

White Paper



MRO Supply Chain Optimization in Manufacturing and Utility Industries

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Maintenance Repair and Operations (MRO) supply chain not only provides one of the best opportunities to reduce cost of operation and increase productivity but also offers complex challenges such as end to end integrated planning, increased availability of assets, inventory optimization and effective spend management. This paper gives an overview of the challenges faced in MRO supply chains and highlights some of the approaches to meet these challenges, drive efficiencies and optimize the entire supply chain.

In challenging economic scenarios, where organizations are constantly under pressure to reduce costs and increase profitability, optimization of Maintenance Repair and Operation (MRO) supply chain, also known as indirect supply chain, is one of the greatest initiatives where manufacturing and utility organizations can unlock value and drive significant savings.

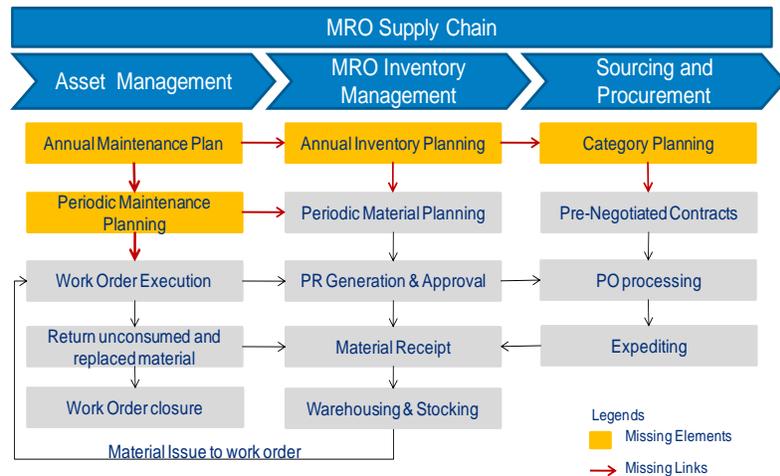
MRO is traditionally seen as a low value & indirect supply chain. There has been less of focus and investment in new processes in systems in the past, which resulted in the MRO supply chain taking the back seat. Of late, organizations have started looking at MRO supply chain as one of the potential areas to drive efficiencies. At the same time, technology & outsourcing service providers have come up with unique solutions to address the need of this segment.

This paper gives an overview of the typical challenges seen in MRO supply chains of manufacturing & utility organizations and presents some approaches to drive and add value through IT application implementation, process improvements and consolidation and by moving some of the processes to a centralized offshore delivery centre in a low cost country.

Challenges and key pain points in the MRO supply chain

Lack of integration in MRO supply chain functions

MRO supply chain consists of three key functions i.e. Asset Management, Inventory & warehousing and sourcing & procurement. Traditionally, these functions are viewed in silos in the organizations. Although organizations are focused on integrating transactional processes such as work order execution, purchase requisition management, inventory issue/receipt/return and purchase order processing, they are yet to move forward to integrate end to end processes, right from the level of planning to the level of execution across all MRO supply chain functions. A lack of integration of processes specifically at the level of planning results in suboptimal inventory management, high procurement costs and higher unavailability of assets.



Inaccurate and incomplete Master Data

Master data management activity is one of the most important activities in MRO supply chain and acts as a foundation stone for success of the planning and execution functions. Below are the key elements of master data which play a crucial role in MRO supply chain

Asset Master

Asset master is one of the most important elements of master data in the MRO supply chain. In asset master, most often than not, the Asset BOM (Bill Of Material) and spare part linkages are not defined, which results in inefficient inventory planning, high inventory obsolescence, non availability of spares on time and increased maintenance costs in the long run. Other missing and incomplete details in asset master such as associated also down assets, asset hierarchy, etc also causes poor visibility for opportunity maintenance and material planning for associated assets and lead maintenance personnel to miss maintenance opportunities of these assets.

Incomplete or Inaccurate Maintenance Task BOM

Maintenance task lists are one of the major components in maintenance plans and work orders. Once the task lists are defined along with BOM, these task lists then help in automating the planning to execution cycle and also provide help to plan the material in advance. If task BOM is incomplete and inaccurate then it may hinder the material planning, material requisition and reservation process.

