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Beyond MRP

Meeting the Current Materials Synchronization Challenge

Solve the problems of poor inventory performance, poor customer service, & high expedite-related expenses that frustrate implementations of ERP, Lean and TOC in complex and challenging environments.

Beyond MRP – Meeting the Current Materials Synchronization Challenge

By Carol Ptak and Chad Smith

The effectiveness of any system has to be judged by the results that it achieves. In today's environment, companies that struggle with effective materials planning consistently see at least one or a combination of three main business results:

- **Unacceptable inventory performance** (Too much of the wrong material, too little of the right material, high obsolescence and low inventory turns).
- **Unacceptable service level performance** (Low on time delivery, low fill rates, poor customer satisfaction, downward price pressure).
- **High expedite related expenses and waste** (Premium and additional freight charges, increasing overtime, penalties).

How is it that with today's level of technology and connectivity that companies can struggle so mightily with materials synchronization and these effects? After examining many companies locked in this struggle there appear to be two main reasons why the above effects happen in today's manufacturing enterprises:

1. **MRP was not designed to deal with today's challenges.** The sheer size of ERP systems today hides the reality that for most mid-range and large manufacturers, MRP (Material Requirements Planning) remains a critical module in their ERP system, and the changing global manufacturing environment has exposed critical shortcomings in most MRP implementations and tools. Variability and volatility are on a dramatic rise and the implementations of pull-based philosophies like Lean and TOC are proliferating. These conditions and approaches are putting extreme pressure on MRP systems and even creating conflicting modes of operation (push versus pull). MRP was designed in the 1950's, commercially coded in the 1970's and really hasn't changed since. It was never designed with today's factors in mind.
2. **Users are forced to make incomplete and unsatisfactory compromises.** Most companies are not blind to the above shortcomings. Materials and Productions Control personnel often find themselves in a dilemma regarding their MRP system. There are powerful aspects of MRP that are still relevant and necessary. At the same, there are disastrous consequences to ignoring MRP's shortcomings in today's environment. Given this conflict, Materials and Production Control personnel are forced to find various, often unsatisfactory and incomplete, ways around this conflict.

A Brief History of MRP

The invention of Materials Requirements Planning (MRP) in the 1950's was nothing short of a revolution for manufacturing. For the first time companies could plan for needed material based on an overall master schedule exploded through a bill of materials. The manual single and double order point systems were no match for the proliferation of products coming to market post World War II. The world was in the age of marketing! We could no longer live without things that didn't exist 10 years earlier. Class A MRP implementations yielded significantly reduced inventory and improved on time deliveries. Driven in a large part by APICS education through the 1970's, MRP quickly became the number one tool that inventory-related management personnel relied upon to insure that material was available to meet manufacturing and market requirements.

Even in these simpler, more predictable times, MRP was really successful in only a small percentage of companies. One big reason was that MRP was intended to do only that – plan material. At the time, the limitation was available computing power but computers quickly became more powerful. Every operations manager knew that not only was the correct material needed but capacity had to be available as well. Closed loop MRP was the next evolution and allowed the planning of both material and capacity. Still, system implementation was far from a guarantee of success. In the 1980's, MRPII (Manufacturing Resources Planning) brought further integration to the core business system by incorporating the financial analysis and accounting

functions. Still, these systems that were so advanced at the time were no guarantee of bottom line success. In the 1990's, ERP (Enterprise Resource Planning) was the next evolution and brought all the resources of an enterprise under the control of a centralized integrated system.

In the mid 1990's Advanced Planning and Scheduling (APS) systems leveraged the visibility of the company's resources in ERP and promised to keep all scarce resources busy all the time. Again, the implementation of these complex systems was rarely a bottom line success. At the core of this continued evolution still remains the MRP calculation kernel. MRP fundamentally is a calculator utilizing the data about what you need, what you have, to calculate what you need to go get – and when.

Can MRP Meet Today's Challenge?

The world that existed when MRP was developed no longer exists. We are now in a world with global capacity far exceeding global demand. Customers can purchase what they want, when they want it, at a price they want to pay due to the lack of transactional friction available through the internet. In addition, customers are increasingly fickle. The push strategy of produce and promote just does not work anymore.

While some manufacturers turn to various technologies to reduce variability in individual processes on the shop floor, reality is that variability and volatility are rising dramatically when you examine the bigger picture – the entire enterprise as well as the supply chain it operates within. Today's manufacturing operations are far more susceptible to disruptions throughout their internal operations and external supply chain due to:

- Global sourcing and demand
- Shortened product life cycles
- Shortened customer tolerance time
- New materials
- More product complexity and/or customization
- Demands for leaner inventories
- Inaccurate forecasts
- Material shortages
- Complex synchronization issues
- More product variety
- Long lead time parts/components
- More offshore suppliers

Below is a chart that outlines the organizational effects of typical MRP implementation attributes.

