Can MRP and Lean Co-exist?

In the first part of this two-part series, we covered the theory and reality of both MRP (Material Requirements Planning) and lean manufacturing. We also discussed how MRP functions in various contexts, along with tips on how to make it resemble, or at least support, lean processes. Those tips included system parameter settings in the item master file, the use of backflushing, and simplification of the routings. The last two tricks help reduce the number of transactions that must be processed in your MRP system.

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In Part 2, we take you further along in making your MRP system and business processes support lean processes on the factory floor. CAUTION: this article provides some guidance for key part management, but there is a lot of material and information available. Not everyone will agree with some of the material presented here, and not all of it will apply to every situation. The best way to take advantage of the tips and tricks provided in these two articles is to experiment with a single flow line or sample of parts and work out the kinks.

PFEP – Plan For Every Part

The starting point is to have a plan for every part. What is it? How many do I use in a given time period? How much effort must I expend to manage it? What is the storage unit size? These are but a few of the myriad factors to consider.

Let us start at the beginning by asking some key questions:

Do I Need to Manage This Part?

Many firms make and stock subassemblies, but as companies implement lean processes, the need to maintain this practice is starting to disappear. With process improvement or changes to flow, it may be possible to transform directly from components to a finished good, and the system should reflect that change. The way to go about it depends on the features of your software and the sophistication of your users, but here are two options for moving away from stocking subassemblies (Table1).

"Phantom" items, and their BOMs, are not supported by all MRP systems. This is a special item category for which MRP will skip, or blow through, the item to plan the components. Some systems will check for inventory of the phantom and consume it before exploding the components.

Both these options mean fewer work orders and fewer transactions to process.

	"As-is" Stocked Item	Option 1 "Phantom" Item	Option 2 Eliminate item
Item record	Yes	Yes	No
BOM entry	Yes	Yes	No
Stocked	Yes	No	No
Benefits		• Fewer production orders • Fewer system transactions • Visible on indented BOM	• Fewer production orders • Fewer system transactions • Reduced item records • Reduced BOM records
Trade-offs			More BOM maintenance if highly common part

Table 1.

The benefit of the phantom item option is in terms of bill of material (BOM) maintenance. Let us look at the case of a simple replacement of a fastener in a subassembly. If the subassembly is common to many finished goods, then a swap only needs to be made to the BOM of the phantom item for it to be reflected in all the next higher assemblies. If the item is eliminated entirely (option 2), then the fastener change needs to be replicated in all affected higher-level goods.

Do I Need to Manage This In MRP?

This question brings us back to the A-B-C's. Parts can be classified using the Pareto Principle based on item cost, annual quantity usage, or annual dollar value usage. At the end of the day, we want to focus our management efforts on the "A" items, with less effort on "B", and even less on "C" items. Most firms would choose to use their MRP system to leverage its most advanced planning features for the A's. As we move to the lower classes, one may choose simpler tools and less frequent intervention. The choice really depends on the daily volume and level of lean maturity. We can still mimic lean for all these cases, but it is simpler overall, in terms of transactions and reporting systems, for items not using full MRP logic (Table 2).

Do I Need This Part in the BOM?

Let us look at class "C" and even "D" items. If these items are low value and high volume, many companies may consider them to be consumables, removing them from the BOM and treating them as a shop supply. Removing items from the BOM means fewer MRP messages to manage, but it also necessitates keeping a sharp eye on inventory. In addition, consumables, or expense items, will no longer appear in the finished item cost. Most firms will build this cost into an overhead rate on labor, material, or process time. Examples of parts considered expense items can be fasteners, adhesives, and packaging. The real benefit is in managing these items entirely with simple Kanban, or 2-bin, approach with minimal ERP system recording. These inventory management systems are well described elsewhere and won't be covered in detail in this article.

Item Parameters and Data Elements for Your PFEP

Whether we use MRP, ROP/EOQ, or pure Kanban signals, we must define key operating parameters, or data elements, for the chosen inventory management technique to work. Some of those parameters affect all three approaches and others only some. We covered a few key parameters in Part One, mostly with respect to item profile settings of the finished goods. In general, we are trying to balance order quantity with consumption while reflecting the supplier's package sizes and lead times. We can use the same approach internally for manufactured items by matching periodic consumption, transport capability, and storage constraints. We want to get away from the old mentality of large lots to offset set-up times. This is why a big focus of lean efforts is directed to set-up reduction (a subject for another article).