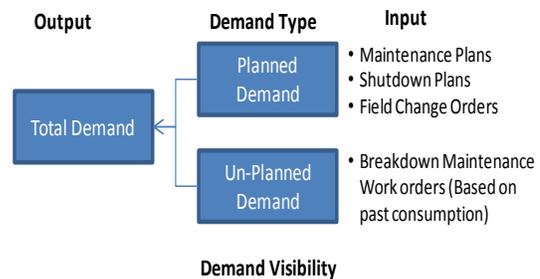
Part Cataloguing

One of the characteristics of MRO supply chain is that there are thousands of parts in the system with each part having unique characteristics & attributes. Proper and structured cataloguing of these parts is a major challenge. Inaccurate and incomplete cataloguing leads to

- Difficulty for the end user to search the material
- Duplication of SKU codes
- Increased chances of stock outs due to duplication
- Increase in inventory due to duplication

Lack of demand visibility from Asset maintenance plans

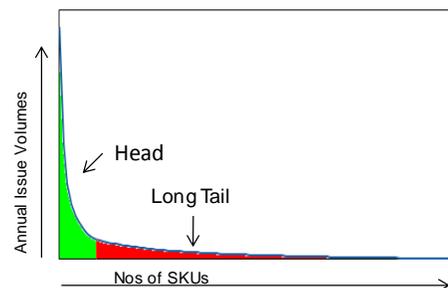
Asset Maintenance, being the demand driver, presents two types of demands in the MRO supply chain – Planned and Unplanned. Planned demand arises out of planned preventive/predictive maintenance plans, shutdown plans and field change orders whereas unplanned demand arises out of breakdown and unplanned maintenance. Demand invisibility in the supply chain may arise if the plans are not made in ERP/EAM (Enterprise Resource Planning / Enterprise Assets Management) systems or if the maintenance personnel carry out maintenance planning and work order management manually without entering the data into the ERP/EAM systems. The demand invisibility will affect Inventory management and sourcing processes significantly and will result in higher costs throughout the supply chain



Difficulty in managing inventories

MRO inventories are characterized by large numbers of SKU bases, different attributes and high demand variations ranging from non-moving SKUs to fast moving SKUs. Part criticality and demand unpredictability aspects further complicate the inventory planning process. All these factors require highly skilled resources to carry out planning and select the right stocking policy. Most of the ERP applications do not come with the features for dynamic inventory planning and hence it makes inventory planning more difficult. Due to ineffective planning, the following problems may arise

- Suboptimal inventories- Too high inventories for some parts while non availability or too low inventories for other parts
- Higher Inventory levels i.e. more than 1.5% of Asset Replacement Value (ARV)
- Lower service levels
- Higher level of non moving and obsolete inventories



- Less than 15% of the parts fall in head. It is easy to develop the stocking policies for these parts
- More than 85% of the parts fall in tail. The demand pattern for these parts is lumpy. The lumpy demand poses difficulty in identifying the correct stocking model

- Asset under maintenance for longer duration in case of non availability of spare

Warehouse inefficiencies and inventory inaccuracies

Since MRO materials are large in numbers and each material differs in size, shape and attributes ranging from gas to solid, light & simple parts to large and complex sub assemblies, some parts being prone to pilferage, some perishable in nature with short shelf life, some parts requiring sophisticated preservation techniques and some parts requiring controlled environmental storage conditions. All these factors make the warehousing extremely complex & challenging and require highly skilled resources who understand commodities and warehousing requirements of such commodities. Some of the implications of these challenges are:

- Non availability of the stock at right quantity at the right location leading to equipment under break down for longer duration
- Non availability of spare parts at the right time leading to equipment under break down for longer duration
- Availability of spare parts in unusable condition leading to order expending and equipment under breakdown for longer duration
- Inventory Shrinkage due to pilferage and damages
- Maintenance personnel lose faith in system

Fragmented supply base

Fragmented supply base across the categories is another challenge. Supply base is even more fragmented in organizations with multiple locations and decentralized procurement processes. At times there may be many codes for the same supplier. Due to fragmentation, there is a limited opportunity to leverage the spend value and get the most competitive prices and most favorable terms & conditions such as short delivery lead times, pay terms, return policy for obsolete parts, Vendor Managed Inventory (VMI) programs, etc.

