



DIGITAL MAINTENANCE
POWERED BY HCL iMRO

Introduction - What is iMRO?

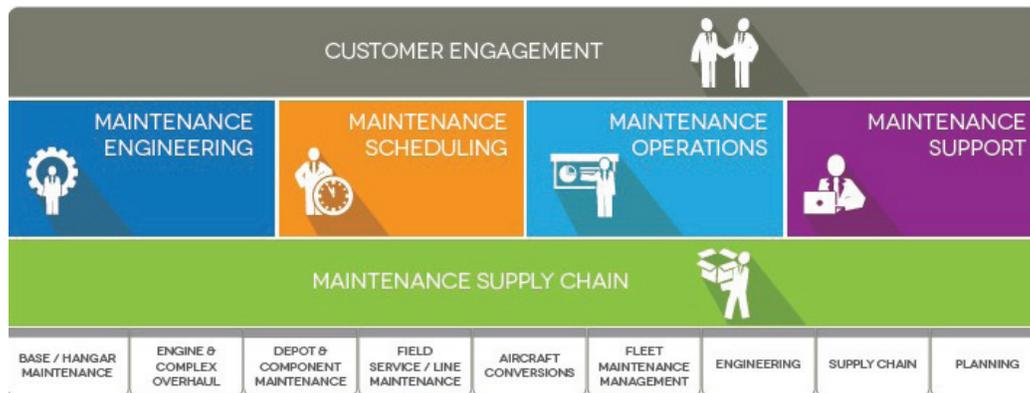
iMRO is an add-on product for SAP ERP solutions created by HCL. It is the only SAP endorsed solution for Maintenance Repair and Overhaul (MRO). To create the product HCL has drawn on over 20 years of experience implementing SAP solutions at over 100 customer sites covering aviation, aerospace, complex asset management and general maintenance organizations.

iMRO is an SAP complementary software product which extends the core SAP platform for any company which maintains complex, expensive or regulated assets. iMRO enhances the SAP user interface to meet industry requirements in the areas of maintenance engineering, planning and operations for business organizations in the following market segments:

- Airlines performing their own or external third party aircraft, engine, line or component maintenance
- Travel and transportation organizations (such

as railways, trucking or shipping companies) inspecting and maintaining a complex fleet or transportation infrastructure

- Dedicated MRO providers performing third party (revenue bearing) maintenance services
- Aviation and Aerospace original equipment manufacturers who simultaneously perform after-market maintenance and support services on their own or their competitor's products
- Defense and other public sector organizations managing and maintaining fleets of aerospace, transportation or nautical assets
- Energy and utility companies performing repairs and maintenance on plant and site equipment
- Plant maintenance for complex facilities and processing equipment such as chemical plant



Business Process Coverage

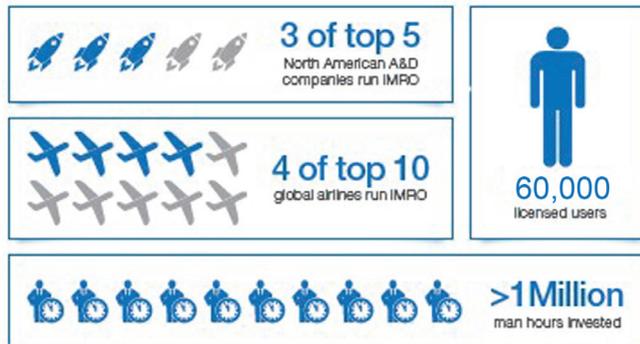
The iMRO solution in combination with the core SAP MRO solution enables a rich user experience in areas such as:

- Customer engagement
- Maintenance scheduling
- Maintenance support
- Base/Hangar maintenance
- Depot & component maintenance
- Aircraft conversions
- Engineering
- Planning
- Maintenance engineering
- Maintenance operations
- Maintenance supply chain
- Engine and complex overhaul
- Field service/line management
- Fleet maintenance management
- Supply chain

1 SAP Endorsed MRO Solution

Best Practice

- SAP software comes with embedded best practices, aerospace industry solutions and supplier and customer portals. HCL's view from implementing SAP solutions SAP ERP for MRO is that while organizations may be unique, the MRO business processes are not.
- Together with MRO functionality in core SAP, HCL's iMRO solution provides best practices for industry specific business requirements and processes, allowing your team to focus on the specific opportunities that deliver strategic value to your organization.
- iMRO significantly enhances all of SAP's core maintenance processes from planning through execution and supply chain operations.



