

IBM Maximo Inventory Optimization (MIO)

*AI-driven MRO Inventory:
Less downtime, more savings*



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Santa Anna, CA

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Today's Objectives

- State of the Industry
- MRO Challenge
- Overview
- How it Works
- AI in MIO
- Customer Successes



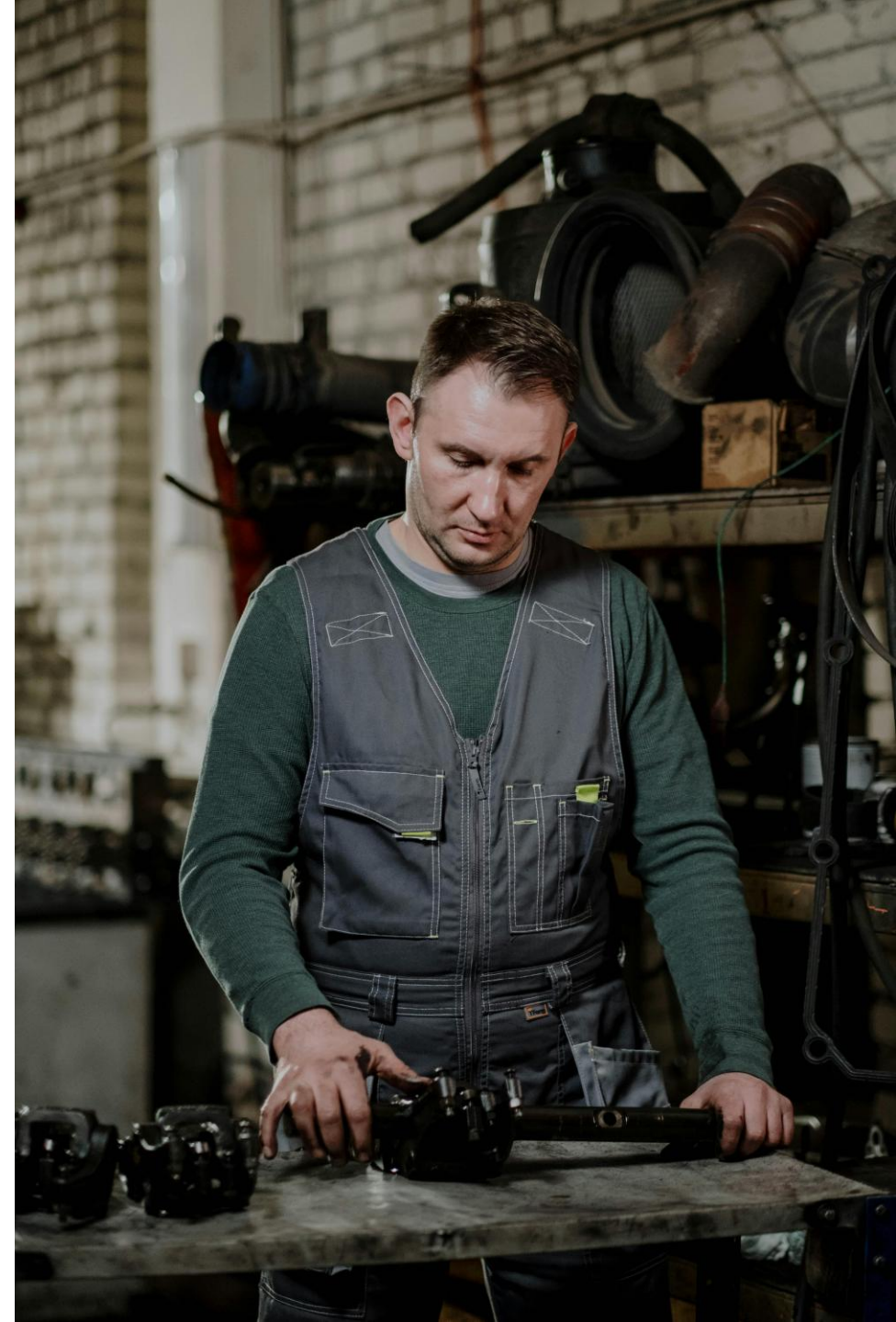
Trailing organizations view MRO as a traditional **cost center**, while leading organizations utilize MRO as a **strategic catalyst** for growth

\$91B spent on MRO spares in 2024

8-10% of MRO spare parts inventory used annually

20-30% of inventory value is spent on holding costs

20-30% of inventory is obsolete at any given time



A lot of working capital is tied up in stockrooms, **going obsolete!**



Fund new projects

Pay for upgrades
(MAS)

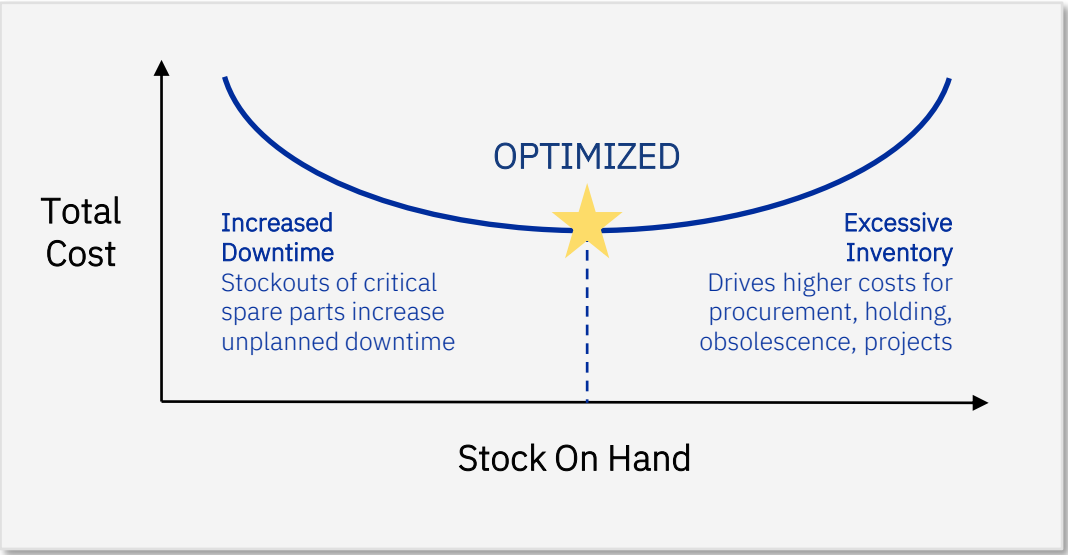
Improve balance
sheet

Reduce operational
costs

Increase
shareholder value

Maintenance, Repair, & Operations (MRO) Inventory Challenge

Why Optimize MRO Inventory?



