

Lean Manufacturers Use the Visible Inventory iBin™ System to Dramatically Increase Inventory Turns

Lean manufacturers have not abandoned pull systems despite their inherent problems. They see that the benefits outweigh the downside and are constantly searching for creative ways to eliminate the obstacles. In addition, most of those practicing lean techniques see the benefits of ERP and the indispensable job it performs of integrating the many business processes that flow within an organization. Also, by utilizing current database technologies, ERP provides simple and powerful reporting as well as a common interface for all users. Which direction should manufacturers take to compete effectively? The answer lies in the marriage between ERP, with its powerful integration capabilities and Demand Flow (Pull System) technology, with its self-regulating and inventory-reducing capacity. But this union must be facilitated by real-time, continuous inventory measurement and communication.

A new study from Industry Directions, a Massachusetts-based research firm, highlights the fact that market leaders are turning to demand flow and advanced planning and scheduling techniques. The study, "Becoming Demand Driven: The Foundation for e-Business Leadership" found that 83 percent of companies identified as market leaders use these strategies. Those companies using flow techniques experienced superior results in producing to demand rates, increasing productivity up to 20%, reducing cycle times by 50%, doubling and tripling inventory turns and improving cash flow and gross margin.¹ These strategies cannot work in isolation from a company's trading partners so there has been a major push towards the integration of ERP with customer-facing CRM (Customer Relationship Management) and SCM (Supply Chain Management) software. APS (Advanced Planning and Scheduling) software will soon replace the older MRP systems that assume infinite capacity and fixed lead times. It is also possible to model a much wider range of constraints with APS.

Supply Chain Management Requires New Tools

Driven by the revolutionary effects of the Internet, companies are spending much effort on the front end (CRM) of the e-business process by allowing customers to order directly over the Web. Now, the back office processes responsible for order fulfillment (SCM) are under increasing pressure. Compared to traditional methods of ordering from distribution stocking centers, e-business customers demand customized orders and faster responses as well as the ability to make last minute changes. They want product in the configuration they want, when they want it and in the same time as if it were in stock. The result is potential chaos in production schedules, supply chain coordination and distribution. Fulfillment execution systems need to be reliable, highly visible and real-time. Alice Greene of *Industry Directions* says it nicely. "As more businesses move into the fast-paced, high mix flow of goods to lean organizations and Web-site customers, they require systems that address the need for considerable flexibility, line item visibility, real-time adjustment to constraints, and same day exception resolution. They also require product movement visibility anywhere in the supply chain. Internet ordering steps up the volume and mix for distribution facilities and drives the need for even greater real-time information exchange..."²

This attention on the supply chain is highly warranted since a large organization can include thousands of vendors in several tiers. Communication of demand changes through these layers is relatively slow so each tier tends to accumulate buffer inventory to cope. Internet Trading Exchanges are beginning to develop to expedite the communication process throughout the supply web. Possibilities such as exploding BOM requirements and generating RFQ's and P/O's immediately through the chain will save enormous amounts of time, resulting in less buffer inventory requirements. The tight connections made by the exchange would form a virtual enterprise or, to coin a phrase from Pete Janak of *Information Week* magazine, an electronic *keiretsu*.³ These Internet trading exchanges, which are sometimes called "e-plexes", are rapidly becoming the chosen method of bringing buyers and sellers together. Savvy organizations are starting to use these channels to facilitate the real-time transfer of information, money and goods. There's a frenzy of activity in this area and many established exchanges such as PlasticsNet, Chemdex, Broadlane Inc, TradeMatrix, FreightWise Inc, and Commerce One's MarketSite Portal prove the viability of this medium. Daimler-Chrysler, Ford and General Motors have recently launched an enormous effort to drive their material purchases as well as their suppliers through a single online exchange. As you would expect, ERP and procurement software vendors are seeing the power of these online exchanges and are beginning to develop "hooks" into these channels, or in the case of SAP, creating their own marketplaces. It is becoming very evident that companies don't compete with companies anymore – it will be supply chain against supply chain.

