Competing with Tier I EMS: Software for Lean

Many EMS providers are implementing lean manufacturing to help achieve performance goals and also improve competitive advantages, customer responsiveness, and quality. Advances in software technology for manufacturing operations are meeting the challenge. The case study is presented here involves a mid-tier EMS provider deploying software solutions for lean manufacturing.

BY Bruce Isbell, Valor

Assel is a growing mid-tier EMS company headquartered near Gdansk, Poland. To achieve business development goals, Assel management concluded they must overcome the natural barriers and limitations of a mid-tier company. These limitations, including slow and redundant workflows for AOI and SMT programming and component library development, lead to sluggish customer response time and slow NPI cycles. They create barriers to successful competition with Tier I suppliers even for production volumes within Assel's manufacturing capacity.

Jaroslaw Prolejko, Assel CEO, directed investment in state-of-the-art IT as a means to accomplish three critical business goals. The company needed to significantly cut the time required to process new product introductions (NPIs); build an organization of engineers around the concept that correctly applied IT creates new gains in engineering productivity that cannot otherwise be achieved; and create competitive advantages through high knowledge and advanced skill sets developed through the application of software, which can facilitate levels of expertise in the company that are not limited by their small size.

Prolejko decided to "use IT to build a mid-tier EMS company that can compete favorably with Tier I companies on the basis of expertise, and outperform top-tier EMS providers in customer service and reaction time to customer needs." In a shrinking global economy where the batch size of production runs is decreasing, high efficiency and flexibility are viable competitive tactics.

NPI

Assel implemented an enterprise-level process engineering software and reports measurable benefits from the engineering capabilities delivered in its production-planning features. The company's production manager said that the software system became the most important engineering tool the EMS provider used. Present productivity gain is 20% after 6 May/Junes, and the company expects to achieve 50% improvement in the next 6–10 May/Junes as it rolls assembly instruction documents into the enterprise suite. Before adding lean-enabling software, Assel's typical board with 500 components, single-sided, would take an average of 7–8 hours engineering time. After implementation, the company is completing NPI in 5–6 hours and on target to drop this to 2 hours total time, from receipt of data to programs running on the line.

Product Engineering Division

Data neutralization. In this solution, all customer-supplied data formats for CAD data, Gerber files, BOM files and panelization/fabrication drawings are neutralized into one manufacturing-focused data structure. The data

structure is BOM-centric so the manufacturing data synchronizes with ERP outputs. This creates an early advantage of streamlining the data preparation process.

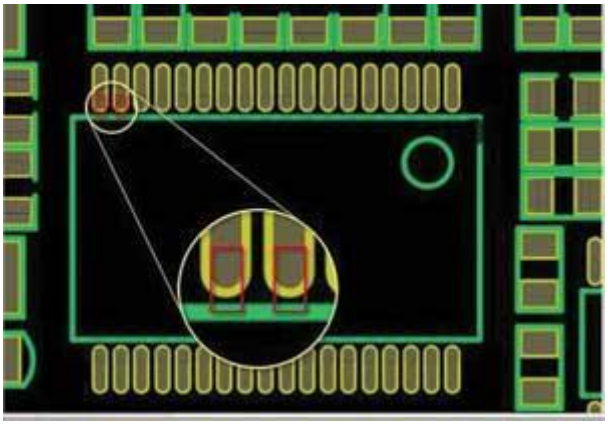

Figure 1. *A graphical view of pin-to-pad issues encountered by the process optimization software.*

Data validation. Product engineers rely on a parts library within the system to help identity BOM errors and footprint/land pattern errors quickly prior to first run (Figure 1). The actual component geometries taken from BOM part numbers are compared to the CAD footprints to validate correct pin-to-pad placement.

This type of pin-to-pad error is likely due to a component selection error in the customer BOM. Although this part can still be soldered, long-term reliability of a soldered connection with zero heel fillet is very poor. The end customer was pleased that the error was caught early in the NPI cycle. Even problems that often prove impossible to catch without software support, such as variations in the lead pitch within the land pattern, are detectable early in the process.

