

TEAMING FOR OPTIMIZED SUPPLY CHAIN EFFICIENCY

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ABSTRACT

For years the electronics manufacturing services (EMS) industry has been touted as an extension of their customers' manufacturing operations. This paper focuses on the application of Lean principles in enhancing responsiveness to support variable demand requirements, while reducing overall purchasing transactions. It discusses key elements to address in initially structuring a robust finished goods kanban program and includes examples illustrating the typical benefits achieved through use of these programs.

INTRODUCTION

Cost reduction in outsourcing relationships can take many forms. A comprehensive focus on cost reduction looks at both visible costs and the hidden costs of process inefficiencies or redundant activities within the supply chain. Properly implemented, Lean manufacturing principles are a robust tool for eliminating hidden supply chain costs. Key benefits of implementing Lean principles at both the raw materials and supply chain level include:

- Reduction in raw materials and finished goods inventories
- Reduction in transactional workload
- Improved responsiveness to schedule change requests
- Better visibility into material and finished goods liability
- Improved working relationships based on joint goal setting.

This paper looks at both the benefits associated with implementation of Lean supply chain processes and key elements which must be in place to achieve those benefits.

INVENTORY REDUCTION

The most visible benefit of a Lean supply chain is the cost reduction associated with reduction in raw materials and finished goods inventories.

Achieving optimum results requires collaboration among suppliers, the EMS provider and the customer. In the MEC model, initial replenishment bin size is set based on the customer's data on historical demand and traditional lot size. Typically bin size is adjusted quarterly if demand trends change. In a stable program, bin size will typically need at least one adjustment during the first year, but usually the first adjustment of actual demand against assumptions will fine tune the system.

REDUCTION IN TRANSACTIONAL WORKLOAD

A robust replenishment system eliminates significant purchasing workload. In its purest form, it becomes an operations-to-operations based system which eliminates the need for buyers at either the EMS provider or customer to generate discrete purchase orders, do inventory counts or expedite orders.

In the Demand Pull model, a mutually agreed upon finished goods inventory kanban is stocked at the customer and replenished from an internal kanban at the EMS provider. In cases where there is a final system build, subassemblies may be stocked in an internal supermarket for rapid assembly in combination with a much smaller kanban of finished units.

Deliveries to the customer may be daily or weekly depending on customer proximity to the facility and program requirements. With local customers, EMS provider employees may count the customer's kanban inventory as part of their delivery activities and subsequently trigger replenishment. With more distant customers, consumption is monitored by the customer and replenishment is triggered by a customer email.

At the supplier level there is a Demand Pull program. Initially, a blanket purchase order with a non-binding estimated annual usage (EAU) may be used to set pricing. A standard release bucket size is developed for each component. Suppliers agree to identify non cancellable, non returnable (NCNR) inventory or other material that would fall outside the release bucket structure. The EMS provider supplies a non-binding weekly forecast with quarterly demand projections to support the suppliers' needs for enough visibility to adequately maintain their pipelines.

Agreements may vary by program, but typically suppliers agree to supply release bucket quantities within three-to-five working days and may also agree to keep a second release bucket on hand to support variations in demand. The EMS provider and the customer agree to accept liability of up to two releases depending on the stocking agreements within the program, as well as any special liability driven by unique component situations. This typically translates to a two-to-three week supply of raw material. Suppliers who support the Demand Pull program receive preferential consideration on new projects.

To reduce internal transactions at the EMS provider, bar coded cards are created for each component. When raw materials bins are depleted, a production team leader scans the card and the MRP system creates a new line on the

purchase order to receive against, which triggers a replenishment release from the supplier.

IMPROVED RESPONSIVENESS

Lean replenishment systems ensure demand trends are visible to production personnel. Bin sizing takes into account likely demand variations and allows spikes in demand to be quickly addressed with whatever safety stock has been build into bin sizing.

BETTER VISIBILITY INTO LIABILITY

The replenishment system described earlier makes it easy to understand exactly how much raw material and finished goods inventory liability any given customer has. This helps in analyzing engineering change order (ECO) impact cost and inventory consumption as products go end-of-life.

IMPROVED WORKING RELATIONSHIPS

Implementation of Lean principles tends to be a joint effort. This in turn drives a strong joint focus on continuous improvement and a culture focused on reducing non-value added activity.