Benefits

HCL's iMRO solution reduces risk, time and cost for customers who are considering the SAP ERP application as an enterprise solution or who are extending their existing SAP footprint to engineering, operations and maintenance.

Typical benefits your organization can enjoy from the only end-to-end seamlessly integrated MRO+ERP suite of applications include:

- Transitioning your maintenance organization from a cost center to a profit center
- Increase asset utilization and availability
- Optimizing responsiveness and reducing inventory levels and transportation/expedite costs across the supply chain
- Ensuring maintenance regulatory compliance
- Reducing total IT cost of ownership
- Significant improvements in data accuracy, productivity and asset or aircraft utilization may be realized by deploying HCL's iMRO solution with SAP ERP.
- Unlike niche MRO applications, iMRO combined with the SAP enterprise management platform supports the entire enterprise, working together on a single database across all departments from the front-line maintenance technicians to back-office support personnel. This results in leaner and faster business processes, improved transparency of cost and maintenance records data, and improved performance measurement, trend analysis and reliability reporting.

iMRO Timeline

PCS - 2000

HCL's first industry SAP add-on solution for A&D companies, the MRO Pre-Configured Solution. Adopted by multiple companies across the world performing component repair and work execution processes.

V4 - 2010

Version 4 of iMRO extended the solution to support aircraft maintenance scenarios and modification handling. The user base of iMRO grew to include aircraft operators and further component repair shops. HCL adopted the SAP SYBASE technology to power its mobile solutions. iMRO wins the SAP Pinnacle award for co-innovation.

V5 - 2012

iMRO version 5.0 saw major extensions of functionality across the full solution. iMRO was adopted by the first defence agency to support maintenance across all 3 military services, land, sea and air. The SAP MRO Mobile solutions adopts the SAP Syclo solution

V3 - 2009

The first formal version of the HCL endorsed business solution, iMRO. The solution supports core component repair and maintenance execution processes. Adopted by 3 launch customers across the globe. HCL implements Right Hemisphere, Syclo and Adobe Technologies on platform.

V4.5 - 2011

Version 4.5 was adopted by further airlines and asset operators. These customers spent the following years successfully rolling out their solutions to multiple business locations across the world. Version 4.5 saw the introduction of a graphical maintenance planning board incorporating ADOBE Flex technology.

V6 - 2013

iMRO version 6.0 saw iMRO certified to run on SAP Business Suite on HANA. The first iMRO implementation on HANA is started. SAP Visual Enterprise is integrated into the maintenance solution. The iMRO install base continues to grow.

V7 - 2015

iMRO version 7.0 was launched in October 2015. This release focused on aircraft fleet management with extension to the MPD solution, further automation of the complex asset scenario and optimization of the simple component repair execution processes.

Beyond release7

iMRO continues to evolve beyond release 7.0. including a strong development roadmap with a focus on developing the latest user experiences and the enabling API's allowing customers to take full advantage of the solutions technical capability with a world class user experience

Continuous improvement and functional extensions of the solution continues at a pace.

Generation 2 Maintenance Solution

In 2016 HCL launched a new MRO solution based on the SAP S/4 HANA platform.

The solution builds on over 15 years' experience at HCL of building asset maintenance add-ons to the core SAP platform.

The new product will initially be available on SAP S/4 HANA 1511 and move to a generally available release on the SAP S/4HANA 1610. The solution offers a comprehensive range of complex asset maintenance functionality built to the highest SAP development standards.

The product has undergone the highest level of SAP testing and certification, called Premium Qualification and is supported through the SAP Support Network.



Customer Engagement

Induction workbench to manage customer interactions, advance planning, sales order creation, event workscoping, goods receipt, work order creation and at the end of the repair process the release to service.