Both Under and Over Stocking Drive Significant Costs

Why is Optimization so Challenging?

Massive number of unique MRO parts	Tens to hundreds of thousands of unique parts need to be optimized
Many input variables	Lead time, criticality, where used, number of suppliers, cost, adding new parts, etc.
Inevitable demand and supply changes	Process changes, production changes, acquisitions, decommissions, ERP/EAM changes, lead times, suppliers, etc.
Apply accurate cost model	Accurately factor in critical costs including procurement, downtime, holding, etc.
Cross functional stakeholders	Requires collaboration across functional areas including supply chain, materials management, maintenance, reliability, operations

Complexity

MRO Inventory Values are often >\$100M and increasing YTY

IBM Asset Lifecycle Management – An Integrated Solution

Powered by Maximo Application Suite SaaS



Extend the lifespan of **assets**.



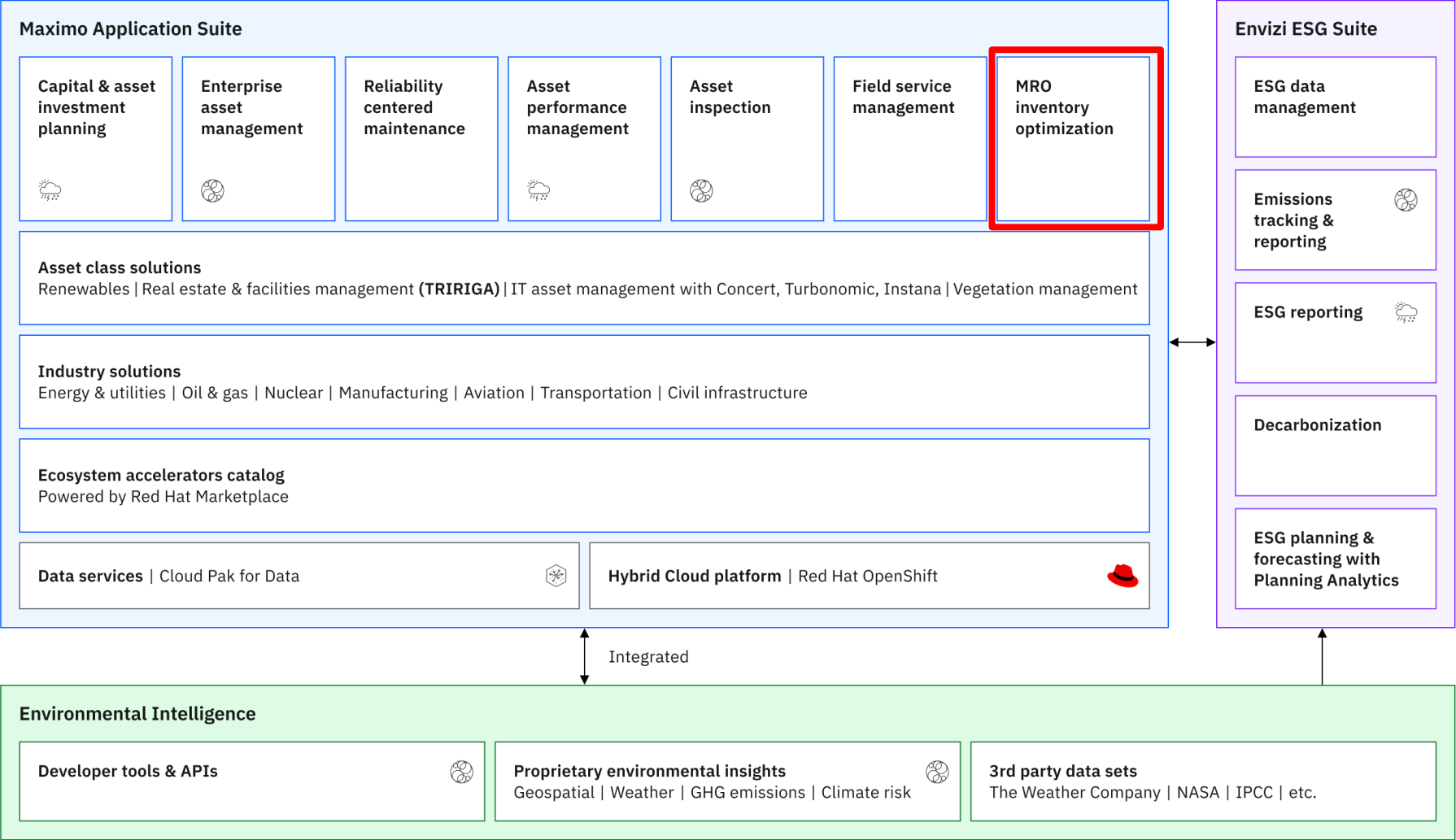
Reduce maintenance and **operations costs**.



