From floor space utilization to quality, there's always room for improvement.

While Lean manufacturing drives a culture of efficiency, Six Sigma provides strong analytical tools as companies move beyond initial Lean manufacturing implementations. While EPIC Technologies has taken a holistic approach to Lean manufacturing, there is always room for improvement.

Over the last year, we have used Lean Sigma disciplines to improve several areas:

- Space optimization.
- Flow optimization.
- Audit preparation.
- Scrap reduction.
- 7S implementation.

Why would a company already fairly mature in terms of Lean philosophy implementation need to improve in these areas? Shifting business patterns and the technology associated with customers' products have driven a need for changes in continuous improvement focus.

Space optimization. EPIC's initial journey into Lean manufacturing over a decade ago came from a need to increase existing factory floor space. The factory re-layout and focus on minimized work-in-process freed up significant amounts of space. When additional business once again increased the need for space in its Norwalk, OH, and Juarez, Mexico, facilities, the team held a kaizen event to identify potential opportunities. The team was able to create 2,000 sq. ft. of additional space by analyzing spaghetti diagrams, modifying workstations to be shared with more products as they became more flexible, and accessing production tables from both sides instead of simply using one side. The improvement came from moving from a mindset where these work cell arrangements were dedicated to customers whose projects ran only part of a week to a more flexible use of the space. For example, if process one requires five tables and process two requires seven tables, the work cell is set up for seven tables and all tools required for either project, instead of having two work cells uniquely configured for each project.

Flow optimization. The team also looked for opportunities to minimize transport, both in terms of product movement and people movement. As part of the space optimization activity focus, opportunities for U-shaped and L-shaped work cells were identified. A test area with a significant amount of cabling was also laid out more efficiently as part of a production move, reducing both space required and process time.

Audit preparation. The improvement related to quality audit preparation was actually a

byproduct of a maturing Green Belt program. As more Green Belts are trained and deployed, they have implemented more process controls and associated data collection. As a result, data that once needed to be collected and compiled into reports as part of audit preparation are now automatically compiled as part of automated reporting.

Scrap reduction. Miniaturization and an increase in printed circuit board assembly (PCBA) complexity increases opportunities for defects, particularly with BGAs, necessitating a change in approach to process control and SPC points. The team held a kaizen event to determine the best approach. The first evaluated the top contributors to scrap and found that the problem was localized to three customers in the SMT area. ICs and BGAs were showing spikes. When a circuit failed, the previous troubleshooting process required analysis of several components. The Six Sigma team worked with the customer to better determine what failures at different points in the test indicated in terms of specific component defects. Test technicians were able to locate problem components faster.

The team also enhanced process monitoring as part of a kaizen event. The target for finished goods scrap is zero. Automated solder height monitoring has been added before placement, and AOI is inline following reflow.

In another example, an automotive customer required an enhanced sampling in conformal coating to ensure that the material had not suffered environmental degradation. In EPIC's model, if enhanced process controls are set up to meet the requirements of one program or industry, they are replicated for all programs, so this process is now used companywide.

7S. EPIC's 5S program, which focused on the disciplines of sort, set in order, shine, standardize and sustain, has been expanded to include spirit and safety. Weekly scores in these and other areas are tracked on a 1 to 10 scale. Any time an area's score drops, the 7S committee audits. Each member of the team has specific issues to inspect. Higher scoring areas get rewarded with cake and a celebration. One change in the audit process is that SWAT team is comprised of management. When 5S programs were run bottom up, corrective action took longer because people at lower levels had difficulty marshaling the resources needed to correct the issue. Having management staff involved in the audits eliminates that issue.

Continuous improvement initiatives never stop. Electronics manufacturing services (EMS) providers have even greater challenges because customers add a wider range of variability than found in traditional product manufacturing companies. There are still many opportunities for improvement in EPIC's model. Lean Sigma provides the tools for continuing that journey.

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