TRENDS IN MACHINING – LEAN MANUFACTURING

INNOVATION & DIFFERENTIATION: LEAN MANUFACTURING IN MACHINING

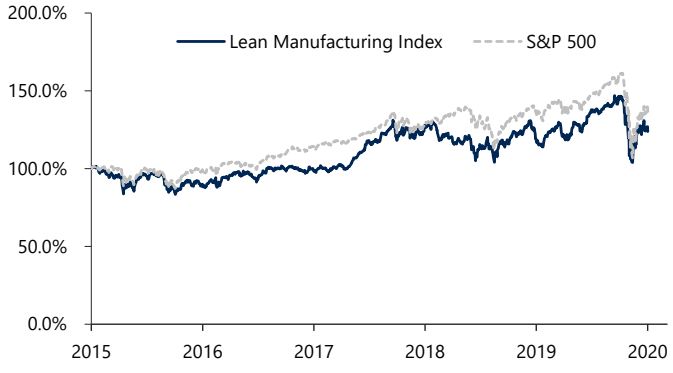
decades after being established and implemented by Toyota, lean manufacturing has become widely accepted and broadly adopted by machining operations looking to differentiate and drive value

Originally devised by automotive OEM Toyota in the 1930s ("The Toyota Way"), lean manufacturing has seen a surge in adoption in the 21st century as machining operations seek a competitive advantage in an increasingly competitive marketplace. Historically, lean manufacturing was best leveraged in a high-volume, low-mix production setting (e.g., an automotive production site); however, today, lean manufacturing has become more practicable and useful in low-volume, high-mix production settings. Whereas other differentiated production approaches (e.g., robotics and automation) leverage more advanced technology as the focal point of their execution strategy, lean manufacturing focuses instead on the manufacturing process. Key easy-to-implement lean manufacturing strategies for machining operations include:

- PRODUCT MIX SEGMENTATION: Segment parts into two categories based on program similarity: (i) highly recurring parts, which are produced in medium-to-large batch sizes and are oftentimes subject to long-term agreements and (ii) "orphan" parts, which are produced in smaller batch sizes and tend to represent one-off orders, repairs, and prototypes. Further subdividing parts based on similar sizes and required machine time helps to drive additional throughput, as does collocating machines, personnel, and support services dedicated to similar part families in defined production cells. Effective product mix segmentation should split a machine shop into two semi-autonomous production units
- ADOPT JUST-IN-TIME INVENTORY & "MAKE-TO-ORDER" SCHEDULING: Raw materials should generally be ordered only as required and delivered to the production cell that requires them. Further, finished goods should be produced to order rather than to stock, and shift scheduling should be "pull-based" and order-driven
- STREAMLINE ANCILLARY PROCESSES: Key non-machining processes, such as heat treatment, plating, coating, and inspection, can lead to longer lead times. However, some of these processes, such as inspection, can be pulled into a cell and performed on a more streamlined, continuous basis, helping to reduce and potentially eliminate bottlenecks
- INVEST IN A MULTIFUNCTION MACHINE TOOL: Consolidating key machining operations that would otherwise need to be performed via multiple processes across multiple machines into one machine can improve both production efficiency and consistency
- PRODUCT RATIONALIZATION: Perform a regular evaluation of parts to identify those parts that do not fit within the framework of a lean manufacturing approach and cull those parts from the production program. In many instances, ill-fitting parts (e.g., labor-intensive, slow-moving, multi-fixture, etc.) can be a drag on a lean manufacturer's margin. Generally, it is best to perform a rationalization activity at least annually, if not more frequently

In the context of Industry 4.0, effective implementation of a lean manufacturing program requires embracing digitization and leveraging data-driven processes. Advanced machine monitoring and predictive maintenance systems can help drive efficiency and eliminate downtime in a machining operation and their integration with a company's ERP and scheduling system is critical to connecting manufacturing operations to customer demand. Meanwhile, more advanced forms of technology, including machine learning, artificial intelligence, and big data analytics, can drive efficiencies by further streamlining processes and reducing waste. For example, data analytics can be used to "train" artificial intelligence, which can then control automated production systems. Such automated production systems can augment and support manual labor to drive efficiency, as well as replace manual labor altogether in certain situations.

STOCK PRICES: LEAN MANUFACTURING INDEX VS. S&P 500
For the Five-Years Ended May 12, 2020
% change in share price



Sources: Capital IQ, Manufacturing Global, Modern Machine Shop