Benefits

- Simplified End to End Maintenance Event Management
- Single object to track the maintenance event throughout its lifecycle from initial planning through to delivery
- One solution for all business scenarios
- Reduced Process Delays
- 60 Second Induction from Component arrival to starting work on the shop floor
- Improved data accuracy with simple data entry
- Work Quotation can be performed without the need for operative data
- Quotations can be based on same data used in work execution
- Fully Integrated data model

Maintenance Engineering

Modification and service bulletin induction workbench to manage modifications, tasks, embodiment rules and effectivity of manufacturer engineering orders and regulatory body directives across an extensive fleet or asset base release to service.

Benefits

- Reduced document processing time for engineering documents
 - Removal of multiple redundant business process steps

- Single integrated solution with no duplicate data entry
- Improved compliance Management
 - Real time status reporting
 - Seamless data flow from engineering to planning to work execution
- Improved data quality
 - Simplified data updates
 - Single transaction for training
 - High familiarity
 - Tailored to business requirements
- Data reuse through master task list
 - Simplified Data Maintenance through the single
 - Clear definition of individual requirements tasks
- Improved Compliance Management
 - Accurate Asset Life Management
 - Enhanced maintenance control options
 - Clear visibility and accurate control over maintenance extensions

Maintenance Scheduling

Graphical tools to manage maintenance demand over short and medium term horizons including planned, unplanned and third party maintenance demands, as well as work in process or deferred work, taking into account available resources and capacity levelling, across your maintenance network. Integration with aircraft flight schedule, available facilities and competencies and material forecasts and requirements.

Benefits

- Improved planning decisions
 - All Critical Information Visible in one location
 - Seamless and fully integrated Planning process from Engineering to Operations
 - Integrated planning between flight operations and maintenance planning

- Improved Delivery of Plan
 - Load and Capacity Considered from day one
 - Material Requirements can be forecast and managed
- Improved Resource Utilisation
 - Underutilised capacity is visible
 - Early Decisions for outsourcing
- Improved compliance Management
 - Real time status reporting
 - Seamless data flow from engineering to planning to work execution
- Accurate Maintenance Scheduling
 - Improved Asset utilisation
 - Improved Maintenance Yield
 - Accurate maintenance event planning
 - Accurate resource planning

Maintenance Operations

Front end tool for maintenance technicians, operators and supervisors to carry out Strip, Inspection and maintenance tasks including access to maintenance manuals, work instructions and documentation, as well as user friendly capture of labor and attendance, signature/stamp, progress, component removal, work-scoping and component disposition, serial number confirmations, inspection results, defects, work order changes, perform component assembly and comments.

Benefits

- Improved Shop floor efficiency
 - Role Specific transactions
 - One stop shop for all shop floor actions
 - Minimal and Simple data entry
 - Single transaction for all main functions enabling simplified user training
 - Tailored to specific business requirements
 - Full integration with surrounding business processes
- Improved compliance Management
 - Real time data entry at the point of execution
- No duplicate data entry
- Seamless data flow from engineering, planning and work execution
- Full visibility of all required data integrated into a single transaction
- Real time Integration between component structure and inventory management
- Common Process for all maintenance execution activities

Maintenance Supply Chain

Material expediting and shortage reporting based on the best available material availability data. Rules based sourcing engine to allocate parts in stock, internal or external repair, or installed on another asset, to open demands or shortages based on location, condition, ownership, operating life etc.

Benefits

- Full visibility of the material supply situation
 - Demand and Supply
- Enables routine monitoring of material availability and early expediting of any issues
- Improved Delivery of Planned Maintenance
 - Advanced allocated of material requirements
 - Maintenance planning decisions can be made based on material availability
- Reduced inventory costs
 - Improved material allocation of constrained inventory
 - Reduced advanced shipment of stock
 - On time delivery of supply
- Clear Visibility of material requirements for all maintenance events
- Improved customer billing for exchanged and sold materials
- Integrated view across maintenance and manufacturing