Complex & non uniform procurement processes

Value of MRO materials varies significantly, and so do the associated procurement and approval processes. It has also been observed that the approval & procurement processes differ significantly from site to site within the same organization. Complexity in procurement processes increase the internal lead time leading to increase in safety stock of the materials and add to the high purchase order processing costs.

Approaches for improving MRO supply chain efficiencies and benefits

To address these challenges and drive efficiencies in MRO supply chain, organizations may use following approaches

IT enablement

Most of the ERPs do not come with features such as dynamic inventory planning parts cataloguing & e-procurement, which are highly useful & specific to MRO supply chains. With help of a consulting services provider, organizations can assess the portfolio of existing IT applications and identify the required tools. Once the required IT tools have been identified, the organization can look for IT services providers to implement and integrate bolt-on tools on the existing ERP/SCM applications. The benefits of using these IT applications are

- Enriched parts catalogue with reduced chances of duplication of codes
- Automated and dynamic inventory planning leading to optimized inventories
- Automated procurement processes leading to reduced procurement lead times and PO processing costs

Delivery through Offshore model from low cost countries

Organizations can identify processes, which can be executed from offshore location at a lower cost. These processes can be consolidated at a global level and can be moved to low cost countries. Organizations can not only reduce processing costs but also benefits from the high level of standardization and improved control attained by moving some of the processes to a centralized offshore delivery centre. Some of the processes, which can be moved from multiple locations and delivered from centralized offshore location, are as under. These processes can help the organization drive efficiencies and meet some of the challenges effectively in MRO supply chain.

- Master Data Management
- MRO Supply chain planning
- Asset Maintenance, Inventory & category Planning
- Parts Pooling
- Supply base rationalization
- Purchase Order Processing
- Disposal Management

Increase focus on Master Data Management

Master data is one of the most critical elements in the entire MRO supply chain and needs to be managed effectively. Organizations can review the existing master data management processes and systems, bring discipline in the whole process and focus on improving the quality & enrichment of the master data for Assets, Suppliers, Part catalogues, part categorization, Part & Asset BOM linkages and maintenance task BOMs on ongoing basis. If master data is being managed in different locations and systems then master data can be moved & managed at a centralized location. Benefits of moving to a centralized location would include increased accuracy & standardization of data set and increased accountability of the team.

Improve integrated planning

Once the required master data is ready, organizations can assess the current state of planning processes, implement a well defined process for annual & periodic planning for Maintenance and ensure that the processes are followed by maintenance planning teams. Annual & periodic maintenance planning will be one of the inputs for annual and periodic inventory and category planning. Benefits envisaged through this process are as under

- Improved demand visibility
- Improved inventory planning
- Improved service levels
- Improved category planning and reduced cost of procurement

Deploy scientific inventory models

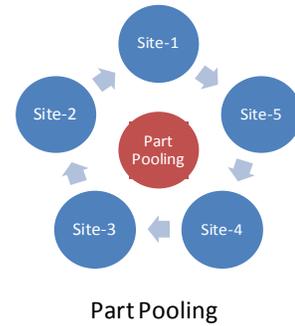
MRO supply chains are characterized by high counts of parts with high variation in demand pattern and varied part criticality. Inventory planning team may evaluate the stocking policies and consistently update data such as required service levels for parts, criticality and demand predictability aspects in consultation with end users on an ongoing basis. Planning team can develop the questionnaire, rules and parameters to identify and measure the criticality, service level requirement and demand predictability aspects for the parts. The team can decide whether the part is stock or non stock item based on the demand predictability and criticality. For example, if the demand of a part is not predictable and part is highly critical then it should be treated as stock item. Since the movement pattern of parts varies from no movement to fast movements, planning team can classify the SKUs based on movement and select the right stocking models for each of the movement class to come out the

