Maintenance management is the discipline of balancing increased equipment availability and reduced costs while also maintaining low levels of LTI and retaining compliance. If performed optimally, maintenance management increases company profit and is a high competitive factor. If performed poorly, it can be a contributing factor to the closing of a company.

In many companies, investments in CAPEX outweigh OPEX costs – equipment, trucks, boats, process plants, machinery, infrastructure, factories and buildings to name a few. The cost and efficiency of these assets are vital for the success of the business.

The purpose of this booklet on maintenance management is to give insight into the main drivers of running a maintenance management set-up, and hereby ensure a cost efficient backbone for the company.
The pains of the maintenance organisation seem endless …

“We have no standard way of dealing with identical situations.”
QHSE manager

“We spend way too much time on paperwork.”
Maintenance employee

“We need to reduce the number of incidents.”
QHSE manager

“We have too many unplanned stops – and the planned stops are not utilised properly.”
Operations manager

“I spend too much time re-planning, and my utilisation is still far too low.”
Maintenance manager

“We could reduce the costs and increase quality if we were able to outsource some of our tasks.”
Procurement manager

“The spare parts are always at the wrong location.”
Maintenance employee

“Our return on invested capital is too low.”
CFO

“We constantly need to increase performance on service level, cost and invested capital – constantly maintaining a very high safety level.”
CEO

“The quality of our data makes it impossible to use as a basis for decisions.”
Maintenance manager
The maintenance management model identifies 10 areas for improvement aiming at optimising four conflicting objectives.

The key business objective is to balance increased availability and reduced costs, maintaining low levels of LTI and retaining compliance.

- Increase availability
  - Optimising maintenance
  - Reduce costs
  - Retain low LTI
  - Retain compliance

The maintenance management model identifies the 10 most efficient areas for system improvements:

- Direction
- Base
- Support
- Execution

- Asset register
- Apply standard processes
- Planning
- Maintenance strategy
- Master data management
- Systems support
- Spare parts
- Capabilities and competences
- Decision support
- Data capturing

Continuous improvements
## Guiding principles for maintenance management

### Maintenance strategy

A maintenance strategy must always be defined. The strategy shall define the framework and directions for maintenance activities. A maturity check can create the foundation for an appropriate strategy.

### Asset register

An asset register must be kept with strict numbering and structure. The structured asset register must enable a clear overview of cost, function, activities and status and should preferably follow an ISO standard.

### Master data management

Master data must always be handled according to strict governance procedures – and for many large entities, shared service centres are prevalent. The data quality can and should always be measured.

### Capabilities and competences

The maintenance tasks should define the required capabilities and competencies – and can be reflected in the organisation diagram. Outsourcing maintenance activities must always be considered in order to optimise total costs and increase flexibility and competence levels.

### Systems support

Maintenance activities should always be supported by an integrated maintenance system securing consistency in Maintenance, Supply Chain, Operations, Finance, HR and Document Management. Mobile solutions are at a price level where almost all companies can benefit.

### Decision support

KPIs must always be defined, measured and evaluated regularly. The KPIs must give a balanced overview of service level, cost, compliance and safety – broken down into measureable and relevant sub-measures.

### Planning

Maintenance activities must be planned – and the planning should be based on condition, rather than on performance or calendar. Long-term planning, optimal close-down utilisation and risk analysis must always be important planning parameters.

### Spare parts

Spare parts must only be ordered based on demand or to maintain safety stock levels. The demand for spare parts including refurbished components must be entered into work instructions for planning ahead. The physical location of spare parts must be carefully considered in order to optimise service levels and costs.

### Apply standard processes

Efficient maintenance processes are mandatory – and long-term efficiency on all critical parameters can be best obtained by developing and implementing processes in compliance with ISO standards. Relevant standards are e.g. ISO55000 (PAS55), ISO15341, ISO81346, ISO14224 and ISO18236.

### Data capturing

All maintenance activities must be registered to provide the best basis for future maintenance decisions. Data capturing should as a minimum include conditions, counter registrations, failures, causes and consequences.
Maintenance management strategy is the blueprint for the maintenance organisation of the future.

