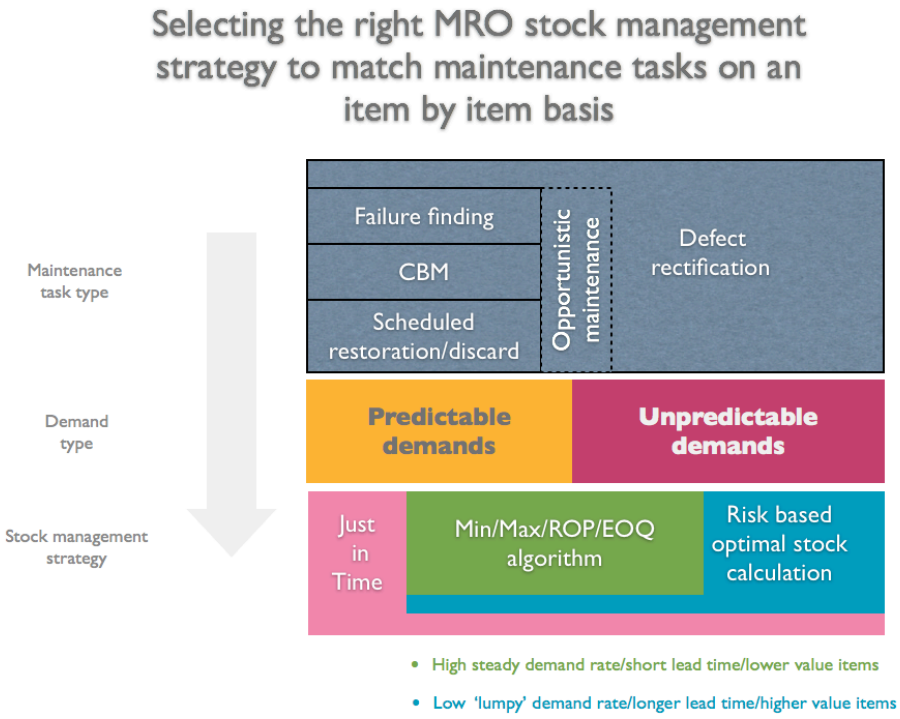
Don’t Sweat the Small Stuff

Managing general MRO consumables and high turnover spares

Brian Oxenham, November 2014

Introduction

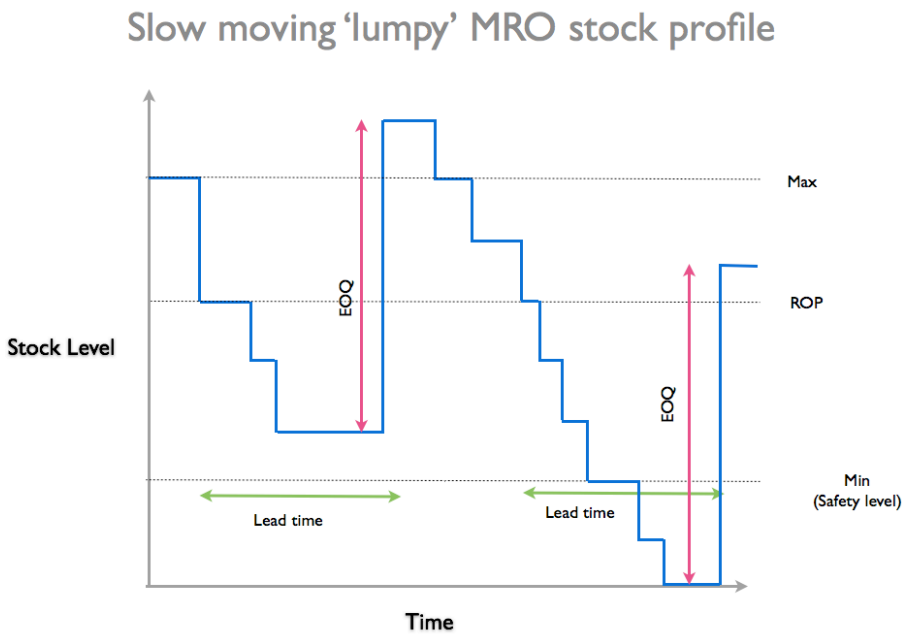
Our previous papers have focused on stock level setting processes for equipment spare parts. They described how methods differ depending upon the nature of the underlying failure modes that drive demand along with their consequences and the associated maintenance and repair strategy that they support.