For plant floor execution, leading manufacturers are choosing demand flow strategies or APS systems. ERP systems with APS modules can accomplish great feats if the operations are modeled correctly in great detail and frequency. Inevitably, modeling accurate forecasts and work schedules leads, in the most part, to erroneous results in this world of rapid changes. MPS forecasts are still a best guess. Move tickets are not transacted, scrap quantities and completion quantities are entered incorrectly. Parts are improperly received. Bill of Materials are not kept up to date. Work center capacities are not updated frequently enough. Parts are stolen from point-of-use locations. The list goes on and on and the end result is inaccurate inventory, improper costing, excessive WIP and Finished Goods, missed schedules and upset customers. To make matters worse, manufacturers in the Internet age must be able to react quickly to daily, if not hourly, changes in what product, configuration and quantity to produce. If the ERP system thinks that there are 5 parts in Bin A then all schedules, purchase orders and available-to-promise quotes are reflective of that number. If there are, in fact, only 4 parts in Bin A then some customers are not going to get their parts on time. Again, in the Internet age, this can be a fatal mistake. Anyone who has spent time on the manufacturing floor knows the accuracy problems with production schedules. There are many variables that can effect order scheduling such as machine and operator variability, part count accuracy, quality problems and demand variability. The effect usually shows up in increased WIP and Finished Goods or more commonly as shortages. ERP systems have attempted to correct these problems by providing more specialized software such as MRP, APS, Inventory Control, Forecasting and Capacity Planning modules. Unfortunately, there hasn't been much success in controlling WIP and scheduling with these techniques because these solutions are neither real-time nor continuously physically corroborated.

Flow Manufacturing

Lean Manufacturing deals with these issues and reduces WIP by controlling the shop floor scheduling with Kanban and smoothing out near-term demand forecasts to create as close to one piece flow as possible. A pull system like Kanban regulates the amount of WIP in the process through visual or other signal-based messages and has proven time and time again to be superior to ERP techniques for work scheduling in standardized product manufacturing environments . Problems do occur as companies approach one piece flow and more frequent work order transactions. To deal with these obstacles, frequent back flushing is introduced to accelerate the work order completion transactions and inventory is moved to the point of use to avoid work order issues. Everything is great until the first cycle count of the point-of-use stock is attempted because back flushing is 100% dependent on B.O.M. and inventory accuracy. Then there is the time lag problem between the actual work completion (actual inventory consumption) and the back flush transaction (system updated inventory consumption). At best, this time frame is measured in hours and in some cases, could be days. But as WIP is decreased, minimum levels for components decrease to small amounts, which require frequent replenishment from suppliers and supporting work centers. If the Kanban mechanism is an electronic signal from the ERP inventory module, the time lag will cause a delay in the signal which in turn, results in a shortage.

Another common obstacle in a back flush environment is how to reconcile the delta between the back flushed quantities and the cycle counted actual levels. Some organizations use an Activity Based Costing methodology to allocate the differences to other accounts based on cost drivers in the company. Still others use an 80/20 approach and charge off to accounts like Scrap, Variance or Engineering. Either way, the reconciliation is accomplished against a manual cycle count, which may or may not be correct. In addition, completed assemblies must be back flushed before the cycle count occurs to avoid "cycling down" components in stock that are actually in WIP assemblies.

The iBin System

A promising new product called the iBin™ from Visible Inventory corrects the accuracy and time lag problems seen in Kanban environments while at the same time, electronically communicates real-time, accurate data back to the ERP system. The product is based on a patent-pending accurate weight technology that communicates the quantities of each bin via RF in real time. The software is easily loaded on a Windows 2000/XP client where item quantities can be viewed by individual bin or in summary. This information can also be posted to an Intranet or the Internet.

Using iBin on a flow line

An example of how the iBin™ system could be used in a demand flow environment might go as follows:

- Daily orders and near-term “forecasts” are exploded in the ERP system. The resulting schedules are smoothed out as necessary for a demand flow environment.
- Supplier contracts and blanket orders are created or updated based on the smoothed demand schedule.
- Minimum and maximum levels in the iBin software would be updated electronically based on business rules and the same smoothed demand schedule.
- As parts in individual bins trigger the minimum levels, a file in the iBin system is updated. An electronic report is e-mailed daily (or more often if desired) to each vendor that has been affected. The report is a release authorization showing the quantity (maximum minus on-hand) that he is allowed to ship. To generate a real-time position, the information is posted continuously on an Internet Exchange in which the company’s supply chain participates.
- At the supplier’s site, B2B (Business-to-Business) software gleans this information from the Exchange and creates a demand in their ERP system. Invoices are generated automatically from the usage data.
- When the parts arrive at the manufacturer, they are placed directly in the bin/container. Typically, for lean manufacturers, there is only one supplier for the item and the iBin software knows the primary vendor for this item. The software then communicates the increase in quantity to the ERP system as a receipt to the next open line on the supplier’s blanket/contract order. If another vendor supplied the item, iBin allows the Receiver to override the primary and enter the secondary vendor number. The ERP system would then receive the increase to the secondary vendor’s open order.
- During the process of manufacture, component levels can decrease for reasons other than assembly consumption. Visible Inventory allows its users to consume inventory at the bin level to customer-configured accounts such as scrap, engineering use, or pilferage.
- After the completion of an assembly, a back flushing transaction is completed in the ERP system. This is an efficient method of moving assemblies and their associated costs between WIP and Finished Goods and in one fell swoop, reduces the inventory levels of all components. At this point, a component inventory level report from the iBin system could be electronically compared to the ERP system levels. Discrepancies would be allocated via inventory adjustments to chosen accounts based on cost driver analysis.
- Communicating component revision changes and obsolescence can be managed at the item level in the Visible Inventory software. The item would be marked as “halted” and the release report will communicate that message immediately to the supplier. Many ERP systems offer this feature in their item master files as well as through their “effectivity date” functionality. The iBin system can be integrated to read this information and act on it through the component release report.

Benefits

- Large reductions in WIP inventory due to the accuracy and real-time execution of the iBin system.
- Elimination of manual setting of kanban levels because iBin uploads new minimum and maximum levels after each MPS/MRP regeneration.
- Immediate communication to suppliers and supporting work centers of inventory level changes. There is no longer a lag time between actual usage and back flushing.
- Elimination of purchase order receipts and all of its associated labor.
- Improved costing due to greatly improved inventory accuracy and timing.
- Reductions in obsolete inventory and rework as a result of the “halt” and “effectivity date” capability of the iBin system.

Using iBin in a Consignment Inventory Arrangement - A Customer’s perspective

Consignment inventory has been gaining in popularity as lean manufacturers are redefining their core competencies. Some are finding that managing inventory is not one of them and have “out-sourced” this function to their suppliers. As WIP inventories decrease, companies need to decrease their “inventory risk” by increasing their parts visibility and supply assurance. ERP systems, with their inherent time lag and data entry issues only expound the problem. John Toomey, President of Visible Inventory, highlights this concern: *“The total inventory measurement and communications cycle-time within ERP, even in lean enterprises, is inevitably too long. Temporal inaccuracies make it nearly impossible to avoid shortages (or overstocks!) without real-time, continuous data communication, such as provided by Visible Inventory systems.”* By presenting real-time and accurate inventory levels to suppliers, manufacturers using the iBin system are assured of the full potential of a consignment inventory arrangement.

One possible Visible Inventory consignment process scenario might be deployed as follows:

- In a consignment inventory environment, the customer does not take control of the inventory until it is used in WIP. Since an on-hand balance will never be shown in the ERP system, only net decreases (usage less returns) in the item count are used to effect transactions. An efficient way to update Purchase Order Receipt files would be to accumulate a set period (i.e. one day) of decreases and apply them to the open lines on the primary vendor's P/O.
- Minimum and maximum levels in the iBin software are updated electronically based on business rules and information from sales order and forecasting explosions.
- As before, parts in individual bins trigger the minimum levels. The iBin system e-mails the release authorization reports to each vendor that has been affected. Again, to generate a real-time position, the information can be posted continuously on an Internet Exchange in which the company's supply chain participates.
- At the supplier's site, B2B (Business-to-Business) software uses this information from the Exchange and creates a demand in their ERP system. Invoices are generated from the Purchase Order Receipt file accumulation previously discussed.
- When the parts arrive at the manufacturer, they are placed directly in the bin/container. No ERP transactions are necessary.
- Communicating component revision changes and obsolescence is managed at the item level in the Visible Inventory software. As previously discussed, the item is marked as "halted" and the release report will communicate that message immediately to the supplier. Many ERP systems offer this feature in their item master files as well as through their "effectivity date" functionality. The iBin system can be integrated to read this information and act on it through the component release report.