Manage **risk** associate with availability and sustainability



Increase **workforce productivity**.



powered with **watsonx**



Environmental insights

IBM Maximo Inventory Optimization (MIO)

IBM Software as a Service (SaaS):

- Continuously optimizes MRO spare parts inventory
- Recommendations based on prescriptive analytics and optimization algorithms
- Rule-based criticality
- Consolidated data visibility enables new insights and actions
- Equipment visibility
- Process and workflow automation
- Highly configurable

Customer Data

- Integrates with ERP/EAM
- Certified connectors (Maximo, SAP)



↓ 40%

Inventory Cost reduction

↓ 40%

Inventory Analysis time reduction

↓ 50%

Asset Downtime (unplanned reduction)

↑ 25%

Service Level improvement

↑ 35%

Maintenance Budget savings

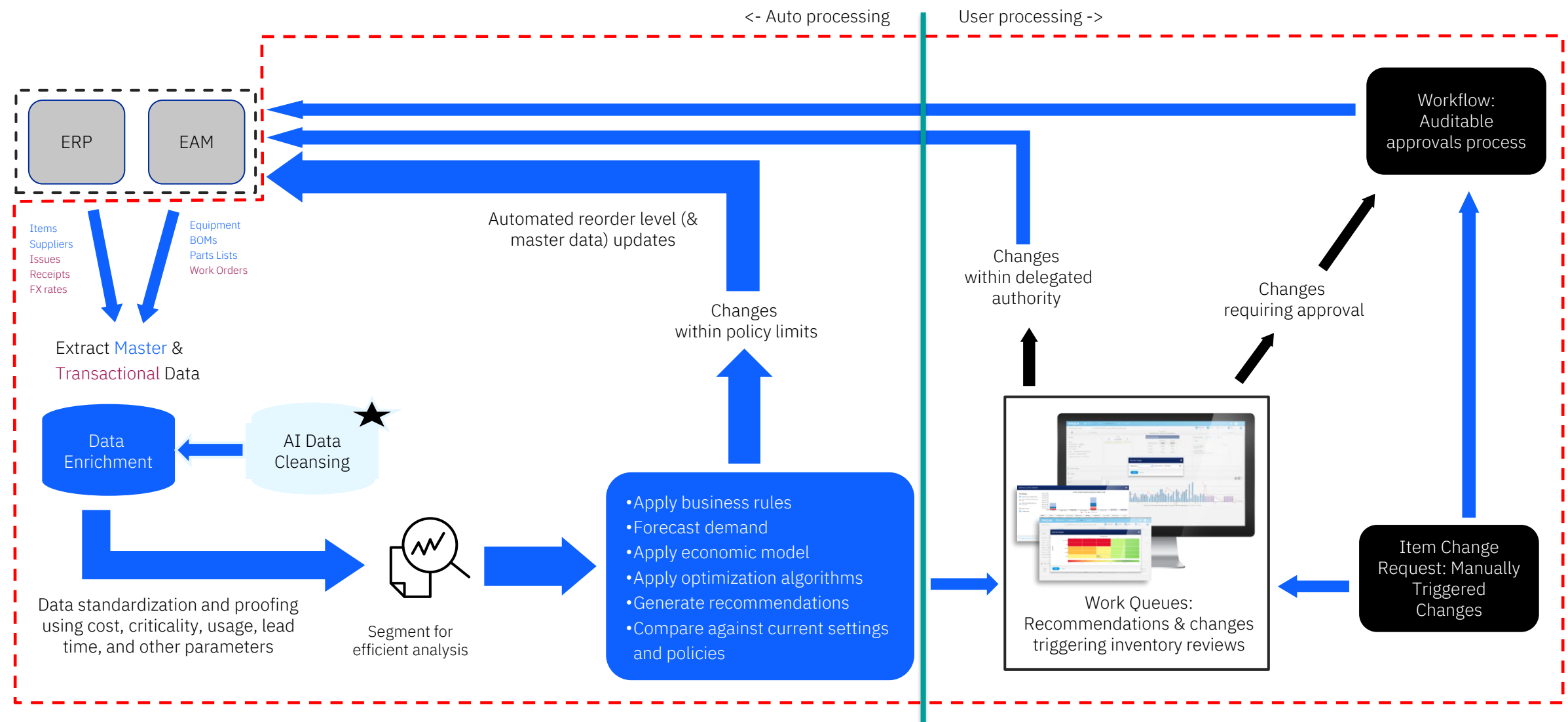
3-6 months

Implementation (typical)

ROI in less than 12 months

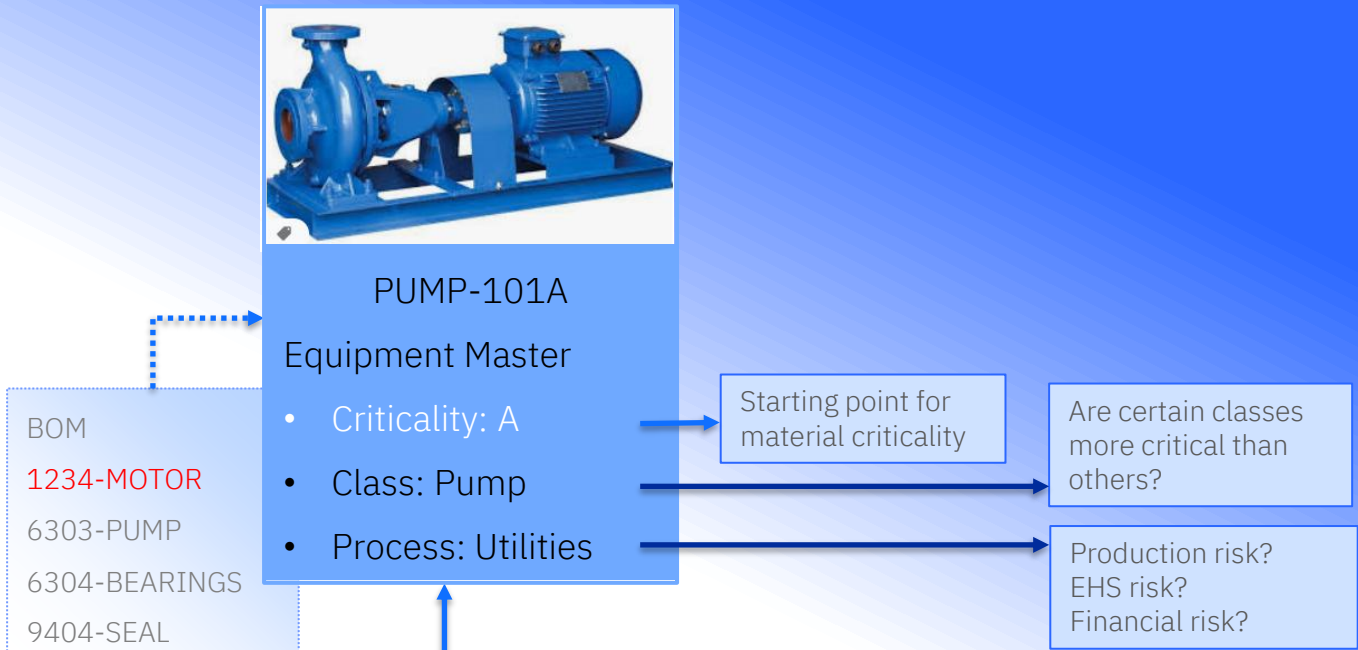
How IBM Maximo Inventory IO works:

Continuous, Automated Optimization

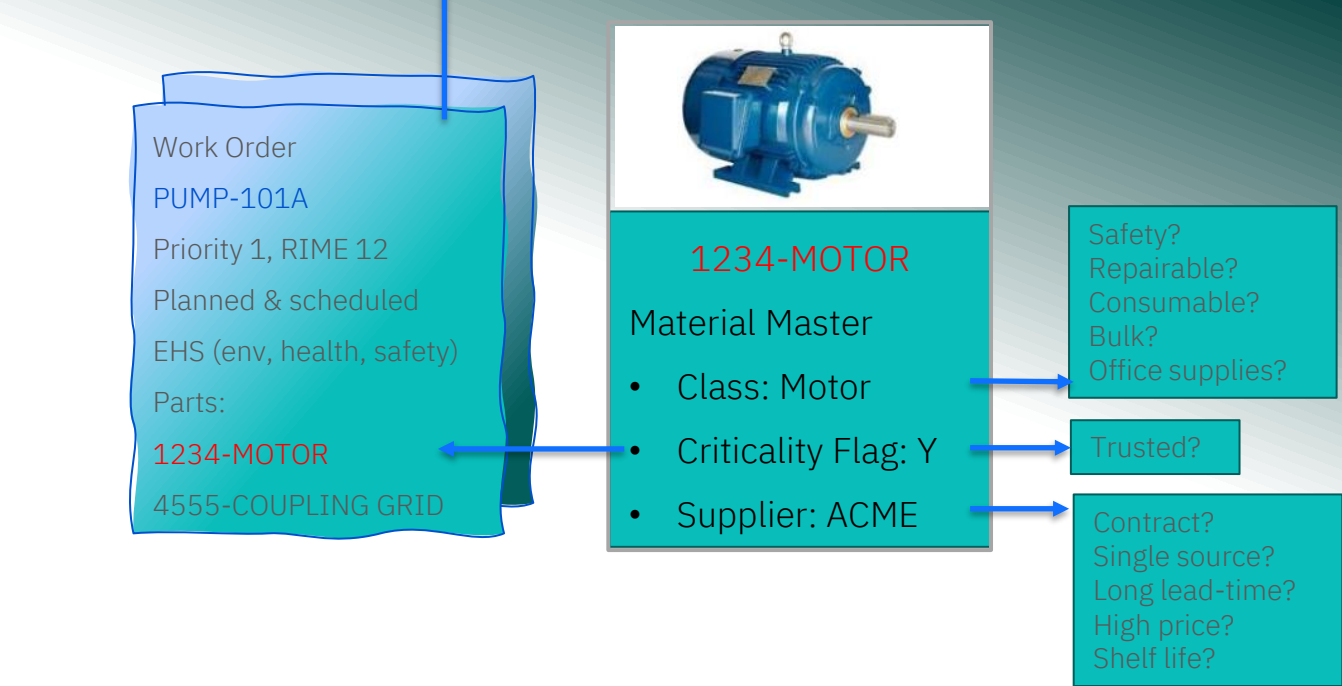


Monthly **reorder level** updates, daily transaction and stock on hand updates/alerts (if enabled)