Typical MRP Attributes			Effects to the Organization
Planning Attributes	*MRP uses a forecast or master production schedule as an input to calculate parent and component level part net requirements. Part planning becomes based on a "push" created by these projected demand requirements.*	▶	*Forecast accuracy at the individual sku and part levels is highly inaccurate. Build Plans and PO's that are calculated from this forecast often are misaligned with actual market demand. This leads to excessive expediting, overtime, premium freight, increased inventory of the wrong items and missed shipments.*
	MRP pegs down the ENTIRE Bill of Material to the lowest component part level whenever available stock is less than exploded demand.	▶	*Creates a complicated materials and scheduling profile that can totally change with one small change at a parent item. When capacity is scheduled infinitely there are massive priority conflicts and material diversions. When capacity is scheduled finitely across all resource there is massive schedule instability due to cascading slides from material shortages.*

	MRP allows the release of work orders to the shop floor without consideration of component parts availability.	▶	*Work Orders are released to the floor but cannot be started due to shortages. This leads to increased WIP, constantly changing priorities and schedules, delays, lots of expediting and possibly overtime.*
	Lead time for parent part is the manufacturing lead time ONLY for the parent, regardless of the cumulative lead time for parent and lower level component parts.	▶	*Manufacturing Orders are often released with dates that are impossible to achieve and/or without all component parts available.*
Stock Mgmt Attributes	*Fixed reorder quantity, order points, and safety stock that do not adjust to actual market demand or seasonality.*	▶	*Additional exposure to forecast inaccuracies resulting in increased expediting.*
	Only parts hitting minimum or reorder point are flagged for reorder.	▶	*Aggregate inventory visibility is limited frequently putting the company in a constant expedite mode.*
	No early warning indicators of potential stock outs or demand spikes.	▶	*Aggregate inventory visibility is limited frequently putting the company in a constant expedite mode.*
	Past due requirements and orders to replenish safety stock are treated as "Due Now"	▶	*Every stock order looks the same, which means there is no REAL priority. To determine real priorities requires massive attention, analysis and priority changes.*

These basic MRP attributes and functions listed above are well defined by the APICS body of knowledge. Some business systems, however, can contain functionality that has nothing to do with MRP and that may attempt to work around some of these frustrating issues. Sometimes this additional functionality simply moves the pain points to another part of the organization. Many times, the additional functionality does not overcome more fundamental limitations and design issues that tend to go unaddressed.

Conventional MRP implementations just do not fit the new pull-based manufacturing and materials solutions required to be fast, lean, and flexible in today's hypercompetitive environment. Users are frustrated because they cannot complete their work inside the system. To get the job done they extract data to Excel® or Access®. Even worse, they use manual sticky notes and scheduling white boards. Gone is the desired integration driving the investment in the formal system. The IT landscape is more complicated and the costs to support it constantly increase.

Does this sound like your Company?

Does your company work within its formal planning system or does your company work around this system? Does it try to do both at the same time? Are spreadsheets, sticky notes and manual tracking systems still alive and well in your operations even though you have implemented an MRP or ERP system in the last 10 years?

When it comes to truly effective materials management most Purchasing, Manufacturing and Production Control personnel frequently feel like their hands are bound and tied. MRP's power has always been its ability to manage Bill of Material connections in order to generate total net material requirements (demand orders that turn into manufacturing orders or purchase orders). The more complex and integrated the product structures and manufacturing facilities are, the more necessary MRP is for netting and getting ahead of critical and long lead time parts. Most Purchasing, Manufacturing and Production Control personnel realize this and are forced into a set of compromises that just don't work.

The MRP Compromises

In most cases, there are four types of compromises that frequently occur (either separately or in combination).

