

Lean - Eliminate Process Waste



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- **The world has an acute shortage of competitive, lean production capacity, but there is a glut of mass and over production.**
- **Lean companies are fast and flexible, they deliver what the customer wants, when they want it.**

Lean – ‘Eliminate Process Waste’

This article explains the evolution of lean manufacturing practices. The belief that the world faces a massive overcapacity in production is a misnomer, the reality being that the world has an acute shortage of competitive lean-production capacity and a vast glut of uncompetitive mass-production capacity.

That said, the world and particularly the automotive industry has come a long way since the days of craft production (the craft producer used highly skilled workers and simple but flexible tools to make exactly what the consumer asked for, one item at a time). However, goods produced by the craft method cost too much for people to afford and at the beginning of the twentieth century the principals of mass production were developed.

Mass-producers began to use narrowly skilled professionals to design products made by unskilled or semi-skilled workers tending expensive, single-purpose machines. These churned out standardised products in very high volume. The machinery was expensive and intolerant of disruption. In dealing with these process inefficiencies and to ensure smooth production the mass-producer added buffer stock (work in progress) and extra workers. At the expense of variety, the customer received a cheaper product. Most employees found this work tedious and dispiriting.

Today, led by Toyota, lean producers have emerged as global leaders. The lean producer combines the advantages of craft and mass production, whilst avoiding the high cost of the former and the rigidity of the latter. Lean producers set their sights explicitly on perfection: continuing to decrease costs, pursuing zero defects, zero inventories, and endless product variety.

The Rise of Lean Production

It was the Japanese who set out to change the rules of the game. By purchasing a few used American presses and endlessly experimenting from the late 1940s onward, Ohno eventually perfected his technique for quick die changes. By the late 1950s, he had reduced the time required to change dies from a day to an astonishing three minutes. He also eliminated the need for die-change specialists. In the process, he made an unexpected discovery. It actually cost less per part to make small batches of stampings than to run off enormous lots. Making small batches eliminated the carrying cost of the huge inventories of finished parts that mass-production systems required. It also caused stamping mistakes to show up almost instantly. The consequences of this latter discovery were enormous. It made those in the stamping shop much more concerned about quality, and it eliminated the waste of large numbers of defective parts – which had to be repaired at great expense, or even discarded – which were only discovered long after manufacture. But to make this system work at all, Ohno needed both an extremely skilled and a highly motivated work force. If workers failed to anticipate problems before they occurred and didn't take the initiative to devise solutions, the work of the whole factory could easily come to a halt.

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- **Ohno developed techniques to reduce the cycle time to change Dies on his machines. In the 1950's he reduced these by half.**
- **The effect was to produce in smaller batches. Small batches eliminated huge inventories.**



- Ford lacked the empowerment demonstrated by Ohno and Toyota.
- Orders issued by Ford Supervisors were expected to be followed. At Toyota workers were expected to take the initiative.
- Ohno, who visited Ford just after the war, quickly realised this whole system was rife with muda (waste).
- Ohno was convinced that assembly workers could probably do most of the functions of the specialists and do them much better because of their direct acquaintance with conditions on the line.

Ford's system assumed that assembly-line workers would perform one or two simple tasks, repetitively. The foreman did not perform assembly tasks himself but instead ensured that the line workers followed orders.

These orders or instructions were devised by the industrial engineer, who was also responsible for improving the process. Special repairmen repaired tools. Housekeepers periodically cleaned the work area. Special inspectors checked quality, and defective work, once discovered, was rectified in a rework area at the end of the line.

Since even high wages were unable to prevent double-digit absenteeism in most mass-production assembly plants, companies needed a large group of utility workers on hand to fill in for those employees who didn't show up each morning. Managers at headquarters generally graded factory management on two criteria – yield and quality. Yield was the number of cars actually produced in relation to the scheduled number. Quality was measured after vehicles with defective parts had been repaired. Factory managers knew the assigned production target had to be met at all costs. Mistakes could, if necessary, be fixed in the rework area, at the end of the line but before the cars reached the quality checker from headquarters. Therefore, it was crucial not to stop the line unless absolutely necessary. Letting cars go on down the line with a misaligned part was perfectly okay, because this type of defect could be rectified in the rework area, but minutes and cars lost to a line stoppage could only be made up with expensive overtime at the end of the shift. Ohno, who visited Detroit repeatedly just after the war, quickly realised this whole system was rife with muda (waste).

None of the specialists beyond the assembly worker were actually adding any value to the car. Ohno was convinced that assembly workers could probably do most of the functions of the specialists and do them much better because of their direct acquaintance with conditions on the line. Ohno began to experiment. The first step was to group workers into teams with a team leader rather than a foreman. The teams were given a set of assembly steps, their piece of the line, and told to work together on how best to perform the necessary operations.

The team leader would do assembly tasks as well as coordinate the team and in particular, would fill in for any absent worker. Concepts unheard of in mass-production plants. Ohno next gave the team the job of housekeeping, minor tool repair, and quality-checking. Finally, as the last step, after the teams were running smoothly, he set time aside periodically for the team to suggest ways collectively to improve the process. When it came to "rework," Ohno reasoned that the mass-production practice of passing on errors to keep the line running caused errors to multiply endlessly. Ohno placed a cord above every work station and instructed workers to stop the whole assembly line immediately if a problem emerged that they couldn't fix. Then the whole team would come over to work on the problem.

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ideas, his production line stopped all the time. However, as the work teams gained experience identifying and tracing problems to their root cause, the number of errors began to drop dramatically. Today, in Toyota plants, where every worker can stop the line, yields approach 100 percent. The line practically never stops.

This methodology and approach extended into the Supply Chain, however, Toyota did not wish to vertically integrate its suppliers into a single, large bureaucracy. Nor did it want completely independent vendors. Instead, Toyota spun its in-house supply operations off into quasi-independent first-tier supplier companies in which Toyota retained a fraction of the equity and developed similar relationships with other suppliers who had been completely independent. As the process proceeded, Toyota's first-tier suppliers acquired much of the rest of the equity in each other. Ohno developed a new way to coordinate the flow of parts within the supply system on a day-to-day basis, known as kanban.

Parts would only be produced at each previous step to supply the immediate demand of the next step. This simple idea was enormously difficult to implement in practice because it eliminated practically all inventories. When one small part of the vast production system failed, the whole system came to a stop. This was precisely the power of Ohno's idea. It removed all safety nets and focused every member of the vast production process on anticipating problems before they became serious enough to stop everything. The dealer became part of the production system as Toyota gradually stopped building cars in advance for unknown buyers and converted to a building-to-order system in which the dealer was the first step in the kanban system, sending orders for presold cars to the factory for delivery to specific customers in two to three weeks. Toyota had come to grip with the principles of lean production by the early 1960s.

Concluding Notes

Lean production should be viewed as a strategy for achieving value leadership. It goes well beyond cost cutting. Firstly, lean production dramatically raises the threshold of acceptable quality to a level that mass production cannot easily match. Secondly, lean production offers over-expanding product variety and rapid responses to changing consumer tastes, something low-wage mass production finds hard to counter except through ever lower prices. Lean production also dramatically lowers the amount of high-wage effort needed to produce a product of a given description, and it keeps reducing it through continuous incremental improvement. This means competition from low wage workers is not a threat. Finally, lean production can fully utilise automation in ways mass production cannot, further reducing the advantage of low wages.

