

# Part 2: Key Concepts of LEAN Manufacturing

Dramatic economic conditions often lead to major changes in how customers use products and services as they learn what they believe are new and better uses. The current downturn will lead to similar changes though we may not understand what all of them are at this time. Good companies are re-evaluating their business models in anticipation of these changes. One thing for certain, companies that improve efficiencies and reduce wasteful activity will be winners as things improve.

Scholars and academic researchers have developed numerous business practice innovations a company might adopt in an effort to reinvent their business model. However, not all are applicable or beneficial to most wood products manufacturing companies. For example, six sigma has transformed many companies and when utilized effectively can lead to dramatically improved bottom line results. However, the techniques of six sigma are more applicable to discrete manufacturing processes. While lumber mills have some discrete tendencies the manufacturing flow more often resembles that of process industries like oil refineries. This is not to say that oil refineries can't benefit from six sigma only that it might not work as well across the full gamut of activity.

On the other hand, LEAN manufacturing techniques and concepts represent one way businesses in our industry are changing their culture toward efficiency and continuous improvement. The wood products industry has been slow to adopt these techniques or any others, as a manufacturing discipline because its been hard to see the "fit" and believe the benefits will be worth the extra effort. However, a few companies that have tried LEAN and worked hard at it have realized significant improvements and continue to use it as a vehicle for change. The underlying philosophy of LEAN, organization, standardization, and continuous improvement is valid for any business.

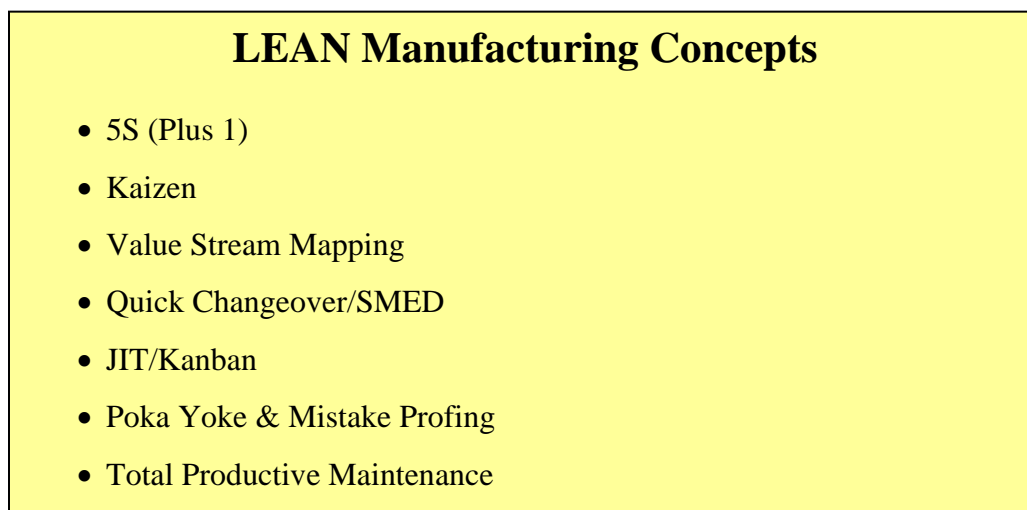


Figure 1

Figure 1 lists concepts of LEAN manufacturing that would be applicable or have been used often in the wood products industry. They represent the major tenants of LEAN.

Understanding and implementation of this list will provide a good foundation for growth and improvement over time. As the implementation of LEAN progresses and work to refine processes and procedures evolves, the interdependency of each on the other will become more evident.

The following question may provide a basis for explanation of these concepts in the context of the industry. Have you ever observed wasted time in the manufacturing process because a hand tool was missing a part wasn't on the shelf or a wrench was misplaced? In some cases this happens hundreds of times a day all around a facility. Each instance by itself doesn't seem significant but when added together the amount of time wasted can be tied to thousands of board feet of lost production.