1. **Manual Work Around Proliferation** – Frequently companies try to work around their MRP system by relying on stand alone, disconnected and highly customized extraction tools like Excel® spreadsheets and Access® programs. These tools have serious limitations and their proliferation makes the IT landscape more complicated and maintenance more intensive. Their use ultimately defeats the purpose behind the major investment in an integrated ERP package.
2. **Flatten the Bill of Material (BoM)** – Sometimes companies try to simplify the synchronization issue by flattening the Bills of Material. The key to better synchronization is NOT to ignore dependencies within the product structure and across product structures. These dependencies provide an excellent way to stop variability from gaining momentum and disrupting the entire supply chain like a tsunami wave. The key to better synchronization is to understand those dependencies and control them. By flattening the BoM, companies can actually lose visibility both at the planning and execution level.
3. **Make to Order Everything** – Still other companies choose to place all of their cash in raw material and purchased components and go completely make to order. In most environments this comes at a price. A company either has to carry additional capacity to meet service level requirements or risk service level requirements with extended lead times. In some highly seasonal or short customer tolerance environments this is simply impossible as it cannot supply the product in sufficient time with sufficient volume.
4. **More Efficient Forecasting** – Other companies implement advanced forecasting algorithms or hire more Planners in hopes of guessing better. At best these solutions result in a 20-40% improvement in demand signal accuracy – still leaving significant room for error. This 20-40% improvement in signal accuracy does NOT translate well to overall effectiveness. Most North American manufacturers have multiple assembly and subassembly operations that are integral parts of their overall flow. In any type of assembly operation it takes the lack of only one part to block a complete shipment. The more assemblies there are the less effective these tactics become. Even the biggest supporters of forecasting can't argue with the fact that it is still a push based tactic. Yes, it can be a more educated push but it is still a push nonetheless. For companies implementing PULL-based manufacturing systems (e.g. Lean or Drum-Buffer-Rope (DBR)) it sets up conflicting modes of operation that will simply not perform well in volatile and complex environments.

Actively Synchronized Replenishment – the way out of MRP Compromises!

There are two critical needs coming into contention behind the compromises.

From a manufacturing perspective, we must have a realistic, responsive and executable schedule (capacity AND materials) that ties to real demand. MRP tools simply do not facilitate materials availability within increasingly shorter horizons that are inherently more variable and volatile. Additionally, many pull-based manufacturing implementations (e.g. Lean and Drum-Buffer-Rope) are effectively blocked by this lack of material synchronization.

From a Planning and Purchasing perspective we must have a way to effectively plan, synchronize and manage the availability of ALL materials, especially critical and/or long-lead time manufactured and purchased parts.

Furthermore, we have to fulfill both of the above requirements without the conventional inaccuracy, inconsistency and massive additional efforts and waste associated with the current set of compromises.

Actively Synchronized Replenishment (ASR) builds upon the traditional replenishment approach of replacing what was taken to create a dynamic and effective pull-based solution to answer the challenges of today's manufacturing landscape. In addition, through a new approach in materials planning and execution, ASR is designed to directly tie material availability and supply to ACTUAL consumption. This is a prerequisite to effectively utilize pull-based scheduling and execution methods like Lean and Drum-Buffer-Rope (DBR).

Actively Synchronized Replenishment has four main components:

1.Strategic Inventory Positioning

The first question of effective inventory management is not, "how much inventory should we have?" The most fundamental question to ask in today's manufacturing environments is, "given our system, where should we place inventory to have the best protection?" Think of inventory like a break wall to guard boats in a marina from the roughness of incoming waves. Out on the open ocean, the break walls have to be 50-100 feet tall but in a small lake, the break walls are only a couple feet tall. In a glassy smooth pond no break wall is necessary.

In the same way, inventory is the break wall against the variability experienced from either supply (externally and internally) or demand unreliability. Putting inventory everywhere is an enormous waste of company resources. Eliminating inventory everywhere puts the company and supply chain at significant risk. Strategically positioning inventory ensures the company's ability to absorb expected variability without having to disrupt every part of the plant and the supply chain. Important factors to carefully consider in determining where to place inventory buffers include:

- **Customer Tolerance Time** – the time the typical customer is willing to wait and/or the potential for increased sales for lead time reductions.
- **Variable Rate of Demand** – the potential for swings and spikes in demand that could overwhelm resources (capacity and material).
- **Variable Rate of Supply** – the potential for and severity of disruptions in particular supply bases and/or specific suppliers.
- **Inventory Flexibility and Product Structure** – the places in the aggregate bill of material structure that leave a company with the most available options (primarily key purchased materials and sub-assemblies/components). The more shared components and materials there are, as well as the deeper and more complex the aggregate bill of material is, the more important this factor is. Through a process known as **BoM (Bill of Material) de-coupling** variability is absorbed, cumulative lead times reduced and planning simplified by the insertion of ASR buffers at these strategic points in the BoM.
- **Minimization of the Bull-Whip Effect** – the prevention of cascading disruptions through a dependent sequence of events. The longer and more complex the routing structure and dependent chain of events (including inter-plant transfers), the more important this factor is. In some cases the creation of new part numbers and an insertion of an additional level in the BoM are necessary in order to decouple long and complex routings or sequences. It is particularly important to protect critical operational areas from the Bull-Whip Effect. These types of operations include areas that have limited capacity or where quality can be compromised by disruptions.