Automated process to assess spare parts criticality



Maintenance & Operations



Materials Management & Procurement

Automatically populated & prioritized work lists using Work Queues

Work queues align to inventory management strategy

Inventory strategy aligns to maintenance strategy

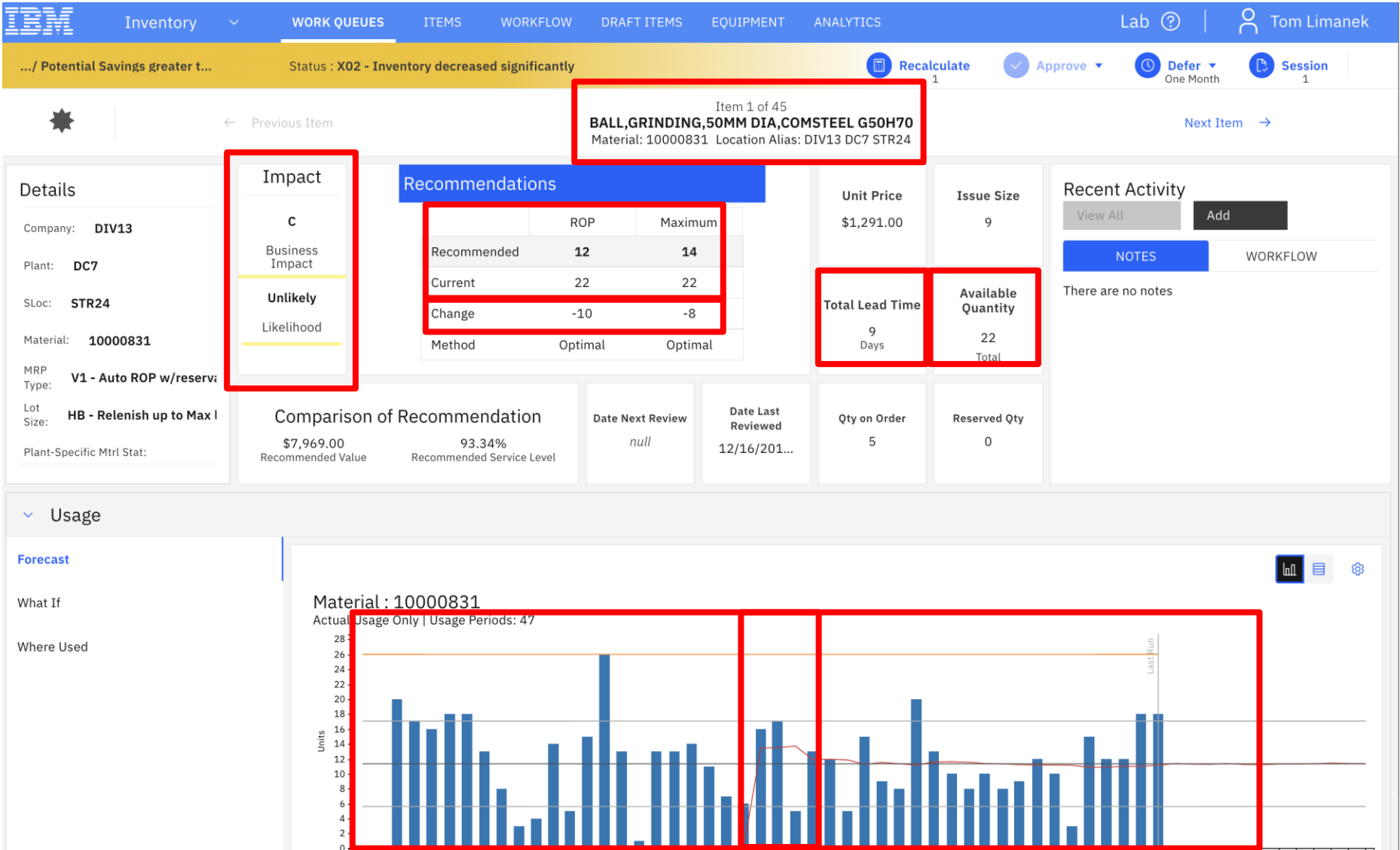
- Rule based
- Update dynamically as data is refreshed
- Aligned to inventory and asset management strategy
- Use case example: movement on slow/non-moving material
- Can use any data field in MRO IO to build a work queue

IBM Inventory WORK QUEUES ITEMS CHANGE REQUESTS 2 DRAFT ITEMS EQUIPMENT ANALYTICS Lab ? Mateo Canarte-Toro							
Work queues by Priority		Limit by site: All selected		Hide completed work queues <input type="checkbox"/>			
Priority	Title	Service level difference	Inventory value difference	Count as at 12/31/2017	Current count	Notes	
1	Critical Items with High Stockout Risk	42.64%	\$478,413	51	51		
2	Items Due for Review	10.84%	-\$57,531	4	4		
3	Savings Opportunity > \$5000 - Likely Reorder within 3 Months	-7.46%	-\$470,905	38	38		
4	NonStock Items - Consider Stocking	81.90%	\$56,139	43	43		
5	Slow Moving - Candidates for MTBF Forecasting			3	3		
6	Regionally Shared Savings Opportunity >\$1000 - Likely Reorder within 3 Months			46	0		
7	Potential Sharing - Overstocked, Short Elsewhere			27	25		
8	Items Due for Review			90	90		
8	Repairable Items - Inventory Decrease Recommended			401	401		
9	Potential Stranded - No Movement in Over 5 Years			2188	2189		
10	Data Improvement - Potential Duplicates - by Manufacture & Part Number			396	392		

Viewing material details in depth with Item view

User experience focus allowing separate customizable screen layouts for:

- Corporate view
- Work queue views (per work queue)
- Personal views



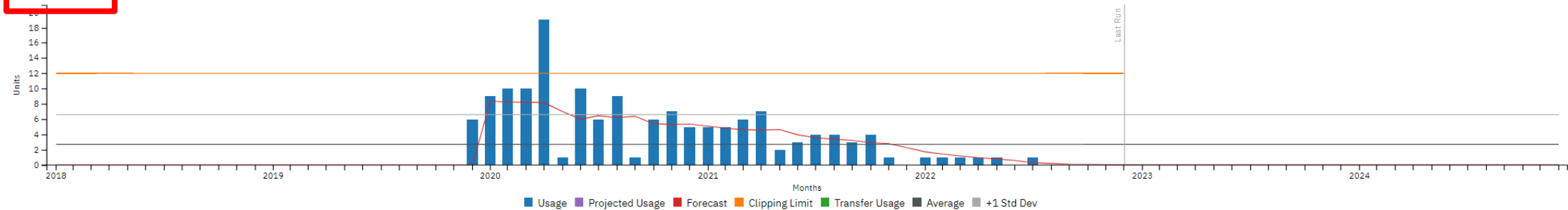
Setting reorder levels for planned issues only

Like only using unplanned issues, customers can choose to set reorder levels based on forecasted future usage only.

- Generally, MRO IO will set reorder levels based on all historical consumption
- MRO IO has the capability to import **maintenance** or **project** plans to set reorder levels
- Planned usage can be applied in bulk or individually.