These "little thieves" steal production away from mills everyday all around the world. They're hard to spot and even tougher to catch and eliminate. When one finally becomes evident the cost is analyzed for the mill it's often hard to figure out how it went on for so long. LEAN is a method to reveal those "little thieves", bring them to light and allow them to be banished from the process. Some definition to the words in figure 1 will serve to better explain how LEAN can be helpful.

**5-S** is used to create more organization in the workplace. It is most often applied on a workstation by workstation basis to systematically improve flow. The idea is to start by sorting out all the tools and parts necessary to do a specific job. Anything not needed is discarded and things needed but not present are added. Next all items are organized and placed so they are easily accessed when needed and often in the order needed. The area is then cleaned as well as possible and changes are made to make it easier to keep clean. This becomes the standard for all similar workstations throughout the facility and potentially the entire organization.

Appropriate training materials are often generated including written instruction and pictures. Then employees are trained in the new process and expectations for accountability are set in order to sustain the gains from the effort. Many practitioners include an evaluation of safety issues that may come up as a result of changes to the workstation or in an effort to improve safety performance. The intended result is that there are fewer wasted steps and less wasted time at the workstation because all parts and tools are always ready for use and in top condition. One mill used this technique to dramatically reduce lost time at a reman station in their mill.

A **Kaizen** event is a multiple day gathering of a cross functional work group to solve a particular problem in the work flow. Cross functionality of the group helps insure that new "out of the box" ideas are presented and all aspects of the issue are represented. It is an intense examination of the problem including evaluation of all inputs, outputs and associated constraints. Kaizen is most often used for larger problems though scaled down versions are appropriate at work stations and with small work teams. For example one mill used a kaizen event to improve the flow of material at a log infeed to a sawmill. In this case mill, log yard, maintenance, and accounting staff members as well as an outside contractor came together to develop a more efficient way to handle logs and increase the volume through the log infeed.

The kaizen group identifies and documents the "present state" to establish the starting point. They use different brainstorming techniques to develop ideas for improving the process. All ideas are tested and evaluated to determine if they improve the process or cause more problems. There are no bad ideas. Heavy emphasis is placed on value added vs non-

## **5 S (Plus 1)**

- **Sort**
- **Straighten**
- **Shine**
- **Standardize**
- **Sustain**
- **Plus**
- **Safety**

value added thinking. Once the best solution is reached it is implemented and the group establishes training materials and procedures to sustain the improvements realized.

**Value stream mapping** is often part of a kaizen event. In its true form the value stream map documents all parts of the manufacturing process from the time the order is taken until it is delivered to the customer. Companies should always be striving to add value at every step in the manufacturing process. If a step doesn't add value it should be evaluated for elimination or consolidation as a way to improve efficiency. Here again however, scaled down versions of the same concept can be applied to less complex situations. At each step inputs, outputs, and variables are identified and quantified. The group should look at cycle times, inventory levels, waiting time and other aspects of the process. The idea is that by painstakingly identifying each part of the process wasted steps will become evident and a kaizen or continuous improvement team can begin the change process.

Once the value stream has been mapped it serves as a starting point for continuous improvement. Depending on what is revealed in this process the scope of future efforts can be defined. The team often develops a picture of a better "future state" which they plan to move toward using other LEAN techniques. It is important that the group documents the "future state". This becomes the goal for the team and can be expanded to include the entire organization.

To realize maximum benefit from value stream mapping it is important to involve customers where appropriate in the process. If the group is functioning as expected they'll ask "what if" questions many of which can only be answered after talking to customers. Getting customer input can be difficult but advances in technology open up numerous ways to efficiently interact with them using voice, video, and other electronic media. This step often yields the most ROI as it leads to changes that may provide a competitive advantage in the marketplace. One company used this idea to reduce the lead time on a product from six days to two, thus reducing cost while adding value to the customer.

Facilities often run multiple species and/or product mixes that require changeovers at various steps along the manufacturing process. **Quick Changeover or SMED** (Single Minute Exchange of Dies) efforts attempt to reduce the number of steps and the time it takes to perform each during a change in the manufacturing process. When these situations arise there are typically two aspects effecting the time necessary to make the change. The first is the steps that can be completed while running and the second is those that must be done when the machine is down.