These factors are applied across the entire bill of material and supply chain to determine positions for purchased, manufactured and sub components and finished items (including service parts).

This step is often accomplished through a combination of "thoughtware" and software. The "thoughtware" is the application of most of the above factors in consideration of the business objectives and operating rules by the people that have experience and intuition in the environment. In complex environments, software is often required to do the heavy computational

lifting in order to analyze product structure, cumulative lead times and shared components across the aggregate Bill of Material.

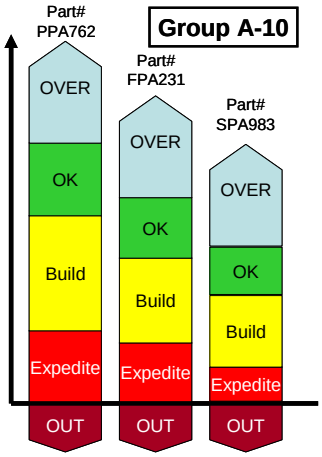
The importance of this step should not be underestimated. Without the right strategic positioning no inventory system can live up to its potential.

2. Dynamic Buffer Level Profiling and Maintenance

Once the strategic inventory positions are determined, buffers levels have to be initially set. Based on several factors, different materials and parts behave differently. Important distinctions have to be made for supply variability and confidence factors, and for demand variability including seasonality, product ramp up/traction, obsolescence and cannibalization. ASR groups parts and materials into like "buffer profiles." These buffer profiles produce a unique buffer picture (top level and zone definitions) for each part as individual part traits are applied to the group traits.

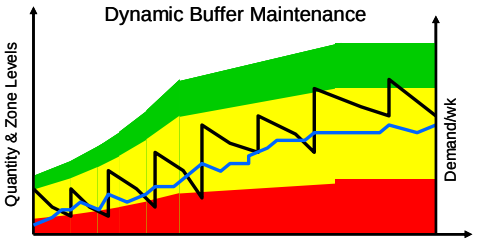
Group Trait Examples	Individual Part Trait Examples
• **Seasonality** • **Order Cycle** • **Supply Variability** • **Demand Variability** • **Lead Time**	• **Average Daily Usage (ADU)** • **Fixed Lead Time** • **Cumulative Lead Time** • **Minimum Order Quantity** • **Maximum Order Quantity** • **Order Multiple**

ASR uses a five colored zone approach. Light blue describes an over stocked position. Green represents an inventory position that requires no action. Yellow represents a part that has entered its re-build zone. Red represents a part that is in jeopardy. Dark red represents a stock out.

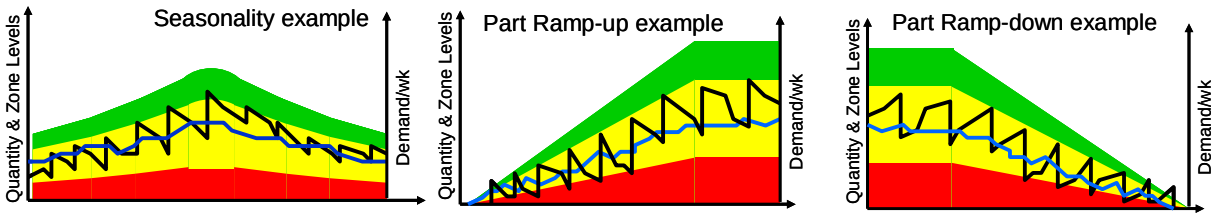


Because each part within a buffer profile has different individual traits, it yields different buffer levels or individual buffer profiles.

Over the course of time, these factors can change dramatically as new suppliers and materials are used, new markets are opened and/or old markets deteriorate and manufacturing capacity and methods change. Dynamic buffer levels allow the company to adapt buffers to group and individual part trait changes over a rolling time horizon. Thus, as more or less variaibility is encountered by these buffers, they adapt and change to fit the environment.

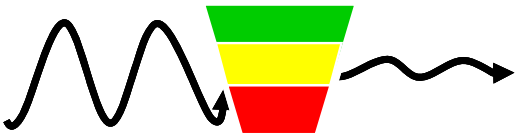


Additionally these individual buffer profiles can be manipulated through "**Planned Adjustments**" based certain capacity, business, environmental and historical factors. In ASR these Planned Adjustments represent the only forecasted elements that effect inventory positions. Buffers profiles can be manipulated for seasonality, product ramp up and product ramp down.