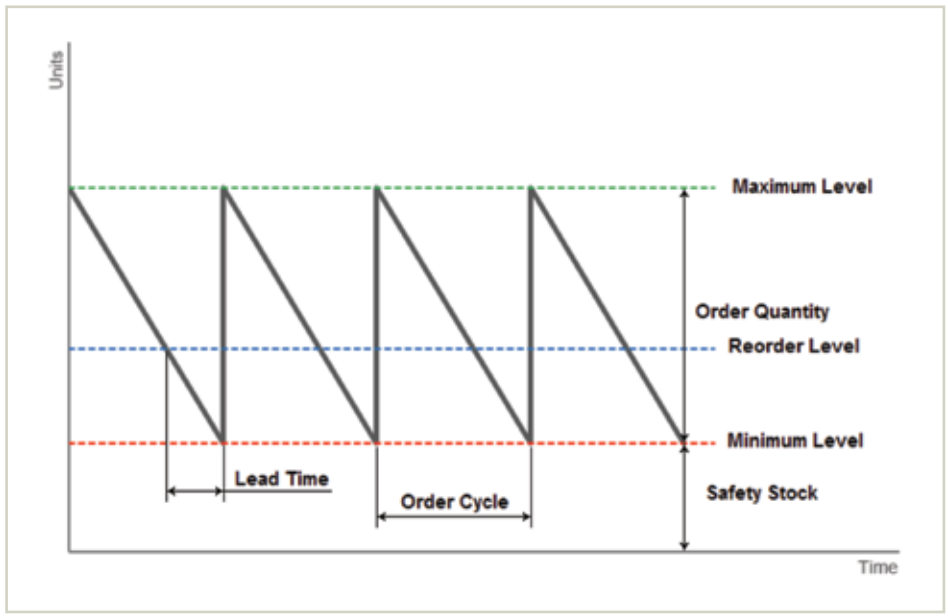
Example of a Class "B Item

Let's consider an item with regular consumption of 1,000 units per week. After consulting with the supplier, we learn the following – the minimum order is 250 pieces, they pack 50 pieces per box, and then place 10 boxes into a master pack. They also place 10 master packs on a pallet due to the weight. This means a single pallet contains 5,000 units.

Based on internal policy, for an MRP part we can set the period-of-supply to be one week. Even though the commercial minimum order is 250, we might want to set the minimum order quantity to 500, since this represents a master pack from the supplier. Doing so means the supplier and the transport company are not dealing with multiple small boxes. Since our typical order would be for 1,000, or two master packs, the supplier

	Class A	Class B	Class C
Use MRP	Yes	Maybe	No
Policy	Lot-for-lot	Period of supply or ROP/EOQ	Re-order point (ROP)/ Economic Order Quantity (EOQ)
Order frequency or Intervention interval	Hourly/Daily	Daily/Weekly	Weekly/Monthly

Table 2.



would likely strap these to a half skid. It would be wise to set the order multiple to 500, which matches a single master pack, for the times we need extra. Setting the maximum order quantity to 5,000 means we would not order more than a single full pallet in one order and would still cover 5 weeks of average use. Naturally, there are always manual overrides to the suggested orders coming from MRP, so nothing prevents a human from doing what is necessary. We simply set the system to coax people to do the right things.

Procurement and Blanket Orders

A best practice approach is to simply set up a blanket PO with a supplier and send signals to pull product into the factory when it is needed. This can be done no matter what planning mechanism is used for the PFEP. The supplier is provided forecast data to manage their production and supply chain, and agreements are made to achieve a set replenishment time when pull signals are broadcast. Ideally, the supplier agrees to maintain some finished goods (buffer) to ensure a short replenishment time when the "withdrawal" Kanban is sent.

Cards or labels can be placed with the container or packaging and simply turned in to the Procurement team as a requisition. For parts planned outside of the MRP system as manual Kanban items, a classic Kanban formula can be used to determine the container quantities to replenish.

Another option is to set up on site Vendor Managed Inventory (VMI). In this scenario, the supplier maintains a set level of material at the receiving site, and this material is transferred from being vendor owned into inventory as it is consumed. Some ERP systems show the combined inventory value in the on-hand balance and differentiate consigned from not consigned. In this scenario, the forecast is provided to the supplier, and they manage their supply chain as they see fit, disconnected from the noise that MRP can often create when using it as an execution tool.

Work Order Controls

Another option is to disconnect execution from MRP, and use MRP to manage the inventory as it moves in and out of WIP and RAW inventory. Pull signals are then used to execute production. This can be done in a few different ways:

A. Release the work orders according to the MRP reports but hold the paperwork back and do not issue the parts until there is a pull signal from the shop floor. The order is released on time, but if production is not ready to begin work, we don't push the material needlessly into a job queue for it just to sit. This way, you do not signal a job start, or material consumption, until it really occurs.

B. Release the orders when the floor is ready to produce. Use a Kanban style card or have someone from the shop floor tell the planner when they are ready for another production order to be released in the production control system.

C. Don't use orders to produce. Go ahead and make the product using Kanban cards. When the item(s) is finished, open an order, back flush the material, and close the order. This is sometimes called orderless completion. Some ERP systems offer this feature in the Production Control module. The production order is opened, released, and closed in one step, while also backflushing labor and material. This is a terrific time saver.

Update ERP to Reflect Improvements

As lean is deployed, MRP settings should be adjusted. Reduce the lead times as you reduce cycle time. Remove safety stock or scrap factors as you improve yields. Change rounding values and fixed lot sizes as you practice setup reduction and reduce batch sizes or box sizes. In this case, lean and MRP play very well together.

Wrap-up

The answer to the question of whether ERP and lean processes can co-exist is that they must. Lean is an overarching philosophy and mindset for practitioners who are continuously in search of ways to eliminate waste. MRP is a powerful, comprehensive tool for managing all aspects of the supply chain. Is it a perfect marriage? I think we all know that the answer is no, but the systems can work together. In many cases, one without the other will fail. The trick is to apply the lean concepts as best as you can while exploring the full capabilities of your MRP system.

	System – MRP	System - ROP/EOQ	Manual or System Kanban
System intervention	High – order reports, exception messages, detailed consumption transaction processing	Medium – order reports, detailed consumption transaction processing	Low – report only full container consumption at supermarket or point-of-use
System planning horizon	Looks at supply and demand over full MRP horizon	Some systems look at projected available balance to first ROP only; otherwise none	None
Order quantities: Minimum, maximum, multiple	Align consumption with supplier minimum order and container sizes	Align consumption with supplier minimum order and container sizes	Align consumption with supplier minimum order and container sizes
Lead time	● ——	Key variable	—— ●
Unit cost, interest rate, service level, demand variation	● ——	Needed for system calculation of ROP and EOQ	—— ●
Supermarket and point-of-use	● ——	Applicable	—— ●

Table 3.

ABOUT THE AUTHORS

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