first Kaizen focused on space improvement as well as money savings as the operators no longer have to search for raw materials, which took them out of production. The second Kaizen reduced travel time, allowed the operator to remain close to production, and reduced inventory in the raw material warehouse.

For the second Kaizen, the inventory was reduced and moved out of

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Chart 1. Kaizen: Specialty Raw Material Rack & Storage Room

Problem	Measures Taken	Results
Operators required to travel to the warehouse to search for part drums of gel coat, taking them away from their work area in a time-consuming process. Numerous times, part drums were brought into the area and placed in front of the congested raw material rack, which holds pigment that sits in area for more than a month at a time.	Sorted through rack and moved all pigment to the raw materials warehouse. Set racks up to accommodate part drums of gel coat. There was a 12' and 9' rack that would not hold drums. Found a used 9' rack in the warehouse and exchanged the 12' for the 9'. Painted and labeled the racks. Created an inventory board that lists what product is on the rack as well as the control number and weight. Transformed the unused space beside the rack, which was used as an exit when there was a roll-down door in the area. This is no longer the case, and we have decided to remove the door and build three shelves for storage of color pastes in pails as well as other area materials.	The rack is used for part drums, and the area is no longer congested. The information tags for the inventory board went through three phases until we found a tag that provided the user with the appropriate information. The unused storage space is being used for color pastes.
<i>Kaizen Team</i> Three operators	<i>Maintenance Team</i> Two maintenance members	<i>Paint Team</i> Two Summer Students

the production area. The racks then were changed to accommodate storing base intermediates closer to production. This reduced/eliminated the time operators spent leaving the production area to search for drums of processed product. After assessing the relocated raw material inventory, the plant worked with suppliers to return \$6,000 of unnecessary raw material stored on its shelves. The Kaizen increased focus on inventories of other raw materials as well as research of lead times to ensure that valuable rack space was not underutilized.

Go with the flow

The shop also underwent a process flow analysis, which aims to effectively utilize space and minimize waste. In August 2002, Guelph did a process flow analysis on a solid alkyd processing operation and created an efficient way to re-invent this process to use the relocation space available as sparingly as possible. The result was a new work area decreased from 1,466 square feet to only 892 square feet, with a reduction of total batch transportation travel from 51,315 feet to 20,489 feet. This not only saved the process valuable time by removing wasteful travel, it also improved the flow of work and safety dealing with the transport of molten alkyd.

Lean thinking cap

The plant continues to look at everything it does with a lean thinking cap. It has carried on using the 5s process with the implementation of 5s audits and mini-Kaizen improvements. One of the mini-Kaizens performed was re-arranging the corner of the reactor floor and giving permanent spaces to required raw materials. Operators placed drum stock on unused drum holders in the plant and labeled the spaces as permanent homes for these products. We also removed ladders that were cluttering the area and found them permanent homes. The same families of materials are parked in the same area, a safer way to dispense raw materials.

Eventually, the plant will continue the momentum by applying 5s to its labs and offices. Some of the items one can audit are the cleanliness of workstations, clutter, floor clearance, and cabinets identified.

The TAG group taught AOC to look at operations in smaller components because they have a much higher chance of resolve and success. That significant culture change benefits many plant operations, as it increases efficiency, creates more useful space, improves throughput and motivates

employees. Lean and 5s must be an overall plant-wide commitment and fully supported by management. Guelph plans to continue on the lean journey as it progresses forward in the pursuit of Operational Excellence goals and service to customers. **CPC**

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