The combination of the first two solution elements creates strategically placed points of inventory that are actively managed, carefully sized and dynamically adjusted. These buffers dampen or eliminate the effects of variation that are passed up and down the chain of resources and/or dependencies.

Variability and volatility from the supply side is isolated from the post-buffer operations.



Variability and volatility from the demand side is isolated from the pre-buffer operations.

3. Pull-Based Demand Generation

Most Purchasing, Materials and Fulfillment organizations have limited capacity and trust when it comes to sorting through the current demand signals and planned orders generated by MRP. The volume of reschedule messages are impossible to work before more changes happen and the process begins again. Many times critical actions are missed or incomplete pictures are painted. This generates the need for lots of expensive corrective actions at a later time (expedites, premium freight, overtime, etc.).

Generating, coordinating and prioritizing all materials signals becomes much simpler when the environment is modeled properly. The current inventory status is evaluated for potential negative impacts and flagged for alert against open supply orders and demand allocations which includes future sales orders that meet specific spike criteria. Planners then have the ability to quickly see where the signals are really coming from and react, before they get into trouble. This better matches the current intuition of the planners but now they have the real visibility to establish correct and comprehensive priorities.

Key components of the ASR supply generation process include:

1. Buffer levels are replenished as actual demand forces buffers into their respective rebuild zones.
2. Component part requirements are calculated by pegging down through the bill of material. However this planning is decoupled at any buffered component part that is independently managed by an ASR buffer. This prevents the tsunami wave from rippling throughout the company as it does under MRP when a disruption occurs.
3. Component parts with incoming supply orders that are out of synch with demand allocations from parent work orders must be highlighted. This allows the Planners to take actions or make adjustments before work is released to the floor. This reduces the confusion in manufacturing and eliminates a significant amount of expediting.
4. Lead time for parent parts have to recognize both manufacturing lead time for the parent as well as the cumulative lead time for non-buffered component parts on the longest leg

of the bill of material. Remember that the total cumulative lead time for the end item is de-coupled at any necessary buffer points.

5. All ASR buffered parts are managed using highly visible zone indicators including the percentage encroachment into the buffer.
6. An Order Spike Horizon must look out over the cumulative lead times of parts to identify large anomalous Sales Orders. This allows the plan to effectively compensate for known upcoming spikes in demand.
7. All orders get an assigned due date based upon actual cumulative lead times. In a Make to Order (MTO) environment it is important to have cumulative lead times visible because it can help focus any necessary expedite efforts and/or be used to make more realistic promises to customers. In Make to Stock (MTS) environments cumulative lead times are important because you are using a more realistic parameter to help determine stocking levels as well as generate alert signals in the execution horizon.

Below is a point by point comparison of typical MRP implementation attributes versus ASR.

	Typical MRP Attributes		ASR Components
Planning Attributes	*MRP uses a forecast or master production schedule as an input to calculate parent and component level part net requirements. Part planning becomes based on a "push" created by these projected demand requirements.*	▶	***ASR uses known and planned part traits to set only the initial buffer size levels. These buffer sizes are dynamically resized based on real demand and variability.*** ***Buffer levels are replenished as actual demand forces buffers into their respective rebuild zones.***
	MRP pegs down the ENTIRE Bill of Material to the lowest component part level whenever available stock is less than exploded demand.	▶	***Component part requirements are calculated by pegging down through the bill of material. However this planning is decoupled at any buffered component part that is independently managed by an ASR buffer. This prevents the tsunami wave from rippling throughout the company like it does under MRP when a disruption occurs.***
	MRP allows the release of work orders to the shop floor without consideration of component parts availability.	▶	***Projected available stock for component part requirements is verified prior to work order release to insure work is not released to the floor if parts are not available.***
	Lead time for parent part is the manufacturing lead time ONLY for the parent, regardless of the cumulative lead time for parent and lower level component parts.	▶	***Lead time for parent parts recognizes both manufacturing lead time for the parent as well as the cumulative lead time for non-buffered component parts on the longest leg of the bill of material. Remember that the total cumulative lead time for the end item is de-coupled at any necessary buffer points.***
Stock Mgmt Attributes	*Fixed reorder quantity, order points, and safety stock that do not adjust to actual market demand or seasonality.*	▶	***Buffer levels are dynamically adjusted as the part specific traits change according to actual performance over a rolling time horizon.***
	Only parts hitting minimum or reorder point are flagged for reorder.	▶	***All ASR buffered parts are managed using highly visible zone indicators including the percentage encroachment into the buffer.***
	No early warning indicators of potential stock outs or demand spikes.	▶	***An Order Spike Horizon looks out over the cumulative lead times of parts to identify large anomalous Sales Orders. This allows the plan to effectively compensate for known upcoming spikes in demand***
	Past due requirements and orders to replenish safety stock are treated as "Due Now"	▶	***All orders get an assigned due date based up on quoted lead time in a make to order environment or based on cumulative lead time in the case of buffered stock.***

This pull-based demand generation plans the right material in the right place at the right time and enables techniques like Lean and Drum-Buffer-Rope to work effectively in organizations that experience a wide variety of products demanded.

