

# Achieving Stock Service Levels using a 'Push' and/or a 'Pull' System

What are 'push' and 'pull' systems and can they really work together to achieve high stock service levels at the optimum cost?

**Accurately planning demand (or demand planning as it is more commonly referred to) will help to achieve high levels of stock service with the minimum of stock investment. Demand Planning can be defined as 'the management process within an organisation which enables that organisation to tailor its capacity, either production or service, to meet variations in demand or alternatively to manage the level of demand using marketing or supply chain management strategies to smooth out the peaks and troughs'.**

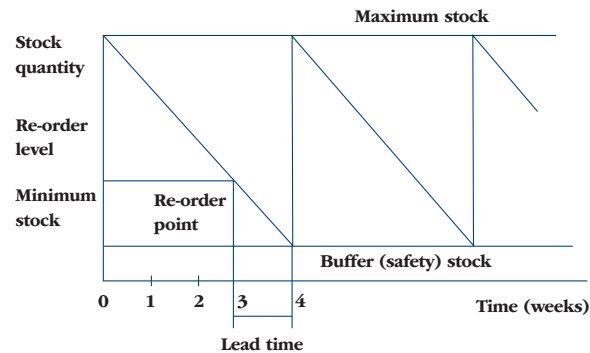
The trick is to get the balance between minimising carrying costs and carrying enough stock to ensure there is enough stock to meet demand without any significant risk of stockouts. Demand however, can be complex and difficult to predict.

## Dependent and Independent Demand

Demand may be either independent or dependent

- (1) *Independent demand* for an item is influenced by market conditions and not related to production decisions for any other item held in stock. In manufacturing, only end items, i.e. the final product sold to the customer, have exclusively independent demand.
- (2) *Dependent demand* for an item derives from the product decisions for its 'parents'. The term 'parent' is an item manufactured from one or more component items. A table, for example, is a parent made from a top, legs and fasteners. A component is one item that goes through one or more operations to be transformed into a parent.

There is a cyclical nature of many inventory items. They come into stock are issued then re-ordered on a continuous cycle. If demand were always constant (which is not realistic in an independent demand situation), the ideal inventory movement could be represented as in the saw-tooth diagram as below:



Independent demand:

- (i) can only be estimated
- (ii) although fluctuating with random market influences, usually demonstrates a continuous and definable pattern.

Dependent demand

- (i) derives from production decisions for its parents and can therefore be forecast
- (ii) due to the practice of scheduling manufacturing in lots, is usually discontinuous and 'lumpy'.

## Materials Requirements Planning (MRP) Systems

Dependent demand items are those for which demand depends ultimately on the demand for the end product.

Independent demand items are not correlated to the demand for the end product - MRO supplies for example. An MRP system can be described as a system for supplying the number of components required to produce a known quantity of finished assemblies.

The MRP process starts with a master production schedule, which schedules the end-products to be completed week by week during the planning period. It is based on customer order levels, sales forecasts and manufacturing policy. The master production schedule is exploded to produce a bill of materials.

The MRP system will calculate gross requirements level by level, adjusting at each level for stock on hand and orders due in to get net requirements which are offset by lead times to arrive at dates by which back orders should be placed if net requirements are to be available in time.

A simplified summary of the stages of MRP is as follows:

1. Sales Forecast -updated with latest actual sales information
2. Sales forecast, customer orders and production policy used to produce the master production schedule (MPS)
3. MRP program calculates how many of each component and raw materials are needed by exploding end product requirements into successively lower levels in the product structure.
4. Net requirements calculated utilising inventory status file (that is, stocks and current orders deducted to give net requirements).

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5. Net requirements adjusted by lead times to determine order release profile.
6. Purchasing dept places order
7. Goods received

## **Manufacturing Resource Planning (Usually known as MRPII)**

MRPII is an extension of MRP in that it is a closed-loop MRP system. Various functions in production planning and control (capacity planning, inventory management and shop floor control) have all been integrated into a single system. Financial systems can also be included in the operation of MRPII. There are a number of operational advantages over MRP;

1. Planning can be prioritised - rush jobs can be brought forward in time and others put back with the necessary adjustment being made to material delivery schedules
2. Integrated functions into the systems (in particular, capacity planning, inventory management and shop floor control) allows feedback from them, making sure that the production plan is constantly kept up to date
3. There is feedback from vendors, the production shop, stores, when a problem arises in implementing the production plan which enables adjustment to be made to overcome these problems without delay
4. As it is a company-wide system and covers all aspects of the business and includes purchasing, inventories, production, sales, engineering and cash flows, all departments can operate with the same data. The interactions across the business are captured by the system, with, for example, the values of inventories, work in progress, and finished goods are known at all times.

5. If financial systems are included not only is it an operational and financial system, but it can be used for simulations.

## **Just in Time (JIT)**

Demand Planning should not be confused with JIT, which can be described as "a continuous flow production".

Demand Planning is certainly a necessary component of JIT, where materials and services are provided or generated in the exact quantities and just at the right time, with the obvious effect of keeping inventory down to a minimum and reducing costs. Demand Planning is appropriate for all organisations, not just those who subscribe to the JIT philosophy.

JIT takes the view that that inventory is not an asset but a liability and should be eliminated wherever possible. Hence stocks of production materials and components are kept to a bare minimum, as are stocks of work in progress (WIP). Supplies arrive when they are required, hence the expression Just In Time. MRP or MRPII should not be confused with JIT. MRP systems are for coordinating, ordering, scheduling and inventory, whereas JIT is a system for inventory reduction. The main difference between the two is that JIT requires the smoothing (i.e. fairly fixed quantities at regular intervals) of the product mix so the same mix of the end products is produced at regular intervals. MRP on the other hand is very sensitive to items in demand, which are reflected in the updating of the master production schedule (MPS). In many industries an MRP system is developed alongside a JIT approach. The principles central to JIT Philosophy can be summarised as follows:

- Quality is built into the product to ensure rework times are kept as short as possible; the goal is zero defects
- Inventory is not an asset but a liability to be eliminated if at all possible
- Set-up times are reduced to the level where they become insignificant

Traditional methods of production attempt to achieve long production runs and large lot sizes. This requires large amounts of capacity, large inventories and WIP in a short period of time but can result in queues, delays and plant standing idle. The basic operating principle is to start with raw materials and components with the emphasis on pushing work through the plant. This is costly in terms of working capital tied up and ultimately the rate of return on capital is reduced. In the JIT approach the emphasis is on pulling work through the system; nothing is produced for which no demand exists at the next stage. Hence, stocks of materials/components and WIP are effectively eliminated.

It is important that inputs to an MRP system - such as Lead times, Economic Batch quantities etc - are reviewed and updated periodically. This will ensure that stocks are as low as possible. Demand along the supply chain will be 'smoothed' where possible by avoiding 'lumping' demand on suppliers and creating demand amplification along the Supply Chain.

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