Maintenance Engineering	Modification Induction Workbench	Modification Status Report	Measuring Point & Counter Enhancements	Maintenance Plan Enhancements	Technical Publications Integration	
	Tech Pubs - Document Upload Facility	Remaining Life Enhancements	Maintenance Scheduling	Planning Task Lists, BOM's, and Orders	Maintenance Planning Workbench	Auto Slot Creation & Packaging
	Workscoping Workbench	Flight Sectors		Line Maintenance Demand Generator	Induction Workbench	Bill of Work
Mtc. Supply Chain	Shortage Reporting	Sourcing Workbench	Picking & Staging Facility	Maintenance Operations	WIP List	Strip & Inspection Workbench
	Time Since Event Reporting	Task Elimination and Sequencing	Maintenance Execution Workbench (EWI)		Maintenance Execution Labor Collection	Shop Floor Barcode Fast Entry
	Raise & Defer Defects	Dismantle & Installation	Digital Signature		Event Management Workbench	Tooling Integration
				Customer Management		

FIORI

User Experience

Developing a new world class user experience is Central to the iMRO Roadmap. This involves creating a suite of new iMRO API's to enable decoupled user experiences alongside new SAP FIORI based User Interfaces

Initial focus has been on Shop Floor processes and the maintenance technician. These enhancements are now being rolled out to further roles and transactions.

The iMRO FIORI based Electronic Work Instruction workbench is specifically designed for tablet based operation to enable paperless shop floor processes.

The solution is formally released in the latest iMRO service pack.

The solution is live at its launch customer

Organization and Case description

Client is a world-leading MRO/ME service provider.

The company provides maintenance, repair, and overhaul (MRO) services; completions and refurbishment; engineering and fixed-base operations – along with aircraft management, charter services, aircraft sales, and personnel services

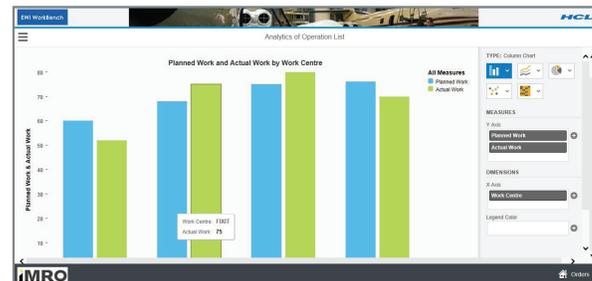
It was seeking the right MRO Software solution to improve processes for maintenance scheduling; planning, scheduling, and capacity planning; customer management and sales and billing; long-term planning and budgeting; reporting and training

Solution Area

- The shop floor FIORI implementation was part of the client's shop floor improvement initiative called 'paperlite'. The initial focus was to improve efficiency on the shop floor and a full digital signature solution supporting paperless maintenance execution.
- Aerospace: All iMRO components
- HCL supported the client in the implementation of the new shop floor FIORI Solution by providing expert functional and technical resources with deep iMRO and business knowledge

Order	Order Description	Equipment	Functional Location
4002019	Perform Visual Inspection of Pump	10015470	ARCRA.10.01.FL
4002640	Perform Routine 100 Hour Inspection	10015470	ARCRA.10.01.FL
4002641	Replace Inlet Filters	10015470	ARCRA.10.01.FL
4002642	Inspect Outlet Filter	10015470	ARCRA.10.01.FL
4002643	Perform Internal Inspection of Pump Impe	10015470	ARCRA.10.01.FL
4002644	Fill Oil System and Recard	10015470	ARCRA.10.01.FL
4002645	Lubricate Drive System	10015470	ARCRA.10.01.FL

Technical Object Name	Material	Material	Serial No	Serial Number
1006202				
1006499	Equipment No	Equipment No	Quantity	Quantity
1006969	Plant	Plant	Storage Location	Storage Loca.
1006664	Valuation Type	Valuation Type	Work Centre	Work Centre
	Disposition (see		Close Loop	
	Initial			
	Material	Material	Batch	Batch
	Serial Number	Serial Number	Quantity	Quantity
	Reservation Num	Reservation	Item Number	Item Number



Order No.	4002639	Priority	2-High	Notification No.	30004665
Order Type	PL-PROP MAINT			Notification Type	RI
Order Status	001			Request Status	WORK ORDER
User Status				User Status	
Order Description	Perform Visual Inspection of Pump			Notification Long Text	
Order Long Text				Material No	C18_MAT_SER
Functional Location	ARCRA.10.01.FL			Serial No	SRG.01
Equipment No	10015470			Plant	X001
Basic Cost Code	10002015			Work Centre	X001
Basic Finish Date	17/09/2015				

TECHNICAL OVERVIEW

iMRO is built as an add-on to SAP's ECC and S/4 HANA Enterprise Management platforms. iMRO Release 7, is compatible with SAP's Enhancement Pack 7 and 8 for ERP and SAP's discrete industry solution add-on. iMRO V7 also includes certification on SAP Business Suite on HANA. The next generation iMRO solution is available on the SAP S/4 platform supporting both 1511 and the 1610 releases.

iMRO is built using SAP's NetWeaver development platform to SAP's internal development standards - including user interface, accessibility and back-end ERP integration standards. For example, iMRO uses SAP's enterprise service repository to the fullest extent possible.