4. Highly Visible and Collaborative Execution

Simply launching Purchase Orders (POs) and Work Orders (WOs) from an ASR system's more effective pull-based planning mechanism does not end the materials management challenge. These POs and WOs have to be effectively managed to synchronize with the changes that often occur within the **execution horizon**.

Most ERP and/or MRP systems lack real visibility to the actual priorities associated with the entire queue of Purchase Orders, Transfer Orders and Manufacturing Orders throughout the manufacturing operation and supply chain. Without this visibility, the supply chain (suppliers, manufacturing, fulfillment and customers) employ the usual default mechanism of ***priority by due date***.

Priority by due date often does not convey the real day to day inventory and materials priorities. Priorities are not static, they change as variability and volatility occurs within the active life span of Purchase Orders and Manufacturing Orders. This life span is called the **execution horizon**. Customers change their orders, quality challenges come up, there can be weather or customs related obstacles, engineering changes happen and suppliers' capacity and reliability can temporarily fluctuate. The longer the execution horizon, the more volatile the changes are to priority and the more susceptible a company is to adverse material synchronization issues.

Ask yourself the following questions:

How does the manufacturing floor **really** know the relative priorities of stock orders?

- Does your operation ever have Manufacturing Orders to replenish stock that have the same due date (either a discreet date or "DUE NOW)?" How does the manufacturing floor decide what the priority is?
- Do you ever have MOs to replenish stock orders that have different due dates? Is it conceivable that despite a MO being due later, it is actually a higher priority based on certain events that have happened during the execution horizon?

How does the supplier know how to align their capacity to your priorities?

- Do you ever have several open POs to a supplier all with the same due date? If yes, how do they know which is the most important to apply efforts to?
- Do you ever have several open POs to a supplier with different due dates? Is it conceivable that despite a PO being due later, it is actually a higher priority, once again, due to changes that have occurred within the execution horizon ?

Any sort of visibility to or specific answer about the real-time priority of stock orders often necessitates a manual workaround or subsystem which requires massive daily efforts of analysis and adjustments.

Current Inventory Alerts

ASR provides real visibility of those items at risk within the execution horizon by providing current inventory alerts. The current inventory alert must consider factors like:

- On-hand inventory alerts for parts that are currently stocked out

- Projected stock-out alerts for parts where projected consumption may result in a stock out prior to receipt of incoming supply orders
- Lead Time Alerts that are used to prompt personnel to check up on the status of critical non-stocked parts (see ***Lead Time Managed Parts*** below).

Visible Buffer Status

ASR allows actual order priorities (POs, TOs or MOs) to be effectively conveyed without additional efforts, disconnected subsystems or other workarounds. Color coding gives an easy to understand general reference. The percentage of buffer remaining gives a specific discrete reference. These references convey today's real priority regardless of due date. **Suppliers and manufacturers need to see this every day.**

Manufactured Parts

Order #	Due Date	Buffer Status
WO 820-89	05/24/09	Critical 11%
WO 891-84	05/22/09	Critical 16%
WO 276-54	05/22/09	Med 36%

Suppler: ABC Casting

Order #	Due Date	Buffer Status
PO 820-89	05/13/09	Critical 13%
PO 891-84	05/12/09	Med 39%
PO 276-54	05/12/09	Med 41%

Lead Time Managed Components

Many critical components simply don't make sense to stock due to their relatively low volume. Ask most seasoned materials managers in major manufacturers and they can immediately recite a list of these types of components. These long lead time components can be very difficult to manage especially if they are remotely sourced. Without an effective way to manage these parts we risk major synchronization problems, costly expediting or poor service level performance.

In ERP/MRP systems there is very little done about the management of these parts. They are managed by due date with no formal system of visibility and proactive management to reflect real priorities.

Actively Synchronized Replenishment gives special status and visibility to these parts. These **Lead Time Managed** components are tracked and at a defined point in the part's lead time buyers are prompted for follow up. If satisfactory resolution is not achieved, the visible warning or alert continues to get more critical. Resolution could be either the assignment of a follow up date (temporary resolution) or the assignment of final confirmed date and decision (could be sooner, on time or later). Regardless of what the resolution is, at least it is known and understood ahead of time. Additionally, these types of proactive efforts often nip things in the bud resulting in better due date performance for these types of components.

