

B1-LEAN MANUFACTURING

In the lean world, there are six kinds of waste in the manufacturing process:

- Defects. When a defective part is shipped to the customer, the customer must waste time and labor identifying the defect and returning the defective part to the OEM. The OEM's time and labor have been wasted in manufacturing the part.

- Transport. The parts the OEM ships to the customer should only be what the customer needs and should be undamaged at the time of delivery. When these conditions have not been met, time and labor have been wasted for the OEM and the customer.
- Timing. When the parts are shipped to the customer before the customer is ready to receive them, time, labor, and other resources are wasted in storing the parts until they are needed. Also, when the customer is ready to receive the part, the specifications for the part may have changed. Again, in this case, the OEM's time and labor have been wasted

- Waiting. This is the opposite of overproduction. When the customer must wait for a parts shipment, the customer must divert manufacturing resources to other processes and the OEM's time and labor are wasted.

- Overproduction. When an OEM produces more parts than the customer wants or parts with features that the customer does not need, the OEM's time and labor are wasted

- Motion. To save time, the amount of effort for a worker to perform a task must be minimized. For example, effort is wasted when there is too much distance between workstations, and a line worker must spend more time carrying a part between them.

How Do You Apply Lean to Your Manufacturing Process? Lean has a clearly defined set of principles to guide you in applying it to your manufacturing process:

- Precisely determine the customer-defined value of the product.
- Identify the product's value stream.
- Ensure that the value flows uninterrupted through the manufacturing process
- Establish the process so that the customer "pulls" the value from the producer.

- Continuously attempt to perfect the first four principles. Let's look at each of these principles in more detail. Determining the Customer-Defined Value When all aspects of the manufacturing process meet the customer's needs at a specific price and time, the customer-defined value is met. When the customer doesn't respond to a product by ordering more, the OEM often makes the mistake of adding more bells and whistles to the product or adjusting the price. If that doesn't work, the OEM employs another marketing strategy even when it is clear that the customer has already decided against the product. In this case, the producer is focused on fixing the internal process and not on rethinking the product value from the perspective of the customer. Lean thinking clears the board, ignoring existing

assets and technologies, and rebuilds the process into one that ensures product flow and no waste.

Identifying and Analyzing the Value Stream

The value stream includes all the steps and processes necessary to put the raw materials together to create the finished product and deliver it to the customer. Implementing lean involves analyzing the value stream, which identifies three types of actions throughout the stream: actions that create value; actions that do not create value but are unavoidable because of the restrictions of current technologies, production methods, and assets; and actions that create no value and are avoidable. These actions are individually assessed, and those that do not directly create customer value are either redesigned so that they do create value or are removed from the process.

Making the Process Flow

When the customer value has been precisely determined, and the value stream has been analyzed and optimized, all of the actions in the process must be made to flow efficiently. Doing this requires a change of perspective from one that groups tasks by type to one that focuses on how the product should meet customers' needs. The tendency is to think that grouping similar tasks will keep everyone busy and will automatically guarantee that the process flow will be efficient, but this isn't true. On the contrary, this often makes the process rigid and not adaptable to changing requirements. The product flow is disrupted, and time is lost while the product waits for the next operation, or workers change over to another activity. The workcell, a key lean concept, results in optimal workflow. The workcell is a space on the factory floor where all of the work necessary to complete the assembly of one part is done. Workers don't have to cross long distances to access all of the machines they need to produce a part; the machines are always near them and arranged in such a way as to minimize movement. Production lines are usually organized into groups of workcells. Lean asserts that the effort of everyone in the product flow must result in adding customer value to the product and nothing else; this can only be done by minimizing worker effort and maximizing productivity, and only then can the process be implemented with the agility that ensures that it can quickly meet changing requirements with no waste.

Establishing Customer "Pull" Through the Process

The way to incorporate agility into the process so that customers always get what they want is to make it possible for the customers to continuously communicate their needs to each part of the manufacturing process. In effect, the customer is "pulling" the product through the process. Lean manufacturing methods make use of the kanban system to do this—a system in which signals (usually in the form of cards) containing updated information about customer needs accompany the product through each step of the manufacturing process. This informs workers of the customer value, reminds them that they are working to achieve customer value, and guarantees that customers know that they are getting what they need.

Constantly Perfecting the Process

When companies accurately identify customer value, analyze the entire value stream to make it more efficient, and make the value-added steps in the process flow efficiently by letting customers pull value from it, something remarkable happens. The people in every part of the process begin to realize that better results can be achieved with less effort and cost, and that this can continue indefinitely. As the process becomes more efficient, previously hidden waste in the process is exposed. This becomes the impetus for further review and refinement of the product flow. When product teams are in close communication with customers, they can always find ways to specify customer value more accurately and enhance flow and pull in the process. Employees who discover ways to improve the process receive immediate positive

feedback, and they realize that they too have a stake in delivering real value to the customer. This encourages them to be even more involved. In some companies, it is the lower-level managers who are the first to buy into the lean philosophy. They propose ways to incorporate lean into the enterprise by devising proof-of-concept efforts to show upper management the potential benefits of adopting lean on a larger scale. This can be a challenge, but as the business begins to show increased customer satisfaction and corporate profits, the message becomes clear: lean thinking, when implemented correctly, can enhance the company's competitive edge. However, to implement lean correctly, you must understand it correctly or you may do more harm to your manufacturing process than good.