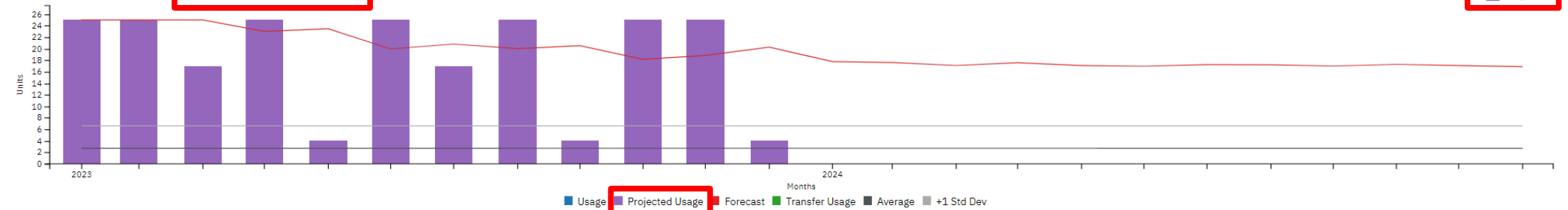
Material : 20074973

Actual Usage Only Usage Periods: 60



Material : 20074973

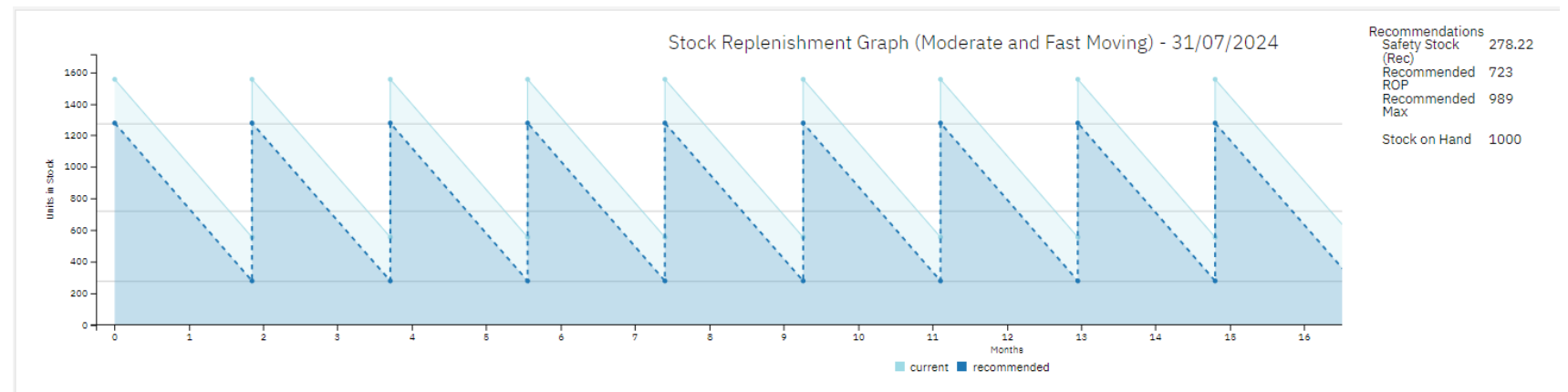
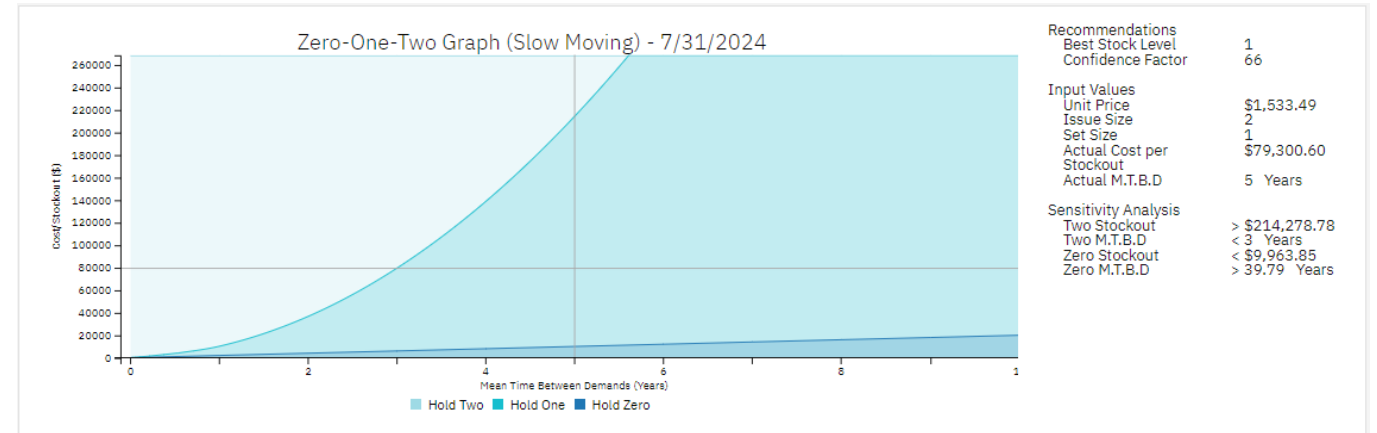
New Trend | Usage Periods: 0 Projected demand period: 12



Modeling future changes using 'What If' scenarios

What if analysis allows for impacts to be assessed before changes are committed

- 0-1-2 method for slow moving items
- Saw tooth for moderate and fast-moving items



Auditable approvals process for nontrivial changes using Workflows

Standardize approvals process across the business. As simple as setting the rules and assigning reviewers and approvers.