In this EMS provider's model, this atmosphere has driven co-Lean events focused on analyzing a project value chain from both the customer's and the contractor's operational perspectives. The end result has been reduction of non-valued added activities in both operations.

CHALLENGES

Leaning the supply chain is not without challenges. New suppliers often balk at adjusting their preferred order quantities to customer preferred release quantities. Guarantees of preferential treatment on new projects tend to help this and as mentioned earlier, when truly necessary, exceptions can be made.

As products near end-of-life and release size shrinks, there is also some supplier concern. As products near end-of-life they are removed from the kanban system and handled separately.

CASE STUDIES

The following examples illustrate the results that have been achieved over time as Lean supply chain principles have been implemented.

Example 1 – Medical Office Equipment Manufacturer

The first project involves a manufacturer of medical office equipment. The project has 15 different assemblies, with weekly release sizes ranging between 90 to 500 units.

The EMS provider does daily deliveries and releases weekly to replenishment. Buyers are not involved in the ordering process. Finished goods are scanned when pulled from kanban at the customer. The customer's production team emails an order with a release quantity at the end of each day. The assemblies are pulled from the EMS provider's kanban and a courier system transports them to the customer

that same day. The customer holds 24 hours of inventory at their facility. The EMS provider holds a week.

Prior to Lean implementation, the EMS provider shipped finished goods quarterly. The customer's initial interest in implementing a Lean supply chain philosophy centered on inventory reduction and reduction in transactional workload. The change from quarterly to daily shipments eliminated over \$500 million in finished goods inventory.

As the customer progressed in its internal Lean implementation, there was interest in analyzing both companies' value streams and looking for ways to improve the entire process.

Improvements achieved as the result of this joint focus on co-Lean events included:

- The ordering process changed from going to the contractor's customer service department to orders placed directly with its production personnel
- The contractor moved from daily to weekly invoicing
- Annual finished goods inventory turns are approximately 20
- Raw materials inventory turns range from a 9 to as high as 29.6 depending on component.

In addition to joint teaming efforts, the EMS provider has quarterly reviews with the customer and discusses business trends and any changes to the forecast. This close level of teamwork helps ensure that project changes are proactively discussed and supported.

Example 2 – Heating Equipment Manufacturer

The second project involves a manufacturing of heating equipment for industrial and medical applications. In this case, EMS provider delivers product and handles all aspects of replenishment of stock at the customer's facility. This is feasible as the customer is within a 30 minute drive time from the contractor's facility.

The project has approximately 20 part numbers. Many of these units have a shelf life of 30-35 days due to calibration data stored in volatile memory. The customer has little sales visibility due to its build to order and distribution sales model. There is not a good forecast, but the customer is vertically integrated and can quickly respond to changes in demand.

All assemblies in the program are supported with blanket purchase orders. The assemblies are placed in sealable bins and stored on wire racks adjacent to assembly cells. The kanban is designed as a two-bin system and is sized to support approximately 10 day demand at typical run rates. The kanban sizes were negotiated with Purchasing. Once a week the EMS provider performs a milk run and counts the quantity left in kanban to determine restocking quantities. The bins are rotated on the racks to protect against loss of

calibration data. The contractor restocks bins during the next milk run.

To support short factory lead-time, the EMS provider stores one release of each model in an SMT supermarket (kanban). SMT and through-hole components required for kanban assemblies are on a Demand Pull (replenishment) program with suppliers. Replenishment is triggered in work cells with a 5-day lead-time.

Results include:

- The customer's Purchasing overhead and contractor's Customer Service overhead has been significantly reduced for order fulfillment activities
- Annualized customer inventory turns across the project average 12-15.
- Internal SMT kanbans provide flexibility to Master Scheduler when replenishment is required.
- On time delivery typically exceeds 98% and expedites for products on the program are infrequent.
- The contractor's finished goods kanban stays small
- System maintenance only requires skilled assembly Team Leaders to manage internal factory and supplier triggers.
- The milk runs give the contractor good visibility into demand trends at the customer.

CONCLUSION

A focus on implementing Lean principles within the supply chain offers both cost and productivity advantages. Schedule flexibility and teamwork are also enhanced. The end result is a strong working relationship that truly makes an EMS provider an extension of the customer's manufacturing activities.