ROQ and ROL levels for the stock items. Stocking model differs based on movement classes; for example, for fast and regularly moving parts, normal probability distribution is appropriate in finding the right ROL whereas; for items with very slow movements, Poisson distribution is the most appropriate model. The benefit of using these approaches are-

- Optimized inventory- neither too high nor too low
- Improvement in service levels
- Ease in identifying unplanned demand
- Streamlined processes

Initiate parts pooling

Organization with multiple locations and same sets of assets can reduce inventory of expensive parts and increase service level by leveraging parts pooling and exchange programs. A centralized inventory planning team of the organization can play a crucial role in the pooling processes right from identifying the pooling location, pooling stock and pooling quantity to supporting the locations in the day to day inter warehouse and inter location transfers.



Improve warehouse productivity and eliminate inventory inaccuracies

Some of the approaches are -

- Group the materials with respect to size, shape and physical storage requirements and keep the same material group at a designated single location.
- Periodic location auditing and implementation of preventive measures to reduce location discrepancy.
- Review existing cycle counting practices and audit the preventive measures
- Identify the parts that need preservation, and development & execution of the preservation plan to ensure that parts are in usable condition
- Store materials such as Batteries, CDs, adhesives etc, which can be pilfered, under lock and key
- Monitor and improve Goods receipt to storage location and requisition to delivery cycle times

Dispose-of non-moving and obsolete stock

The inventory planning team can identify obsolete assets by coordinating with the Asset management team and tag the associated obsolete parts periodically. Similarly, the inventory planning team can also identify the non moving parts, coordinate with end users for future use and tag such parts in the system. Once the non-moving and obsolete parts are identified, the organizations can analyze physical condition of the parts, markets where these could be sold, supplier buy back terms and initiate following action after analyzing the above factors.

- Coordinate with supplier for buy back
- Find customers who may need these parts and sell to them
- Sell as scrap if parts are not in usable condition

These steps of monitoring and management ensure that organizations can recover some value in dead inventory, which is normally written off.

Rationalize supply base

Organizations can leverage the MRO spend value through specification standardization of SKUs (Stock Keeping Unit), consolidation of procurement spend across multiple locations, cleansing of supplier master data, elimination of non performing suppliers and rationalization of the supplier base. The benefits envisaged are-

- Reduced cost of procurement
- Favorable terms with supplier such as reduced lead time, support from vendor for return of excess and obsolete material
- Reduced inventories due to specification standardization and reduced lead times

Improve tactical procurement processes

One of the characteristic of MRO supply chains is significantly high counts of purchase requisitions leading to significantly high counts of Purchase Order (PO) generation. PO processing and post order expediting are highly cumbersome & transactional activities in nature. These activities consume most of the time of the procurement personnel, leaving them with limited time to focus on strategic aspects of sourcing. Organization can review the existing annual spend based on part criticality, cost, supply source, etc, simplify & automate procurement processes and select the suitable procurement methods. For example, organizations can cover the maximum numbers of the critical parts under pre negotiated contracts and can simplify the tactical procurement process by reducing the numbers of approval levels for release orders/POs for parts against pre-negotiated contracts. Simplification and automation in procurement processes will help in reducing the procurement lead times and PO processing costs.

Conclusion

MRO supply chains processes are highly complex and time consuming. But if managed with structured and scientific approach then benefits such as low cost of procurement, optimized inventory and higher availability of assets, can be reaped. To manage MRO supply chains efficiently and improve continuously, organizations can also look forward to outsourcing services providers, who have pool of skilled resources and can provide cost effective end to end solution from transformation led IT initiative to MRO supply chain planning & execution processes.

About the Author

Lalit Khandelwal - is a consultant with Infosys BPOs Sales & Fulfillment practice. He has more than 11 years of experience, spanning across all functions of MRO supply chain and sales & distribution in process manufacturing industry. He is CPIM certified from APICS, USA and holds graduate degree in engineering from IIT Roorkee, India.

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