Making ERP Work In a Lean Manufacturing Environment

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Objective

The objective of this session is to present a framework for ensuring Enterprise Resource Planning (ERP) success in a company that has implemented (or will implement) Lean Manufacturing. The presentation will include: 1) a brief overview of Lean Manufacturing, 2) a brief overview of ERP, and 3) specific treatment of several system related management practices including sales and operations planning, bills of material and routings, rate based and due date driven order management, data organization, minimizing transactions, scheduling and material planning issues, and point-of-use material storage.

Background

Significant changes in factory operations during the past two decades driven largely by Just-In-Time (JIT) Manufacturing and Lean Manufacturing practices have necessitated significant changes in the supporting business systems and management practices. Companies that have successfully eliminated waste, reduced inventory, and shortened throughput times in parallel with complementary system and management practices have realized the best opportunities for lowering cost. In these environments, information is taken directly from the system without spreadsheet post processing, unnecessary work has been eliminated, headcouts are minimized, simplification is the mindset, and response is fast. Interestingly, many simple practices of yesteryear such as visual boards, card systems, and verbal communication are resurfacing as the thing to do!

However, many have ignored systems and practices, or worse yet, have implemented systems and practices “1970’s style” while trying to run the factory “2000’s style”. The result is higher cost through unnecessary work, side systems to post process information, too many people in the process, slow response for making decisions, and operational confusion.

The following topical discussions are intended to help companies recognize opportunities for properly setting up ERP systems and changing management practices to have the best possible chance for lowering costs and speeding up decision making.

Lean Manufacturing

The following is offered as a quick definitional overview of Lean Manufacturing. Essentially, Lean Manufacturing builds upon the teachings of Just-In-Time

Manufacturing that we have all been studying for the past 20 years. In the book Lean Thinking by James P. Womack and Daniel T. Jones, Lean Manufacturing is explained in five steps:

1. Value This is the activity of systematically determining what products and/or services the customer is willing to pay for … and at what price.

2. Value Stream These are the activities, tasks, information flows, and/or production steps required to provide the specified value.

3. Flow This is the activity of physically arranging the value stream steps to flow quickly. It often requires a complete rethinking of the traditional "functional" world by dissolving departmental walls and co-locating resources. Only value-adding steps should be included in the flow while cost-adding steps should be eliminated.

4. Pull The progression of steps in the value stream must be triggered by "downstream" steps and not "upstream" steps. In this way, a step will not be executed until the subsequent step is ready. All steps in the process become synchronized, loss-to-balance is readily identified, and additional waste is more easily identified and eliminated.

5. Perfection The "Lean" environment created by the first four steps will continue to work better as waste is continuously eliminated from the process.

Enterprise Resource Planning

Enterprise Resource Planning is an enterprise-wide information system that describes the next (current) generation of fully integrated and functionally complete manufacturing software products. It potentially includes demand management, production management, distribution management, EDI, electronic commerce, supply chain management, product data management, warehouse management, transportation planning, human resources, and others.

Sales and Operations Planning

The objective of Sales and Operations Planning (S&OP) is to balance demand and supply on a regular and formal basis, and to provide top management's handle on the business. One of the major outputs of this process is to specify run rates by manufacturing cell or line as a function of bookings, backlog, shipments, and inventory levels. Since Lean Manufacturing implementations generally result in organized value streams which appear as cells or lines in the factory, it is critical that the S&OP process be organized in terms that match the physical arrangement of the factory. This minimizes the need for subjective interpretation and post manipulation of the S&OP

information, and it enables S&OP output to be entered into the ERP system for forward planning in the simplest way.

Checklist #1: Ensure that S&OP line run rates align with the physical organization of the factory.

Rate Based and Due Date Driven Order Management

All companies are interested in doing the best job possible in shipping on-time to the customer, and this always starts by making a good shipment promise at the time of order entry. Traditionally, many systems have been written to provide "available-to-promise" information based in inventory availability for individual SKU's. However, in a Lean Manufacturing environment where throughput times are very short in the factory, promising capacity is a much more critical issue than promising inventory. The capacity-to-promise is established in the S&OP process and expressed as a line run rate. The order entry activity simply books orders against this line rate for end items that run on that line, and the priority (position on the line) is set by the due date given to the order. This is what we call being "rate based and due date driven". This works for customer orders on the line as well as finished goods replenishment schedules.

Checklist #2: In a Lean Manufacturing environment, ensure that the system and practices are set up to deal with capacity at the line rate level, not inventory at the SKU level.