Efforts should be made to complete as many steps as possible while the machine is still running product and minimize the amount of down time. Teams often combine steps, prepare tooling ahead of time, and change the order of processing to reduce wasted time. Planer changeovers and saw changes in the sawmill are a prime candidates for this idea. Improved communication is necessary to make the changes successful and get the involvement of more people in the process. As with all LEAN techniques changes are documented and training developed and implemented to sustain the benefits.

The concept of **Just In Time** inventory and Just In Time manufacturing is perhaps the most well known LEAN concept in wood products. In Lean terminology inventory represents waste and is to be minimized everywhere possible. Influences on the supply chain over time have highlighted the need to be mindful of the amount of inventory at each step and the idea has worked its way upstream to the mill and even operations in the forest.

Though better cash flow is often thought of as the primary benefit of JIT there are other operational benefits. Having low inventory at every step of the process makes it easier to make changes and respond to customer requests. In one instance a mill was able to

eliminate a forklift driving position because of efficiencies gained as a result of JIT implementation. Each step becomes more efficient with the cumulative effect of reducing manufacturing time and cost. For most companies these benefits result in more dollars to the bottom line than the savings associated with the carrying cost of inventory.

**Kanban** is a concept which represents the idea that production should happen only as a result of the “pull” from the customer. When product is made in direct response to the desires of the customer the entire process is more efficient. If companies make only what the customer wants in the quantity and quality they desire during the appropriate time frame the manufacturing process can be optimized to produce the greatest profit for the organization. This perfect world characterization forms the foundation which spawned LEAN manufacturing and the drive for continuous improvement. Some companies are using this idea as they focus more on the needs of customers and attempt to become more responsive to changes in the market.



Many mills already use a form of **Poke a Yoke** in their manufacturing process. A laser scanner that measures the size of the product and issues an alarm when it is out of specification is a form of error checking or Poke a Yoke. This concept is meant to help engineer in processes and procedures that make it harder for mistakes to happen and easier to detect when they do. The idea of mistake proofing is to design

a process so mistakes are almost impossible to make as long as all instructions are followed and quality is maintained. It’s easy to see that fewer mistakes translate into lower costs and higher quality.

**LEAN Improvement Data**

<b>BEFORE</b>	<b>AFTER</b>	<b>IMPROVEMENT</b>
7 Forklift Movements	3 Forklift Movements	57% Reduction
27,500 Pieces in WIP	9,950 Pieces in WIP	63% Reduction
144 Hour Lead Time	4.2 Hour Lead Time	97% Reduction
275 Labor Hr/Week	210 Labor Hr/Week	23% Reduction
4.5% Fiber Lost	2.8% Fiber Lost	38% Reduction

**Total Productive Maintenance (TPM)** is a support function promoting high machine time availability and effectiveness. As companies increase the use of LEAN techniques wasted steps are eliminated in the manufacturing process to provide more time processing material and making products customers want. If a machine center or a facility is down due

to a mechanical or electrical failure of some sort, no product will be made or sold. TPM uses the concepts from LEAN to improve maintenance functions providing for high uptime and optimum processing speeds.

TPM by itself is a substantial undertaking for most facilities given the complicated nature of optimizing parts availability, manpower requirements, skills training and break down evaluation. But TPM is most beneficial as an integral part of an overall LEAN implementation for a company. In fact, most have found that TPM doesn't work well unless the entire organization understands and practices LEAN and LEAN doesn't work without the support of effective TPM.

It is important remember that the adoption of LEAN as a manufacturing discipline is the start of a journey, one that can be very profitable. Certain changes will take longer to effect than others. When LEAN is implemented and used properly it can become an effective tool to drive continuous improvement. Once integrated into the culture of the business it becomes the standard for daily operations. Decisions revolve around optimizing all activity and keeping waste to a minimum. Companies that do this better than the competition will be the winners regardless of economic conditions.

### Part III: Implementing LEAN.