This means that iMRO requires no additional hardware or software to install, maintain, upgrade etc. as it runs on the SAP server directly.

As a result, users of SAP ERP will be able to seamlessly navigate between SAP ERP and iMRO transactions without logging onto a separate application, or getting confused by a different user- interface and screen layout. iMRO re-uses SAP ERP user masters, authorizations, menus, navigation, data dictionary and database processes.

Users will not even be aware when they are switching between SAP ERP screens and iMRO screens.



Endorsed Business Solution

iMRO is the only SAP Endorsed Business Solution for MRO. SAP perform extensive technical and functional testing on each release of iMRO to ensure the solution conforms with SAP's stringent development standards and supports real world business scenarios. iMRO is supported through the standard SAP support process, OSS, enabling a seamless and fully integrated support process for your SAP system. By providing industry tailored functionality and a fully integrated support process, iMRO provides you a lower cost of ownership compared to performing in-house developments.

Version

- The current release of iMRO, iMRO 7.0, is released for SAP ECC 6.0 Enhancement pack 7 or 8,

including certification on SAP Business Suite on HANA. GEN2iMRO is released in S/4 HANA Enterprise Management 1511 and 1610 platforms. The iMRO solution aims to provide new releases on higher enhancement pack levels shortly after SAP release the new enhancement pack enabling business to upgrade and take advantage of the new SAP functionality in the enhancement pack and new iMRO functionality as quickly and as easily as possible.

- if you are not on Enhancement pack 7 or 8 or on S/4 Hana 1511 or 1610, then this is not a barrier to adopting iMRO. Please talk to us and we can develop a custom installation service enabling you to experience the benefits of iMRO within your current SAP systems.

Technology Stack

- iMRO is fully embedded within your core ECC 6.0 ERP or S/4 HANA system. There is no need for additional hardware to install or run the solution. Equally there is no need for additional software on the client machines, iMRO supports all of the standard SAP user interface options.
- Even though iMRO adds extensive new functionality to your SAP system there is no significant effect on overall system sizing and you can still use the standard SAP methodology to system sizing.

Installation

- iMRO is perfectly suited for any green field SAP implementation, including complex MRO processes, but also has a proven track record of being implemented in brown field (existing) implementations where it can be installed non disruptively enabling flexible adoption.
- iMRO is installed using a software PAT file and can be loaded through the standard SAP transactions and tools for managing software installation and upgrades. An extensive installation guide is provided which enables customers to perform the installation themselves. Remote support is provided for all installations, or an additional onsite installation service is available to the customer.



REFERENCE #1

Company Name

An American general aviation aircraft manufacturing corporation headquartered in Wichita, Kansas

The Client philosophy of service is simple: they keep your aircraft flying. It has 8 domestic and 6 international Service Centers which have expert service engineers offering maintenance, inspections, parts, repairs, avionic upgrades, equipment installations, refurbishments, and other specialized services.

Description of solution provided

HCL was responsible for the realization of the end to end MRO solution. As part of this activity HCL also provided functional and technical iMRO knowledge and iMRO academy training solution

- Design of an end to end reusable template solution using standard SAP and iMRO functionality.
- The HCL team was responsible for process design, data migration, training development and project planning and governance
- Following Client Organizations were in scope of the project:
 - Customer Management
 - Sales & Billing
 - Customer Support
 - Finance - Accounting & Costing
 - MRO - Maintenance Operations
 - MRO - Maintenance Support
 - MRO- Scheduling
 - MRO- Configuration Management
 - Client's Quality (Subject Matter Expert)
 - Client's I/T (SAP, EDW, BI)
 - Client's Service Center (Subject Matter Expert)
 - Client Human Resources governance