We have focused on risk-based and Just-in-Time decision analysis for high consequence items and specifically on how minimum or optimal stock levels should be determined. Clearly the extra effort involved in analysing items on a line-by-line basis is worthwhile for high risk equipment.

The Small Stuff

Demand profiles for items subject to random and infrequent demand present a serious challenge for the ERP and EAM systems that manage inventory; shortfalls and overshoots can become a common occurrence, as we will see later.



Within a typical MRO inventory there are also many items where a high level of analysis and optimisation is not appropriate. In some cases the analysis may not even be possible. These items are the subject of this paper.

Typical examples are:

- Personal Protective Equipment
- Fastenings
- Seals
- Lubricants
- Cabling
- Lamps
- Drive Belts
- Roller Bearings
- Fuses
- Tools
- Gauges

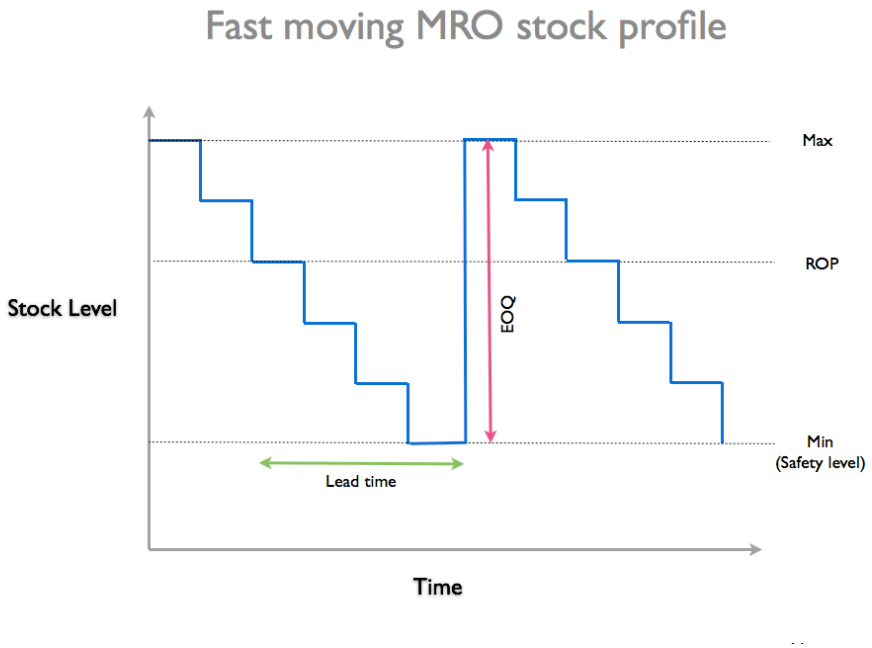
These items tend to share some or all of the following characteristics:

- High turnover
- Relatively low cost
- Short lead time
- Multiple sources of supply (OEM and after market)
- Multiple applications across the site (high installed base)

Collectively they make up a large proportion of purchasing spend but a low proportion of the stock value. Stock outs of these items are of lower consequence and, because of their higher availability, of short duration. Despite this, management of these items takes up a large amount of stores personnel time and effort because of the volume of transactions. They are often candidate materials for vendor stocking. They are frequently managed through bulk replenishment of satellite stores distributed across a site or perhaps in repair vans.

"Management of these items takes up a large amount of time"

High demand rates for these items mean that inventory levels approximate to a classic repeatable sawtooth pattern as shown below.



It therefore becomes possible to forecast demand rates reliably and, with knowledge of lead times, to confidently set a re-order point (ROP) that allows for stock replenishment that achieves negligible risk of unavailability. In its simplest form this system is represented by a Min/Max cycle where

Min = (*safety level*)

Max = *Min* + *EOQ*, and

ROP = (*Demand Rate* x *Lead Time*) + *Min*

Where lead time and demand rate data are less consistent, more complex statistical formulae are employed to reflect this deviation and raise the value of *Min* to a calculated safety stock level providing more protection against fluctuations in demand and supply. Some stock control systems continually capture distribution of demand and lead time and iteratively feed back to recalculate safety stock levels.

Consistent demand means that buyers can establish economic order quantities (EOQ) and therefore purchase in larger quantities to achieve cost savings through bulk buying and reduced transactional costs.

