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INTELLIGENT MRO

12 Best Practices of MRO Inventory Optimization for Oil & Gas Companies

Minimize Costs, Maximize Uptime with MRO Inventory Control

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Minimize Costs, Maximize Uptime with Maintenance, Repair and Operations (MRO) Inventory 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 end customer? 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 safely 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, Oil & Gas companies 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 have a consistent and powerful tool for managing their responsibilities, allowing them to be significantly more effective.

RESULTS:

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

Wikipedia's concise definition of inventory optimization: ". . . a method of balancing capital investment constraints or objectives and service-level goals over a large assortment of stock-keeping units (SKUs) while taking demand and supply volatility into account."

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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 or stock outs, MRO inventory managers 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 produces 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've purchased from them.
- Inventory held by suppliers that becomes your inventory.

Optimizing MRO inventory

To achieve the business benefits discussed in this paper, companies need an approach that supports the unique 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, Oil & Gas organizations can consistently produce results like these:

- **15-25%** reduction in funds invested in safety stock
- **5-20%** decrease in write-offs of surplus and obsolete stock
- **10-25%** fewer stock-outs, for improved availability and productivity
- **10-25%** drop in administrative costs for replenishing inventory
- **33-66%** less resource time spent managing inventory

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 inventory optimization

These best practices — the new business requirements for MRO inventory optimization — are based on specialist inventory analysis and optimization methodologies developed by Oniqua — and supported by Oniqua Analytics Solution (OAS). These proven 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) materials management system 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 review time is focused on high value or problem items. Exception management capabilities include:

- 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 Oil & Gas 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.

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. Oniqua's unique functional expertise, combined with OAS capabilities, is currently helping Oil & Gas supermajors fulfill the 12 business requirements outlined here.

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

About the Author

Andy Hill is Oniqua's CEO and co-founder. Since beginning his career with Rolls-Royce Aerospace in the United Kingdom, and later establishing an Australia-based consulting business specializing in the optimization of maintenance spares inventory, Andy has conducted extensive research and simulation regarding the types of statistical profiles exhibited by maintenance and production-driven inventories. This real-world experience has informed the development of Oniqua's inventory optimization software application, Oniqua Analytics Solution (OAS). Andy has helped many asset intensive organizations across Australia, Asia, South Africa, Latin America and North America reduce costs and drive bottom line results by optimizing their MRO operations to drive asset performance.

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Oniqua provides Intelligent MRO (maintenance, repair and operations) capabilities that are transforming the way Oil & Gas, Mining and Utilities companies manage their capital-intensive assets. Our unique cloud-based offering combines the world's most advanced MRO analytics technology with analyst services, consulting, master data cleansing and industry expertise to optimize the performance of materials management and operations & maintenance activities. Oniqua does the "heavy lifting" on behalf of customers so they can achieve rapid benefits in the form of reduced waste and costs, minimized risks, greater efficiencies and smarter decisions across their MRO operations. Oniqua is proud to serve many of the world's largest energy and resources companies, including BHP Billiton, ConocoPhillips, Dow, BP, Newmont Mining, Rio Tinto, Freeport McMoRan, Tennessee Valley Authority, Nebraska Public Power District and many others.

Oniqua is owned by international oilfield support services company ASCO. The company employs over 2,500 people in four key regions, namely the Americas, Europe, Middle East & Africa and Australasia. The company currently has sales in excess of $1bn. Through Oniqua and its other businesses, ASCO offers a wide range of services including inventory and materials management, offshore supply base management, onshore oilfield support, environmental services, personnel and training, advisory and technical services as well as fuel services. ASCO's global headquarters is based in Aberdeen.

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