REFERENCE #2

Company Name

A European Airline with one of the world's largest 3rd Party MRO divisions

Description of solution provided

- This company have a number of complex component repair subsidiary businesses around the world. These subsidiaries have historically operated on independent IT solutions supplied by multiple providers. As many of these solutions were reaching end of life, the company embarked on a strategy to develop a global template solution which could be rolled out to and adopted by all subsidiaries. This new solution was designed to sit alongside their existing SAP solution used by the core business units. The company elected an SAP platform for this new solution complemented by the iMRO product to provide the specialist MRO functionality. The first subsidiaries to adopt the solution are engine/component repair centres.
- HCL has a team of specialist MRO consultants directly supporting the MRO workstream providing functional and technical iMRO knowledge and iMRO academy training
- HCL consultants come with a wealth of business knowledge that enables efficient process design & delivery
- The HCL team have also been sharing their project delivery experience in process design, data migration, training development and project planning

First site went live in April 2012. Second live in April 2014. First Landing Gear go-live August 2015. Further roll outs are in progress. HCL are involved in Post go-live support, roll out projects and providing iMRO product support

Since the success of the initial template build and project go-lives iMRO has been further selected to enhance the core SAP solution with a planned go-live of this new solution in early 2018.

REFERENCE #3

Company Name

Large North America Defence OEM

Description of solution provided

This company is a technology and innovation leader specializing in defense, civil government and cybersecurity markets throughout the world. With a history of innovation spanning 93 years, the company provides state-of-the-art electronics, mission systems integration and other capabilities in the areas of sensing; effects; and command, control, communications and intelligence systems, as well as cybersecurity and a broad range of mission support services.

The Internal Depot Initiative will enhance capability to meet growing Customer needs through improved turn-around, visibility, and availability via unified internal depot processes.

HCL provide a range of services at this client

- iMRO software
- iMRO software installation support
- iMRO software integration with customized systems
- iMRO functional rollout support
- iMRO co-development priority setting
- iMRO enhancement support

The implementation of iMRO has successfully delivered the following outcomes to the client

- Improved induction process including order management and process handoffs
- Institute Workbenches to integrate Shop Floor processes and work groups onto standard platform
- Provided visibility to Customer Assets for improved reporting Contract management
- Data collection during execution has provided opportunities for Reliability reporting
- Full traceability and history for serialized structures (Parent/Child)

REFERENCE #4

Company Name

A global leader in providing helicopter transportation services to off-shore oil platforms. An operator of over 450 Helicopters across 20 aircraft types. Provides O&G Transportation, Search & Rescue and Medical Evacuation services in about 25 countries around the globe.

Description of solution provided

The scope of this project was to implement an end-to-end solution in SAP for all Maintenance and Engineering processes covering its extensive fleet of helicopters, using SAP IS-AD and iMRO functionalities

The solution can be summarized as follows

- Single SAP ECC 6 instance with iMRO product suite V6.0 covering the entire MRO operations with 8 Regional Rollouts proposed across Europe, North America, Africa, and Asia-pacific.
- Improved Regulatory Compliance enabled by better Planning and Prioritization of Scheduled Maintenance via iMRO Modules like Maintenance Planning and Maintenance Execution Workbenches.
- Seamless Integration of Airframe Maintenance, Component Maintenance, and Engineering & Planning processes via iMRO Induction and Inspection Workbenches, Aircraft Logbook, Maintenance Event Builder, Maintenance Program Definition and Mod Induction Workbench.
- Real time visibility of material availability across current stock, repair stock with vendor and even future routine rotatable maintenance events enabled by iMRO Sourcing Workbench.
- Accurate Tracking of Aircraft and Component Maintenance Cost and Repair History. Greater visibility of Aircraft/Component Reliability Data via Event based Reliability Reports.

The solution has successfully implemented including Line, Heavy and Component Maintenance in the UK region - Aberdeen, Scatsta and Sumburgh for 16 S92A. More than 200 business users adopted the iMRO solution which resulted in successful Go-Live of UK.

Inspired with successful story of UK the company is planning to implement the iMRO solution in their Norway Region by end of this year and planning for US and Australia next year for all the fleet types.



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