Economic Order Quantity is classically defined by the Wilson formula

$$Q^* = \sqrt{\frac{2DK}{h}}$$

where the terms are

*Q** Economic order quantity

D Annual Demand Quantity

K Cost per order of ordering shipping & handling

h Annual holding cost per unit (warehousing, cost of capital tied up, insurance and so on)

Note that the purchase cost of the item has no impact upon the EOQ derived from this formula.

This formula is the basis for the majority of system-generated EOQ values and has its roots in the theory of raw material inventory management. It works well in that environment: stock turns are high and inventory is consumed by the downstream manufacturing process in a relatively short period, long before it could deteriorate.

"In the MRO environment it can be disastrous"

However, when applied in the MRO environment it can be disastrous. MRO stock turnover is usually far lower than that of production materials and there is a constant danger that items could be damaged in store or suffer simple age-related deterioration (for example, O-rings, flexible hoses and adhesives). If a component deteriorates in store, it may be fitted to equipment where it fails prematurely. The associated lost production and remedial costs can be many times greater than any initial savings derived from batch discounts and lower transactional costs.

High system-generated EOQ values can result in inventory levels that have a duration extending beyond asset life. If items are not linked to a Bill of Materials (BOM) and remain aon the shelf for long periods, organisations eventually forget why they were purchased and they languish until finally they are sent for disposal. The message for MRO items is to look for ways to buy economically in small quantities, and examine very closely the full implications of the standard, system-generated EOQ levels before adopting them. Alternatively, adopt an algorithm that can model the more complex factors specific to MRO inventory usage.

Consignment and vendor stocking agreements with call-off orders have become popular in this area for good reason. Well-managed contracts can benefit all parties, particularly where lead times are short. However, organisations must fully understand that the vendor's offering reduces inventory management cost through reduced wastage, transactional and storage costs. Very rarely does the vendor agree to carry the full risked costs associated with failing to deliver within the required lead time.

Provided that these caveats are observed, in contrast to the low frequency lumpy demands for many equipment spare parts, ERP/EAM inventory management functionality is usually well able automatically to manage stock levels of these items. There is little or no requirement to conduct complex calculations on an item-by-item basis in order to factor in the business risks associated with stock outs.

The most appropriate performance indicators to use here are the simpler measures of stock out rate, fill level, duration and stock turn.

Stock Out Rate	The number of unsatisfied stock demands per annum
Fill level	The percentage of demands fulfilled.
Duration	Given current consumption rate, the time period until existing stocks are depleted before replenishment.
Stock turn	Yearly consumption divided by the stock

Choosing different target stock out rates and fill levels impacts directly on the safety stock level.

It is generally quite acceptable to set blanket performance indicators for this class of items against which to measure the efficiency of an internal stores organisation or perhaps an external contractor performing this service. Stock turns are also of particular interest with organisations looking for values in excess of 2-3 per annum for this inventory class.

To keep control of inventory value, focus should always be placed on identifying and managing down excess items (frequently defined as stock in excess of the reorder point plus EOQ). Stock quantities with a duration that exceeds expected asset life are also targeted. In order to manage down average inventory level without impacting service levels it makes sense to reduce order quantities before lowering reorder points.

A word of caution is essential. Past records are no guarantee of future performance; it just helps a lot. Circumstances and associated consumption patterns can change, but generally systems are able to compensate automatically for any overstocking or understocking since underlying demand rates are likely to remain strong. Fundamentally an overstock of rubber gloves is not going to bring a business to its knees. Notwithstanding this observation it does always make sense to ‘follow the money’. Examining high spend items sometimes presents a good opportunity for reviewing processes to identify

- Profligate wastage
- Theft
- Opportunities for price review with OEM and alternate vendors

As is the case with all inventory, an aggressive structure programme of ongoing review is appropriate.

Finally, another interesting vulnerability occurs where a central store supports multiple satellite stores carrying the same class of items. The bullwhip effect can drive high inventories at the central store. Fast demand feedback can help to reduce this, but replenishment orders can sometimes be placed immediately after items have been demanded; when parts are then returned to stock unused, the result is an immediate overstock.

Summary

For fast moving/general MRO items

- Don’t sweat the small stuff: these items are probably not going to wreck your business financially
- Trust your systems (when properly configured) to manage these inventory lines
- Be sure that your EOQs are actually economic; look for reasons why they should be smaller
- Make good use of consignment and vendor stocking if possible, but understand how it fits with your risk profile
- Use blanket KPIs to derive appropriate minimum stock levels and to monitor performance
- Follow the money: look for wastage, theft and opportunities for cost savings
- Establish a proactive inventory review process

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