



## 12 Best Practices of MRO Inventory Optimization

### Minimize costs, maximize uptime with MRO Inventory Optimization Control

#### Situation:

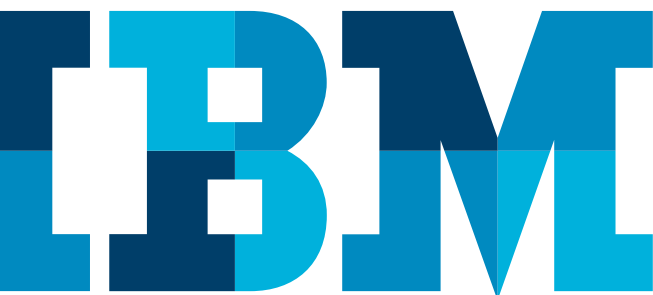
Where are you today with your MRO inventory levels? Too much, so that you're continuously having to write off inventory for pennies on the dollar? Too little, so that you're constantly hurting due to poor service levels with your maintenance and reliability organization? Either way the cost of running the operation is higher than what it should be. And that erodes your competitive edge.

#### Challenge:

Structural problems within the underlying inventory management system, inaccurate manual processes and lack of best practices can have very real consequences. Are you paying too much? Are your assets underperforming? Mitigating risk, meeting service levels, maintaining high safety levels and managing costs should not be competing goals – but can you truly find a balance that works?

#### Solution:

The answer is yes, you can. It's called "optimization". By optimizing MRO inventories, companies can dramatically improve their asset management outcomes. But doing it right requires appropriate technology. With a decision-support system incorporating a best practice methodology, inventory managers can have a consistent and powerful tool for managing their responsibilities, allowing them to be significantly more effective.



## Results

An optimized MRO inventory builds a level of credibility that's tangible and sustainable over time, honing a company's competitive edge. Improving management of MRO spares and consumables inventories with optimization technologies and best practices consistently produces measurable benefits. Beyond simply getting the right parts and materials to the right place at the right time, optimizing your MRO spares inventories helps you reap substantial cost savings and drive greater operational efficiencies. Better inventory performance means you can meet or exceed reliability, safety and production targets.

In this whitepaper, you will find a practical guide to 12 high-level business requirements for optimizing MRO inventory spares and consumables, along with the elements of an ideal MRO optimization system. These best practices are fundamental to inventory optimization – and to achieving the levels of inventory efficiency that help drive better asset performance and substantial bottom-line savings.

*“MRO is really about getting the maintenance, inventory, and supply chain groups to work better together to make sure spare part service levels are maximized while balancing cost and risk.”*

*- Sankara Narayanan, Senior Analyst, Frost & Sullivan*



## Introduction

### **Determining the optimal stock levels for MRO**

Determining the optimal stock levels for MRO spares should be a science, not an art. But for most organizations, it represents an impossible numbers game.

Inventory managers are faced with the challenge of managing tens or hundreds of thousands of items, each with their own characteristics, requiring complex and time-consuming calculations. Without a structured methodology and powerful analytical tools, the proactive management of large inventories becomes an impossible task, resulting in rapidly increasing inventory levels combined with critical shortages of spare parts.

Today, organizations without optimized inventory run the risk of overpaying and underperforming.

In order to avoid costly shortages, MRO inventory managers can often choose to err on the side of caution when it comes to determining stocking levels. But that strategy has its costs. Inventory consumes space, gets damaged, and sometimes becomes obsolete – and carrying surplus inventory costs the organization. Over time, massive amounts of unused or obsolete inventory translate to waste and loss.

Simply, optimizing inventory means finding the perfect balance between demand and supply. The two key elements that dominate and define optimization are risk and ROI. You could think of inventory optimization as maximizing return at a given risk level, or minimizing risk for a given expected return.

Optimized service spares inventory maintains a level of inventory that virtually eliminates out-of-stock situations while improving efficiency and cutting inventory costs.

Any company that carries MRO spares inventory can benefit from implementing optimization principles and practices. Optimized inventory suggests that an organization is putting its inventory investment where it should, when it should, without incurring unchecked future risks.

An optimized inventory builds a continuous improvement loop that can produce tangible, sustainable results over time – driving asset performance, competitive advantage and positive bottom line results.