- Requested changes summarized in single view to allow processing in bulk
- Process is auditable and aligned to delegated authorities
- Approvals tracked inside MRO IO – reduce reliance on emails and spreadsheets
- Reviewer and approver can add notes
- Scheduled reminders for outstanding requests

IBM

Inventory

WORK QUEUES

ITEMS

WORKFLOW

CHANGE REQUESTS

DRAFT ITEMS

EQUIPMENT

ANALYTICS

Showing:

Awaiting my Attention

Items:

Selected

APPROVE

DENY

Role:

All

 Rule:

All

 Requester:

All

 Status:

All

Add Filter

<input type="checkbox"/>	Created	Location Alias	Material	Description Line 1	Export	Rule	Role	Requester	Status
<input type="checkbox"/>	16 minute...	DIV10 DC3 STR30	20002899	BELT FASTENER,PLATE,STL,1...	Reorder ...	Criticality change from A	Approver	Administrator	Ready 0 of 2
<input type="checkbox"/>	16 minute...	DIV10 DC3 STR30	20005378	SEAL RING,OIL,SANDVIK 442...	Reorder ...	Criticality change			Ready 0 of 2
<input type="checkbox"/>	14 minute...	DIV12 DC6 STR28	20083173	POLE,LINE CONST,WOOD,15...	Reorder ...	Criticality change			Ready 0 of 2

Rank: 1

Marion Maintenance

Rob Reliability

Reliability engineering

Waiting

Business Impact		Reorder Levels		Lead Times (Days)		Rec Service Level %		Stock Value Difference
Before	After	Minimum	Maximum	Before	After	Before	After	
A-Major Disruption	B-Significant ...	Before 2	After 1	—	—	—	—	No Change
A-Major Disruption	B-Significant ...	Before 1	After 2	1	3	96.79	99.97	\$379 171% Increase
—	—	Before 3	After 8	3	27	82.74	98.32	\$30,173

IBM

Inventory

WORK QUEUES

ITEMS

WORKFLOW

CHANGE REQUESTS

DRAFT ITEMS

EQUIPMENT

ANALYTICS

Custom Group

Status: ROK - Results of Forecasting and Reorder Calculations OK

APPROVE

DENY

Item 2 of 3

SEAL RING,OIL,SANDVIK 442.8755-01

Material: 20005378 Location Alias: DIV10 DC3 STR30

Previous Item

Next Item

General

Location Alias:

DIV10 DC3 STR30

Material:

20005378

Date Created:

18/06/2014

Key Fields

MRP Type:

V1 - Auto ROP w/reservations

Lot Size:

HB - Replenish up to Max level

Material Type:

HIBE

Recommendations

	ROP	Maximum
Recommended	2	3
Current	1	1
Change	+1	+2
Method	Optimal	Optimal

Available Quantity

1 Total

Unit Price

\$248.27

Details

Vendor Number:

Supplier 6693

Description Line 2:

SEAL RING,OIL,SANDVIK 442.8755-01

Comparison of Recommendation

\$601.00 Recommended Value

99.97% Recommended Service Level

Impact

B Unlikely

Business Impact Likelihood

MRP Type/Lot Size

V1/HB

Date Last Reviewed

31/07/2024 08:21

Date Next Review

...

Decision Code

No action required

Material: 20005378

Actual Usage Only | Usage Periods: 60

Location	Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
DIV10 DC3 STR30	2022	0	1	0	0	0	0	1	0	1	1	2	2	8
	2021	0	0	0	0	0	0	0	0	0	0	0	1	1
	2020	0	0	0	0	0	0	0	0	0	0	1	-1	0
	2019	0	0	0	0	0	0	0	1	0	0	1	0	2
	2018	0	0	0	0	0	0	1	0	0	0	0	0	1

Show Store Locations

Forecast Usage

0.31613

Issue Size

1

Usage Periods

60

Rounding Value

1

Rules

Download all

Search

▼

≡

Add

Priority	Rule	Description	Trigger	Export profiles	Status
0	Criticality change from A	Criticality change ...	ORIGINAL(BUS_IMPACT) = 'A'	Reorder Values	Active
1	Increase holding >=\$1000	Increase holding ...	INVTY_SAV <= -1000	Reorder Values	Active
2	Criticality change to E	Criticality change ...	ORIGINAL(BUS_IMPACT) <> 'E' AND BUS_IMPACT = 'E'	Reorder Values	Active

Recent Activity

View All

Add

WORKFLOW

CHANGE REQUESTS

By: Administrator

Exported Criticality change from A

Exported

31/07/2024 16:48

By: Marion Maintenance (Approved)

Approved Criticality change from A

looks ok

31/07/2024 16:48

By: Administrator

Submitted Criticality change from A

31/07/2024 16:22

Manually triggered reviews processed using Item Change Request

Manage manual requests for change by users

- Standardized process across business
- Auditability and traceability of requests

Items change request

Request number: 1 Status: Created
Requester: Administrator Created Date: 30/07/2024 10:57

FLOCCULENT,PWDR,SNF FA290SH
Material: 10000956 Location Alias: DIV10 DC3 STR30

Request description
Reduce criticality - this is not B, should be C

Processor notes

Available Attachments(0) Selected 0 Save

Field	Requested value
Business Impact	C-Minor Disruption

Go To Item

Process

Complete

Close

Recent Activity

View All

Add

< FLOW

CHANGE REQUESTS >

Request number: 1
By: Felicity Finance 30/07/2024 10:59

Processing
[View details](#)

Request number: 1
By: Administrator 30/07/2024 10:57

Created
[View details](#)

IBM Inventory WORK QUEUES ITEMS WORKFLOW 1 CHANGE REQUESTS 1 DRAFT ITEMS EQUIPMENT ANALYTICS										
Showing All requests Status All Requester All Processor All Add Filter										
Created	Created Date	Request Number	Status	Location Alias	Material	Requester	Processor	Processor Notes	Change Request Description	
4 minutes...	30/07/2024	1	Created	DIV10 DC3 STR30	10000956	Administrator	null		Reduce criticality - this is not B, should be C	

AI Use Case: Smart Review

AI powered assistant, an additional resource “looking over your shoulder” to help make decisions.

- **Smart Review Accept:** If **True**, AI model predicts recommendation will be **Accepted** based on the latest month data. Otherwise, it needs a **Review**.
- **Smart Review Confidence Score:** Confidence score for Smart Review Accept.
- **Smart Review Risk Score:** It is the risk-ranking based on ‘Business Impact’ and ‘Likelihood Code’.
- **Smart Review Explanation:** Natural language explanation of Accept/Review.
- **Automated:** Advice can be fully automated



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Inventory

WORK QUEUES

ITEMS

DRAFT ITEMS

EQUIPMENT

REFERENCES

ANALYTICS

.../ REDUCE > \$500 | ROP hits ...