Master Scheduling

The concept of master scheduling changes significantly in a Lean Manufacturing environment. Traditionally, the master schedule contains quantities to be produced by SKU through a 6-12 month planning horizon. The thought driving this was the needed to provide materials, capacity, and order promising visibility. However, short factory throughput times require that the master schedule only exist at the SKU level through the factory throughput time … usually a few days at most. The balance of the material, capacity and order promising visibility is handled via the line rate established in the S&OP process. This technique reduces the number of MPS entries by over 90% in many cases.

The job of the master scheduler changes also. Where we once thought that the job was to ensure the schedule was produced, the job really is to ensure the schedule detail in the short term totals up to the S&OP specified line rate. Additionally, the schedule should be material checked and dates validated to ensure it is fit-for-use for production.

Checklist #3: Schedule detailed SKU's only through manufacturing throughput time and beyond that use line rates for driving material plans and order promising.

Material Planning

Before little “MRP” (material requirements planning) most material planing was done using one of many order point systems … and many of these were visual. When MRP surfaced on the 1960’s and 1970’s, many thought that all materials (purchased and manufactured) must be planned with MRP. This has created quite a bit of confusion, paperwork, and slow response in the material planning practice area. It also required the planner to essentially spend equal time on the low dollar and high dollar items.

Today, MRP is being used as a planning tool for long lead-time high dollar purchased parts, and visual order point based systems are being used for the low dollar short lead-time parts. This removes 90% or more of the parts from the MRP planing process. The result is that the order point parts bypass the planner’s desk once they are set up on a visual system. Planners now devote most of their time to the high dollar items that matter, and only tend to the order point items when a significant rate change orders or an engineering change is implemented. The planner’s job has changed from tending to MRP output to a balance of MRP and visual systems.

Checklist #4: Use MRP for high dollar long lead-time purchased parts. Use visual systems for low dollar short lead-time purchased parts and all fabricated parts.

Material Replenishment

The ERP system has the ability to provide MRP “take action” messages to trigger replenishment action for each and every stock and non-stock part. In this method, planners must go through these action messages page-by-page … low dollar and high dollar items. This is the “execution” part of replenishment, and results in a purchase order for purchased parts and a work order for make parts.

To compliment the simplified material “planning” method described above, an equally simple “execution” method must be used. In a Lean Manufacturing environment, this is generally some type of kanban … a visual system. Kanban systems are usually either based on one-bin, two-bin, or multi-bin systems. The signal can be in the form of empty containers, cards, pre-made lists, on-condition lists, or other methods. Accountability for the kanban replenishment can be a shop operator, a designated materials person with charter part accountability for specific parts, or a supplier person in a supplier managed inventory situation. Once the kanban is enacted, it can be communicated via physical movement of the kanban device, bar codes, faxban, or other means. Kanban replenishment is best suited for the “trivial many” parts … low dollar short lead-time. And sometimes, high dollar long lead-time parts that are MRP planned are replenished using kanban.

To make this transition, two very important practice changes must occur:

1. The decision to replenish changes from a planner to a person on the shop floor.

2. The authorization to replenish changes from a purchase order or work order to a kanban signal.

Checklist #5: Move 90% of parts replenishment from “take action” messages to visual kanban.

Bills of Material

Based on the simplified scheduling and material planning practices stated above, a planning bill of material is required for providing material forward visibility as a function of the line rate. This is a different planning bill than has been traditionally taught. Rather than taking a product family and assigning percentages to establish the SKU mix, this new type of planning bill takes the line rate and assigns percentage mix to the materials required for the line. It only contains the items that are to be MRP planned … the long lead-time high dollar parts.

Checklist #6: Establish planning bills of material suitable for attaching to the line rate as specified in the S&OP process.

Routings and Operational Schedules

Traditional thinking suggests that each step in the production process for a specific part has all the manufacturing steps listed to produce the part. It is common for each of these parts to have ten or more steps in the “routing” document, and for each step to carry an operational due date. In a top level assembly having 20 manufactured parts, 200 system schedules (communicated via the daily dispatch list) and transactions to complete production are possible. In a Lean Manufacturing environment, this mass of schedules and transactions would significantly slow throughput time, and thus be a cost adding activity.

In a Lean Manufacturing environment where the entire product is built on a line (quite likely with feeder lines), the routing could ultimately be simplified to one step … “build end item xyz”. This routing step is structured to the end item. For each of the parts, stationized planning provides the detail on how to build the components, and internal kanbans set their schedules. The only due date is for the end item, and is consistent with the rate based and due date driven practice previously mentioned. Here, transactions are reduced from 200 to one!