### **MRO inventory can include:**

- All maintenance spares held for responding to unplanned breakdowns and scheduled maintenance.
- The operating supplies needed to keep the maintenance processes running.
- Spares held by OEMs (original equipment manufacturers) to service the equipment you have purchased from them.
- Inventory held by suppliers that becomes your inventory.

## Optimizing MRO inventory

To achieve the business benefits discussed in this whitepaper, companies need an approach that supports the distinct management requirements of MRO inventory, including:

- High criticality
- Long lead time
- High price
- Generally infrequent and highly variable usage
- Low data quality

Make no mistake – achieving and maintaining inventory optimization is complicated and challenging. But, it’s also transformative. That’s why best in class organizations take it on – the business transformation benefits, including increased service and safety levels, reductions in inventory holdings and stock-out risk, far outweigh the costs.

With the right tools and technology, supported with the right MRO processes and best practices, successful companies are making that transformation and reaping substantial rewards.

### **Inventory optimization technology**

Optimized inventory requires frequently obtained data points and evolution of the inventory in question based on those measurements in real time. A decision support system that incorporates best practice methodologies gives inventory managers a powerful tool to manage their business objectives and make their teams significantly more effective.

By leveraging technology tools, automated processes and inventory management best practices to optimize MRO

spares and consumables, asset-intensive organizations can consistently produce results like these:

- Up to 50 percent reduction in unplanned downtime related to parts
- Up to 40 percent reduction in inventory costs
- Up to 35 percent savings in maintenance budgets
- Up to 25 percent increase in service levels

## 12 Best practices of Inventory Optimization

### **Key business criteria**

- 1. Criticality analysis**
- 2. Demand forecasting**
- 3. Lead time forecasting**
- 4. Issue size forecasting**
- 5. Economic modeling**
- 6. Optimization of reordering parameters**
- 7. Exception management**
- 8. Inventory segmentation**
- 9. Spares risk assessment**
- 10. Spares pooling**
- 11. Knowledge capture**
- 12. Inventory key performance indicators**

# The 12 best practices of MRO inventory optimization

These best practices — the new business requirements for MRO inventory optimization — are based on specialist IBM® MRO Inventory Optimization analysis and optimization methodologies developed by IBM — and supported by IBM® MRO Inventory Optimization. These demonstrated best practices are fundamental to achieving the significant inventory reductions and substantial bottom-line savings that are the hallmarks of inventory optimization.

## **1** **Criticality Analysis** – Generate a recommended criticality (business impact code) for each stock item by analyzing:

- Application (where used and fitted)
- Commodity classifications
- Practical “real-world” considerations or “workarounds”
- Supplier or Original Equipment Manufacturer
- Price
- Other factors and business rules

## **2** **Demand Forecasting** – Commissioning of additional equipment may be expected to increase demand for certain inventory items. Demand forecasting capabilities should include:

- Selection of appropriate forecasting algorithms
- Automatic selection of algorithms for each stock item
- Use of forecasting and statistical distributions that are appropriate for a wide range of spares items including slow moving and lumpy demand (e.g., Poisson, Negative Binomial, Binomial, Normal)
- Clipping and filtering techniques to manage abnormal data
- The ability to isolate planned maintenance and project demand from unplanned demand
- Capabilities to use knowledge of expected future events or trends to apply demand profiles to future forecasts

## **3** **Lead Time Forecasting** – Forecast lead time is a key factor in determining optimal safety stocks – aspire to achieve these capabilities:

- Forecast average lead time using purchase order and receipts history
- Filtering and clipping techniques to eliminate abnormal data
- Override lead times as required
- Calculation of lead time variance and use of this variable in calculating expected service level

**4 Issue Size Forecasting** – The number of units typically required for an application (the issue size) is also a key factor in determining stock levels – a good inventory optimization solution will provide:

- The ability to forecast average issue size using issues history
- Appropriate filtering and clipping techniques to eliminate abnormal data
- Capabilities to override forecast issue size as required
- Calculation of issue size variance and use of this variable in calculating expected service level

**5 Economic Modeling** – Economic modeling capabilities should allow for “what-if” modeling of inventory trade-off decisions:

- Inventory holding costs for different types of items
- Total replenishment costs for different purchasing methods
- Expediting or emergency freight costs
- Stock-out costs, based on criticality and duration of stock-out
- Comparing existing and optimized results for metrics such as:
  - Inventory value
  - Service level
  - Turnover
  - Annual inventory costs

