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Optimizing Mid-Volume Medical Products: A Case Study

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Optimizing Mid-Volume Medical Products: A Case Study

By Curtis Campbell

While the processes associated with high volume, continuous demand products are relatively easy to optimize, mid-volume projects, especially those with variable demand, are more subject to inefficiency. Both outsourcing strategy and the challenges of accommodating a changing forecast can contribute to these hidden costs. This case study looks at ways a mid-volume medical box build at SigmaTron International's Union City, CA facility has had processes optimized to eliminate common areas of inefficiency.

The project involves an electronic patient assistance device. SigmaTron builds the printed circuit board assemblies (PCBAs), assembles and tests final units; and provides warranty repair and upgrade services.

The key areas where inefficiency is minimized are:

- Overall outsourcing strategy
- Production scheduling
- Final assembly process design.

Overall Outsourcing Strategy

While mid-volume projects don't offer the same economies of scale that a high volume project would, co-locating production and repair/upgrade operations helps eliminate redundant costs that would otherwise be present.

In this example, the final assembly work cell also handles repair and upgrade operations. In some cases, units are returned in bulk shipments from the customer for a retest and software upgrade. In other cases, units are returned from the field for warranty repair, which involves troubleshooting and repair. Repaired or upgraded units have their existing serial number annotated in the database and a new serial number (traceable to the original) is issued.

Combining production and repair/upgrade enables use of the same team, test equipment, systems and inventory. That minimizes raw materials inventory and capital equipment requirements since the programming and test equipment supports both types of production activities. It also minimizes the transport that would occur if manufacturing and repair operations were handled in separate work areas. Finally, it also helps mitigate defects, since a core group of trained production operators and technicians familiar with the entire production process support the entire project.

Production Scheduling

The printed circuit board assembly (PCBA) has three separate models. The SMT area is treated as supplier that ships to a Kanban in the stockroom. The PCBAs are pulled from the Kanban and kitted as part of the top level assembly as orders are released. The SMT area is able to replenish the Kanban based on pull signals.

This arrangement helps minimize line changeovers and schedule changes that can otherwise be driven by this type of variable demand product. In replenishment mode, the SMT area is able to schedule this production more efficiently.

Final Assembly Process Design

Significant design effort has gone into the final assembly work cell to enhance efficiency, improve operator working conditions and poka-yoke or mistake proof complex operations.

The final assembly work cell handles ongoing production, as well as repair and upgrade operations. In addition to the improved resource utilization benefits previously mentioned, this also helps mitigate defects, since a core group of trained production operators and technicians familiar with the entire production process support the entire project.

The top level assembly process uses a fixture to minimize process variation and wasted motion in fan assembly which is the most complex assembly step. Most other operations are simple assembly steps. The work cell structure is a metal frame that is adjustable to facilitate ergonomics. It can be adjusted so that operators can sit or stand to perform their tasks based on their personal preference. The ergonomic element provides two benefits. First, from an operator safety standpoint it minimizes the potential of repetitive stress injuries. Second, it gives production operators more control of their working environment in a way that doesn't impact the process, enhancing workplace quality of life. The adjustable framing also makes it easy to arrange work surfaces, raw materials and work-in-process in ways that minimize clutter and foreign object damage (FOD) risk.

Programming, test and pack is an integrated operation within the work cell. This ensures serialization integrity. The serial numbers are stored in both an Excel database and SigmaTron's proprietary Tango program. The product is traceable through the serial number and the customer utilizes this information for warranty verification. Co-locating these operations also minimizes transport, motion, waiting and over processing since the operation is performed as products complete assembly in the same work cell. Co-location also eliminates the potential mix-ups that can occur when products are tested and packed in separate areas of the production floor.

Several operators in the work cell are cross-trained on similar projects enabling them to shift to other work cells if demand drops. This flexibility also adds to worker quality of life and job focus by adding some variety to production activities.

The approach outlined here represents a collaboration between the customer and the contract manufacturer where the overall outsourcing strategy enables better leveraging of economies of scale than would be possible if operations were spread over multiple suppliers. The inefficiency that would otherwise be created by variable demand is eliminated through use of Lean stocking principles at the PCBA level and production personnel cross training.

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