Status : X02 - Inventory decreased significantly

Recalculate 0

Approve

Defer One Month

Session 2

Item 1 of 61

CABLE, 4C, 16MM2, 0.6/1KV, NON COMPACTED

Material: 1000000224 Location Alias: 1000 1000

Next Item →

General

Control Segment: FAST HIGH VALUE

Date Last Exported: 16/07/2021 05:51

Date Created: 27/02/1987 00:00

Date Last Issued: 08/12/2022 00:00

Date Last Receipt: 17/03/2022 00:00

Moving Code: 4 - Fast (12-17)

Key Fields

SAP MRP Type/Lot Size: V1/H1

Material Status:

Spec Proc Type:

ABC Indicator: A - Material - High Significance

Store for External Proc: 0001

Bin Location: BRQ1104

Recommendations

	ROP	Maximum
Recommended	1118	2100
Current	1749	3500
Change	-631	-1400
Method	Optimal	Optimal

Comparison of Recommendation

\$7,987.00 Recommended Value

79.07% Recommended Service Level

Inventory Saving \$10,713.00

Total Lead Time 64 Days

Available Quantity

1,504 Total

Unit Price \$10.65

Recent Activity

View All

Add

NOTES

There are no notes

Material: 1000000224

Actual Usage Only | Usage Periods: 60

Impact

C Almost Certain

Business Impact Likelihood

Export MRP Type/Lot Size V1/H1

ABC Indicator A - Material - H...

Date Next Review 13/02/2023 12...

Date Last Reviewed 13/01/2023 01...

Work Code

Decision Code No action requi...

Date Last Exported 16/07/2021 05:51

Work Queues 2

Track Changes changes

Gallery

Smart Review Accept

Smart Review Confidence Score 98

Smart Review Risk Score 40

Smart Review Explanation Like previously accepted neighbors this material was used recently. Like previously accepted neighbors this material has a recommendation to decrease the ROQ

Smart Review Accept

Smart Review Confidence Score 98

Smart Review Risk Score 40

Smart Review Explanation

Like previously accepted neighbors this material was used recently. Like previously accepted neighbors this material has a recommendation to decrease the ROQ

MRO Inventory Optimization “Smarts”



Uniquely packaged in one solution to improve spares availability, increase equipment uptime and reduce costs

Provides continuous, sustainable, consistent optimization by combining:

- + Client Data (Items, Equipment, Suppliers, BOMs, Issues, Receipts, Work Orders)
- + Prescriptive Analytics & Algorithms
- + Client-Based Logic Configuration

 Data Enrichment	 Item Characteristics	 Demand Forecasting	 Availability/Lead Time	 Item Criticality	 Risk-Based Cost Model	 Workload Prioritization/Efficiency
Lead Time	Automated Segmentation	Historical Demand	Internal PR-to-PO	5 Levels of Business Impact	Stockout Risk	Prioritized Work Queues
Criticality	Movement Stratification	Planned Demand	Weighted Average PO-to-Receipt	Equipment Linkage	Holding Cost	Item-Level Scoring
Potential Duplicates	Bin Constraints	14 Forecasting Methods	Receipt-to-Put Away	Material Type & Class	Expediting Cost	Workflows
Average Issue Size	Set/Pack Size	Forecast Scoring/Selection	Outlier Clipping	Supplier	Replenishment/PO Line Cost	Fully Automated Recommendation Process
Data Anomaly Alerts	Average Issue Size	Historical & Future Durations	Variance Factoring	Cost	Economic Order Quantity	Excel Import / Export
Missing Data Alerts	Shelf Life	Automated Clipping	Supplier Performance	Description	Safety Stock	On-Line Grid Format Drill Down
Where-Used Issues/BOMs		Forecast Factoring	What-If Overrides	Availability		User-Specific Filters and Views
ERP Stated				Movement		

IBM MRO IO Customer Successes



One of World's Largest
Aluminum Manufacturers



MRO Inventory Rebalanced by

\$37M (33%)

In Year One

- Maintenance driven initiative to reduce inventory
- **\$23M** net inventory reduction in first 12 months
 - **\$30M** inventory reduction
 - **\$7M** inventory increase to minimize downtime
- Improved both asset uptime and service levels in the first 12 months



Major
Mining Company



MRO Inventory Reduced by

\$52M (71%)

Over Six Years

- Operating 7 mine sites, and 1 terminal
- MRO Inventory Value decreased from **\$73M** to **\$21M** over 6-year period
- Achieved **50%** year over year reduction in inventory for 6 years
- Improved asset uptime



Large
Electric Utility



MRO Inventory Rebalanced by

\$33M (25%)

In Year One

- Reduced inventory growth from **10%** to **0%**
- Improved asset uptime
- Net **\$77.8M** spend avoidance over 5 years
- Critical spares service level for generation improved to **99.7%**



One of World's Largest
O&G Companies



Reduced Working Capital

10%

In Six Months

- Maintenance driven initiative to reduce inventory
- Lowered inventory levels by at least **10%** for three years in a row
- Achieved over **\$90M** in savings through rebalancing over three years
- Savings at single site funded global implementation in year 1

Ask: Achieve the **outcomes** that you desire



Assets

- Increase asset productivity and economic output
- Increase service reliability and economic output
-
- Reduce cost of planned and unplanned downtime
- Extend economic life of assets and equipment



Costs

- Reduce external maintenance vendor spend
- Increase MRO inventory productivity
- Reduce cost of asset decommissioning and disposal
- Reduce ALM platform total cost of ownership (TCO)



Risk

- Reduce compliance process and regulatory cost
- Reduce service-level agreement (SLA) penalties
- Optimize risk-based asset investment spend



Workforce

- Increase operations and reliability engineering productivity
- Increase maintenance supervisor and staff productivity
- Reduce cost of inspections and quality