**6 Optimization Of Reordering Parameters** – The reordering parameters – minimum and maximum levels (MIN/MAX) – used by the enterprise resource planning (ERP) and enterprise asset management (EAM) materials management systems to generate replenishment orders are the main determinants of inventory outcomes. Reordering parameters should be optimized periodically to reflect changes in usage, lead time, criticality and other factors. The optimization process addresses:

- Selection of appropriate algorithms to optimize minimum and maximum stocking levels
- Use of an economic cost model that considers costs of holding inventory, replenishment, expediting and stock-outs as a preferred alternative to a fixed service level approach
- Analysis of groups of items rather than one-by-one, one at a time
- The ability to perform “what-if” modelling and compare optimized results against current inventory performance
- Consideration of “real-world” constraints including:
  - Maximum bin capacity
  - Storage capacity
  - Standard pack sizes
  - Set sizes



## **7** **Exception Management** – For large, complex MRO inventories, a “management by exception” approach ensures that inventory

- Tools for users to define any number of exception conditions with related alert thresholds
- The ability to search, sort and filter by exceptions
- Mechanisms to exclude changes to reordering parameters for items with exception conditions

## **8** **Inventory Segmentation** – Inventory segmentation provides a management framework for inventory that recognizes that a number of different management techniques are required for various item profiles:

- Segment the inventory based on characteristics such as:
  - Usage value
  - Holding value
  - Movement frequency
  - Availability
  - Criticality
  - Commodity
  - Stock holding method
- Apply structured policies or business rules to the management of each inventory segment, such as:
  - Manual control of special items
  - Review of potentially obsolete items
  - Items suitable for statistical optimization
  - Items that can be made non-stocked
  - Surplus and obsolete for disposal

## **9** **Spares Risk Assessment** – Some MRO inventories will include a high proportion of spares that are high cost, critical, have little or no expected usage and require long lead times to receive. Managing these items requires specific techniques:

- Risk modelling of the effect of holding zero, one or two sets
- The ability to perform sensitivity analysis around expected mean-time-between-demand and stock-out cost
- The ability to model or override all inputs to the stocking decision
- Decision-support tools to assist in new stock purchasing or deferred replacement decisions
- The ability to model the repairable item replenishment cycle

**10 Spares Pooling** – Significant reductions in overall safety stock investment are possible through the pooling or sharing of high value, infrequent items (insurance spares) across multiple sites. To facilitate such arrangements, asset-intensive companies need to:

- Identify common spares that are suitable for sharing
- Establish the optimal number of pooled spares to be held
- Determine the optimal location for holding the spares

**11 Knowledge Capture** – Capturing organizational knowledge relating to inventory items is an important business process in preventing mistakes and re-investigation; the inventory optimization solution should:

- Capture notes and commentary about inventory items
- Provide an audit trail for decisions
- Ensure high data quality for input parameters and classification codes
- Provide reminders when reviews are due

**12 Reporting Inventory Key Performance Indicators (KPIs)** – Inventory KPI reporting is important to allow progress in improving inventory to be tracked.

KPI reporting should include:

- A selection of pre-defined inventory management reports
- The ability to automatically capture a large selection of pre-defined inventory KPIs
- The ability for users to customize reports and statistics

## Conclusion

For today's asset intensive companies, competitive advantage requires a positive mindset towards innovation and technology. Without technology solutions and best practices, companies are left to struggle with manual processes, standard ERP system functionality, and ad hoc databases or spreadsheets. These manually intensive approaches are prone to error and impossible to sustain on a repetitive basis.

Automated continuous MRO inventory optimization is just good business. Achieving and maintaining inventory optimization is possible and profitable, with the right tools and the right type of help. IBM's unique functionality expertise, combined with proven MRO inventory optimization capabilities, helps our clients fulfill the 12 business requirements outlined here. Furthermore, advances in asset optimization including predictive capabilities depend on accurate stock levels to execute recommended tasks. IBM® MRO Inventory Optimization solution and services form part of a set of asset management and optimization capabilities available from IBM.

In fact, many leaders in asset intensive industries throughout the world complement and extend the value of ERP/EAM systems such as IBM® Maximo, SAP, Oracle, Ellipse and others with IBM's MRO inventory optimization capabilities and best practices. By optimizing their MRO inventories, IBM's clients can achieve levels of inventory efficiency, asset performance and bottom line savings that can make their executives and stakeholders very happy.





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