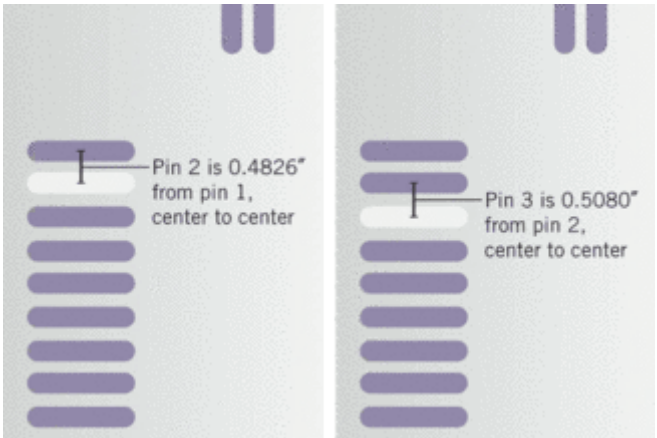

Figure 2. *Pitch variation within pads of the same component.*

Assel saved significant time by catching this example problem before poor yields and high rework requirements would have become necessary on the shop floor.

Data transfer and centralization. There are 10 engineers at Assel between product engineering and SMT divisions. Before lean software solutions were implemented, a measurable amount of time was lost due to use of multiple tools, multiple data formats, and multiple locations for data storage and retrieval. Now, all project data is

stored within a single relational database, making all information transfers streamlined and seamless. All engineers have access to complete project data at all times.

SMT Engineering Division

Virtual line simulation. As the factory grows and adds more customers, optimizing factory layout for SMT line configurations becomes crucial. Assel is gaining additional benefit from its management software deployment by simulating various line configurations and mixing this with different product volumes. The result is an accurate "what if?" simulation that lets engineers try various machine types and line configurations to find the best mix and layout to meet their needs. This is possible with accurate and user-friendly line configuration tools, line balancers, and cycle time simulators. Assel tries out a variety of machine platforms, even within the same line, before deciding on the best capital investment and layout.

AOI programming. Without the lean-initiative implementation, programming AOI equipment was time consuming and required redundant work flows. Now, since the complete product data model is prepared by the product engineering division – including fiducials, component rotations, pin centroids, body centroids, part numbers (including internal, customer, and manufacturer PNs), pin one locations, and polarity status – the product data model is sufficiently neutralized so that each different AOI platform can be quickly programmed from a single standardized output file. This is all accomplished off-line and substantially reduces the steps required to generate new programs. Due to the high quality and accuracy of the neutralized data set, the amount of program debug time also was greatly reduced.

SMT machine programming. The same benefits as described for AOI also apply to SMT placement machines, to a greater extent. Since specific line configurations and individual machine models are included in the virtual process models created by Assel, generating machine-ready programs for each machine platform is highly streamlined. Two major capabilities have provided the greatest impact on Assel's NPI productivity: auto-generation of machine library parts data and off-line program placement location and rotation validation.

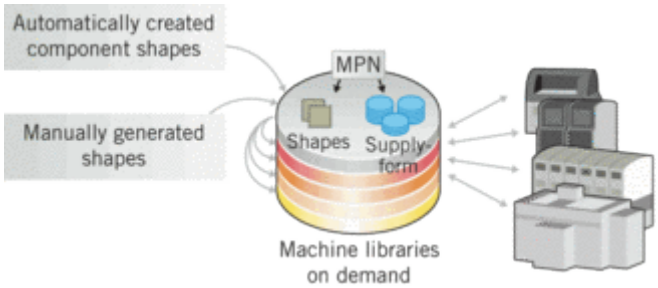

Figure 3. *AG prevents line stops or delays due to missing library data.*

Assel is taking advantage of the accurate component shape geometries imported from the its parts library, as linked to BOM data containing the manufacturers' part number, for each placement ref des location. They then use the software to automatically create generic high-level shapes for all components missing from the corresponding machines libraries in the line, for the specific machines placing that component. Using a fine-tuned rules set for each machine, the software auto-generates complete machine library parts data off-line. This optimizes line balancing. The process makes it possible to run new products quickly, as missing library data is created automatically. This capability also makes it possible for Assel to quickly move a product from one line to

another, even if the new line has no library data for the board. This production flexibility is both a competitive advantage and a means to reduce costs by improving asset utilization.