A compromise would be to reduce all of the components and assemblies to one step routings plus one for the end item. Even this step will reduce schedules and transactions by over 90%.

Checklist #7: Reduce routing steps to one. Reduce routings to one. Reduce schedule transactions to one.

Point-of-Use Storage

Traditional systems of inventory control encourage fenced stockrooms that require a transaction to move material in or out. The factory stockroom was centralized and contained purchased parts plus manufactured parts/subassemblies moving in and out as work orders opened and closed in the march up the product structure to produce an end item. It was often believed that this type of control would facilitate inventory record accuracy and enable proper MRP planning. This practice resulted in many transactions, much material movement, and too much inventory.

Lean thinking encourages us to minimize the movement and eliminate the transactions. This is best accomplished, in part, by taking the material directly to the point-of-use. For example, when material is received, it is taken directly to the line where it is used. If it cannot be accommodated at the workstation, it is positioned in a “one-off” location very close to the workstation. The operator then replenishes their workstation from this point-of-use position.

Similarly, fabricated parts should also be moved directly to the point-of-use and not be moved in and out of stores. The result is the elimination of considerable material movement and transactions.

Checklist #8: Dismantle the central stockroom and position all material at the point-of-use.

Transactions

Many ERP type systems can be very transaction intense … and as we all know transactions only add cost, not value. In this brief discussion, the ultimate simplification of inventory transactions in a Lean Manufacturing factory is addressed.

Traditionally, inventory is transacted every time it is moved … mainly operation to operation, and in and out of stores. This could amount to hundreds of transactions to make an end item. In a factory where long throughput times exist, planners may feel the need to know where the parts are located to help make planning decisions.

In a Lean Manufacturing environment, the parts move so fast that there is little (if any) need to know where they are in process. The only useful information is whether or not the end item is done!

In this simple transaction model, an argument can easily be made for only four transactions:

1. Material received on the dock.

2. Production completed for the end item (components are backflushed to the bottom of the bill of material).

3. Finished items shipped to the customer.

4. Scrap that is removed from the factory.

All other transactions are eliminated. This does, at times, test the thinking of the accountants who must keep the balance sheet valid. And it does make inventory accuracy a bit of a challenge. But when most parts are on visual replenishment, the need for accuracy is diminished. And if these four transactions are executed to perfection, the total amount of inventory within the four walls of the building will be correct!

Checklist #9: Simplify the transaction model to four transactions for in-plant material movement (or as close as you can get to four).

Data Organization for Cellular Manufacturing

One of the most serious flaws in ERP implementations is not properly coding data so information can be easily extracted. For example, it is common for each end item to carry a "product code" which forms the basis for S&OP reporting. However, sales people and manufacturing people think in different ways … sales people in terms of product/market groupings and manufacturing people in terms of where the products are run in the factory. It makes sense then for end items to carry TWO codes … one for sales and the other for manufacturing.

Other questions that will be asked go something like this for component parts:

1. What items are required for line B?

2. Of these items, which are MRP planned and which are order point?

3. Of the order point items, which are kanban?

4. Which are manufactured? Purchased?

5. Which parts is John the "charter part accountable" person?

6. Which parts are "stock" and which ones are purchased or made only when an order exists?

In other words, John might make a reasonable request like: "Give me a list of parts for line B that are my kanban replenished parts". Can the ERP system do this? It is really

unfortunate when a company spends a seven or eight digit number on a system, and then can't answer the first simple question!

Checklist #10: Make a strategic well thought out plan on how to code items so that the user questions and requests can be answered.

In Summary

In today's world class manufacturing companies, you can benefit from BOTH Lean Manufacturing and ERP. Lean Manufacturing helps simplify production execution while ERP handles the data/information used to plan and manage the business. They work together. It's not one or the other … it is BOTH! The important thing to remember is that the ERP system must be set-up to work in a Lean Manufacturing environment. Where companies get frustrated and blame the "rotten system" is when steps like those listed above are not taken. In this case, the system is set up traditionally and the factory is setup lean … you have a big disconnected problem.

What is your situation? What are you going to do about it?

J. E. Boyer Company, Inc. integrates lean manufacturing with enterprise resource planning to create world-class manufacturing environments where these two improvement strategies work together. We work on-site at your company. We do classroom training, one-on-one coaching, and project work … individually or as part of a team. We work at all levels of the organization from the boardroom to the stockroom! Since 1984, clients from a wide variety of industries have improved their operations in terms of cost management, on-time shipments, inventory investment, people development, operational speed, and overall business performance.

More information is available at: www.jeboyer.com

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