The execution side of ASR is an ideal environment for the application strong front office interface involving text notes, calendar updates/exports and the ability to launch e-mails that are part AND order specific. The key is to increase the amount of accurate and timely information available to the entire chain. This highly visible and collaborative execution capability creates a remarkable effective supply chain that can respond to real market demand without manual workarounds and other disconnected subsystems.

Purchasing, Manufacturing and Fulfillment personnel thus are able to see and communicate a bigger picture that is clear, concise, prioritized for action and shows the ramifications of decisions and actions based on the dependencies in the aggregate material supply and fulfillment system.

ASR dampens the nervousness of MRP systems in comple and challenging environments where even small changes in demand and supply can create ripple effects so great that planners simply have to ignore them, even recognizing there will be a price to be paid as a result. No longer must the planners try to respond to every message for every part that is off by even one day. The ASR approach provides real information about those parts that are truly at risk of negatively impacting the planned availability of inventory.

What happens to inventory levels in an ASR implementation?

While significant inventory reductions are an effect of implementing the ASR approach, this concept is not intended to focus on inventory reduction. ASR must never be implemented with the sole purpose of inventory reduction. Dramatic reductions in inventory are a result of the overall approach rather than the primary objective.

In early adopters, the impact on inventory is consistently somewhere between a 20 to 50% reduction in the first year. However, at the early stages of the implementation there is typically a temporary increase in overall inventory levels because parts may need to be buffered that were not previously inventoried combined with substantial inventory dollars that exist over the top of the required ASR buffers. As the excess drains down to within the buffer parameters then companies begin to see significant inventory reduction and a highly improved level of turns.

Does my ERP system offer ASR functionality?

At the time of this writing, no ERP system has the functionality that effectively facilitates all four components of the Actively Synchronized Replenishment approach. Most systems support both min/max as well as MRP with an input of a forecast or master production schedule (MPS) for inventory planning. None of this supports the four components of ASR. Min/max levels are static and usually are not reviewed after the initial system set up. They are used for passive buffers typically for low value parts only. Forecasting and MPS are inherently a push system. ASR is inherently a pull system. The bill of material decoupling analysis is not supported by any ERP system today. This is a key ASR component for providing the break walls absorbing cumulative variability arising from supply and demand. This decoupling is also the key behind managing and compressing cumulative lead time for manufactured parts.

What are the specific business benefits expected from implementing Actively Synchronized Replenishment?

Besides resolving the MRP compromises and the effects associated with them, there are additional business benefits when the Actively Synchronized Replenishment (ASR) approach is implemented.

1. **Protect and Increase flow** by significantly reducing the negative impact of variability in dependent and interdependent systems. This can include both demand variability from the market place and supply variability starting with external sources then continuing internally through operations.

2. **Create a competitive advantage** by developing and exploiting ways to compress product and materials lead times to the marketplace. This insures that lead time offers are significantly better than what the market is expecting. In most cases, a highly competitive lead time can be achieved with no investment in equipment or traditional lead time reduction initiatives.

3. **Highly improved on time delivery performance** to the marketplace. If lead times are dramatically reduced and flow is improved, then significant improvements in service performance can and will follow.

4. **"Right Size" Inventory** through the strategic inventory positioning process insures that the right amount of protection is carried in the right places based on the rate of demand pull from the market and potential disruptions in supply and demand. The critical difference with ASR is that these are dynamic buffers that constantly reflect the changing market and supply conditions.

5. **Enable better execution**; the ongoing management process in ASR becomes relatively simple once the analysis is complete and buffers are established in the correct places. The execution side insures early identification of potential problem areas such as a supplier that is going to be late, or a delayed work order, etc that could potentially impact buffers. This allows action to be taken before these small disruptions become big problems.

In early implementations of this approach a very powerful insight was realized – *the above business benefits are complementary and happen collectively*. Unlike the typical expectation of inventory versus customer service tradeoffs, in the early implementations of ASR there have been **no trade-offs**.

By implementing ASR only with no additional capital expenditure, overhead or other improvement initiatives **Oregon Freeze Dry**, the world's largest custom freeze drier, reported the following gains:

- **Mountain House Division:**
  - Sales increased 20%
  - Customer Fill Rate improved from 79% to 99.6%
  - This was accomplished with a 60% reduction in inventory
- **Industrial Ingredient Division:**
  - 60% reduction in make to order lead time
  - 100% On-Time-Delivery
  - This was accomplished with a 20% reduction in inventory

What kind of manufacturing environments should consider ASR?