Assel's engineering group also is saving time by replacing multiple machine libraries with a single centralized library within their relational database. The auto-generation capability also saves line time that was previously required to debug incorrect or missing parts data.

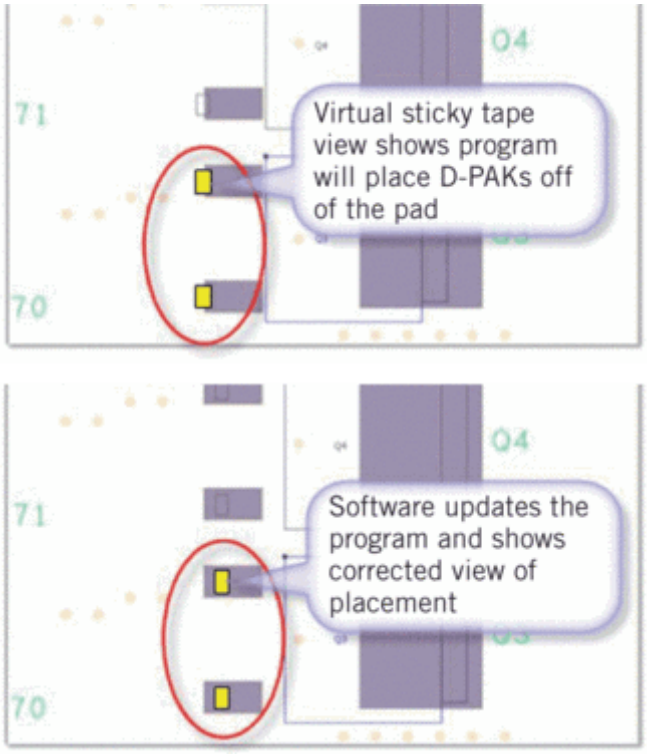

Figure 4. *VST enables error-free first-run boards.*

Before Assel's lean strategy went into effect, its engineers spent an average of 2–3 hours on the line per NPI, running a bare board with sticky tape applied so that they could verify placement positions and rotations in the machine programs. This slowed the NPI process and stopped real production on that line. Assel eliminated all sticky tape runs by adopting a virtual sticky tape function, which is run off-line in a simulation environment. This enables the engineers to find and correct any position or rotation problem and instantly output the corrected program files. Assel reports that rotation errors on first runs were completely eliminated.

Competitive Advantage

Assel improved productivity and quality by using IT software innovations. The software is helping them build a more lean NPI process. Along with working faster to complete more NPIs in less time with higher quality, Assel also improved asset utilization by cutting downtime on the SMT line. Before the new software was deployed, line production time was being consumed by nonproductive tasks (waste) like editing incorrect machine library shapes or fine-tuning machine programs to adjust component rotations or placement positions. Costs, rework, and wasted time were reduced.

The addition of lean production software creates a degree of manufacturing flexibility that was not possible before. This is due to the automation in creating new machine library shapes on demand. A product can be

moved easily from one line to another to fit changes in schedule or improve line utilization. If new programs are needed due to a line change, including new machine library shapes, the software quickly and automatically creates these, preventing wasted time or engineering resources.

Assel is using IT as means to improve overall productivity and engineering skill. Prolejko sees a higher level of expertise at the company, as well as better engineering productivity and production flexibility. The EMS provider won four accounts from larger Tier I companies now that it runs with lean-supporting software on and off the lines.

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