The benefits to the customer of using iBin for consignment inventory include:

- Reduction in shortages due to immediate communication to suppliers of inventory level changes. There is no longer a lag time between actual usage and bin auditing.
- Elimination of manual setting of kanban levels because iBin uploads new minimum and maximum levels after each MPS/MRP regeneration.
- Elimination of purchase order receipts and all of its associated labor.
- Reduction in obsolete inventory due to the "halt" functionality in the iBin system.

Using iBin in a Consignment Inventory Arrangement - A Supplier's perspective

Consignment of inventory has been a virtual no-brainer for the customer but has created new problems for the supplier. They have had to assume additional overhead in the form of breadmen to refill bins and document inventory usage at the customer site. Receiving personnel at the customer site must manually enter the receipts into the ERP system to enable the customer to pay for the invoiced components. There always seems to be discrepancies between reported usage and the vendor's invoice. The "temporal inaccuracies" caused by the time delta between inventory usage and supplier breadman visits can be very large in a consignment environment. Suppliers understand that they must now provide a total inventory replenishment service and not just parts. They need to assure timely supply at a competitive price without increasing their buffer inventories. This typically equates to more frequent deliveries and bin audits.

A supplier might use iBin in the following process:

- Net decreases (usage less returns) in the item count are used to update Purchase Order Receipt files in the customer's ERP system. The iBin system would accumulate a set period (i.e. one day) of decreases and apply them to the open lines on the primary vendor's P/O.
- Parts in individual bins trigger the minimum levels. The iBin system e-mails or posts the release authorization reports to a participating Internet Exchange.
- At the supplier's site, B2B (Business-to-Business) software uses this information from the Exchange and creates a demand in their ERP system. Invoices are generated from the Purchase Order Receipt file accumulation previously discussed.

- When the parts arrive at the manufacturer, they are placed directly in the bin/container with no ERP transactions necessary.
- Communicating component revision changes and obsolescence is managed at the item level in the Visible Inventory software. As previously discussed, the item is marked as “halted” and the release report will communicate that message immediately to the supplier. If an Internet Exchange is utilized, the message can immediately update existing sales order shipment schedules and open purchase orders in the supplier’s ERP system.

The benefits to the supplier include:

- Elimination of overhead required to audit and reconcile inventory usage.
- Reductions in obsolete inventory and rework as a result of the “halt” and “effectivity date” capability of the iBin system.
- Reductions in ERP entry transactions such as invoice generation and sales order changes due to the digital nature of the iBin data.
- Greatly improved customer service as a result of the automated, immediate and accurate recognition of inventory levels.

Using iBin in an MRO Supply Environment

In addition to the demand flow and consignment scenarios, an obvious application for the iBin is in an MRO (Maintenance, Repair, Operations) supply system. Individual minimum and maximum levels could be set for each item and the release report could be continuously posted to one of the many MRO services that exist today. There would no longer be a need for bread men to visit manufacturers and the supplier would see demand fluctuations instantly. As an added bonus, usage history can easily be retrieved from the Visible Inventory system. This information has traditionally been hard to come by as MRO items are typically expensed and are not included on bill of materials.

Visible Inventory Facilitates Demand Flow Execution

Overall, the iBin system is a powerful tool that enables efficient, timely and accurate execution of demand flow manufacturing. It addresses the need for real-time information in the internet-driven supply chains of today and tomorrow. The accuracy of the patent-pending Visible Inventory technology is critical for the low, buffer-reducing inventories of leading lean manufacturing companies. Suppliers benefit through overhead and transaction reduction and of course, through greatly improved service to their customers.

References:

Dave Turbide, “Best Practices: Manufacturing Systems”, *Supply Chain Technology News*, March 2000.

Brian Johnson, “Taking the First e-Step”, *Midrange ERP*, February 2000.

Jeffrey K. Liker, *Becoming Lean*, Productivity Inc, 1998.

¹ Roberto Michel, “Demand Driven, Plant-Focused”, *Manufacturing Systems*, March 2000.

² Alice Greene, “E-fulfillment: More than self-serve”, *Manufacturing Systems*, March 2000.

³ Pete Janak, “Tighten the Supply Chain”, *InformationWeek*, March 6, 2000.