Below are characteristics of environments where ASR delivers the significant business benefits listed above. The more of these characteristics that an environment has the more significant the benefits will be.

- Environments with sets of highly repetitive builds (either product or process).
- Environments that will reward you for shorter lead times either through premiums or increased sales.
- Environments that frequently use the same purchased component or raw items.
- Environments that utilize the same components across multiple parent parts.
- Environments with deep and complex BoMs.
- Environments with longer or more complicated routings that create significant scheduling and/or lead time difficulties.
- Environments that are considering or currently using pull-based scheduling and execution.

Summary

By bringing together rules, vision and technology Actively Synchronized Replenishment provides a practical real world solution to the MRP conflict found in so many companies today. ASR allows the company to work completely within its formal planning system and finally realize the return on investment expected when the system was first implemented. The current ERP system is not ripped out and replaced. Instead the components of ASR leverage all the good work done to date. The four components of the ASR approach effectively manage the volatility and variability plaguing your company to create the velocity and visibility necessary to provide a

competitive advantage in today's hypercompetitive market. Isn't that better than disconnected sticky notes and Excel® spreadsheets?

The authors have set up the website: **www.beyondmrp.com** for interested readers to learn more about Actively Synchronized Replenishment. We welcome your thoughts and feedback on this innovative approach.

Your Next Step

If your company has felt the impact of material, parts, component or finished goods availability problems - and especially if you have a challenging Bill of Materials structure, or if your Bills of Material have many components with multiple where-used - AND even more so, if these problems have persisted for more than just a few months - **you need to learn more about ASR.**

The gains in customers service and productivity, with reduced inventories and lead times, are simply too large to ignore. If shortages have been blocking efforts to implement a Lean or TOC Pull-based system, ASR could be the key to successful implementation.

Go to www.beyondmrp.com to learn more about ASR. Register for a public webinar or arrange for a dedicated webinar for your management team.

About the Authors

Carol Ptak is at Pacific Lutheran University as Visiting Professor and Executive in Residence after years of executive management experience at PeopleSoft and IBM Corporation as well as many years of consulting expertise. Most recently, Ptak served as the vice president and global industry executive for manufacturing and distribution industries at PeopleSoft.

Here she developed the concept of Demand Driven Manufacturing (DDM) as an overall product and marketing strategy to align product development, market awareness and demand generation. Her innovative approach is credited with significantly improving the company's position in the manufacturing industry software market and earned her national recognition in publications such as CFO Magazine and the New York Times. Prior to her accomplished record at PeopleSoft, Ptak spent four years at IBM Corporation starting as a member of the worldwide ERP/SCM solutions sales team and quickly rising to the position of global SMB segment executive.

From 1993-98, Ptak owned Eagle Enterprises, a consulting firm that promotes company-wide excellence through education and successful implementation. Ptak worked with a wide-range of businesses including internationally known corporations such as Boeing and Starbucks.

Ptak, who holds her MBA from Rochester Institute of Technology, is also certified by the American Production and Inventory Control Society in Production and Inventory Management (Fellow level) and in Integrated Resource Management and completed additional graduate work at Stanford University. She holds a bachelors degree in biology from State University of New York at Buffalo.

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Chad Smith is the co-founder and Managing Partner of Constraints Management Group (CMG), a services and technology company specializing in pull-based manufacturing, materials and project management systems for mid-range and large manufacturers. Chad has a wide range of experience in successfully applying pull-based systems within a diverse scope of organizations and industries. Clients, past and present, include LeTourneau Technologies, Boeing, Intel, Erickson Air-Crane, Siemens, IBM, The Charles Machine Works (Ditch Witch) and Oregon Freeze Dry.

Since the late 1990's Chad and his partners at CMG have been at the forefront of developing and articulating the concepts behind Actively Synchronized Replenishment as well as building ASR compliant technology. CMG's homepage is at **www.thoughtwarepeople.com**.

Additionally, Chad is an internationally recognized expert in the application and development of the Theory of Constraints (TOC), getting his formal training at the Avraham Y. Goldratt Institute Academy and working under the tutelage of Dr. Eli Goldratt, author of *The Goal*, for several years.

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Did You Know?

A condensed version of this white paper was featured as the cover article for the July/August 2008 edition of the APICS Magazine. Additionally, it was a featured topic and standing room only at the APICS International Conference in Kansas City on September 15th, 2008 where it led off the Supply Chain tract. Go to **www.beyondmrp.com** and learn why ASR is quickly being regarded as the most significant breakthrough in materials management since the invention of MRP.