A maturity model provides a good starting point for any strategy development.

The basis of any organisation's journey towards maintenance excellence is the establishment of an effective maintenance strategy. It provides the necessary roadmap to achieve short and long-term goals.

Many companies have already developed a maintenance management strategy. The problem is often that this strategy is not aligned with the organisation's business objectives, it is difficult to implement and manage or it is non-existent. It is essential that a proven and effective approach is used when developing a maintenance strategy.

The maintenance strategy should be aligned with the company’s overall strategy and as a minimum cover the following key elements:

- Maintenance service delivery model
- Master data
- Processes
- Technology
- Planning
- Governance and control
A structured asset register is a must for efficient maintenance.

The asset register can be kept at a simple level but normally, a rather detailed technical structure with strict numbering and serialisation is a precondition for efficient maintenance.

The asset register/technical structure must always give an updated overview of the current maintenance status – and ensure that maintenance activities are planned.

The structures should be either:
- Function-oriented
- Product-oriented
- Location-oriented

Similar assets should always be registered in similar structures to obtain advantages in:
- Spare parts utilisation/reduced inventory
- Benchmarking/best practice
- Reporting/KPIs
- Improved labour planning
- Simplified use of external resources
- Simplified documentation

Using acknowledged standards will increase the chance of defining the registers and structures right the first time – and improve the general understanding of the assets by all involved parties (suppliers, authorities, business partners, new employees etc.)
Implement viewpoints

A maintenance set-up with a low level of standardisation and system support is more likely to cause errors and breakdowns.

Equipment data and processes are often handled differently across an organisation. This can be caused by company mergers or having old and new assets under the same roof. These differences should be minimised, as it creates uncertainty and a lack of data transparency.
Master data management: Low quality master data has a direct negative business impact

\[ \text{Process efficiency} = \frac{\text{Process time good MD}}{\text{Process time good MD} + \text{Process time bad MD}} \]

10 processes, 1 with bad MD => \[ \frac{10}{9+10} = 52.6\% \]

A good master data set-up involves:
- Strict governance on creating and changing data
- The possibility of being handled by a shared service centre
- Clear ownership of data
- Clear processes that are followed
- Regular data cleansing and update cycles
- Data interfaces from suppliers

The benefits of good master data:
- The ability to perform maintenance on spare part lists
- Spotting the need for maintenance before breakdowns
- Work instructions help engineers perform their job correctly
- The same maintenance plan for similar equipment
- Full visibility on spending
- Adding more work orders to the same jobs
- High spare part inventory due to a lack of knowledge
Maintenance tasks should define the required capabilities and competences

**Operational maintenance:**
- Requires broad competences and capabilities
- Flexibility is more important than optimised procedures
- Planning is difficult – and requires high-level planning, flexible capacities and simple prioritisation rules
- Data capturing is important to identify maintenance patterns and to be able to move tasks from corrective to preventive

**Maintenance projects:**
- Can often be clearly defined in standard work instructions with very specific qualification requirements (competences, certificates etc.)
- Efficient procedures for frequent projects can be trained and optimised, e.g. NDT analysis or lubrication jobs
- Resources, incl. contracts with external service providers, can be planned and optimised at a detailed level
Efficient maintenance processes are mandatory, and standardised processes across units:

- Increase efficiency dramatically
- Enable benchmarking
- Allow sharing of best practices.

Long-term efficiency on all critical parameters can best be obtained by developing and implementing processes in compliance with ISO standards.

Among the most important standardisation areas are:

- Asset registers and technical structures
- Failure/cause catalogues
- Maintenance plans and maintenance planning
- Replenishment and refurbishment processes
- Master data
- Risk assessment
- Reporting and KPIs
- … and potentially the complete AM system

The ISO 14224 functionality within IFS Applications automates the capture of relevant KPIs, including mean time to failure, mean time to repair and others as required in the standard.
Implement viewpoints

In any business, the maintenance management concept should be clearly defined. By defining the concept and the strategy, vital questions will be uncovered.

Often, maintenance management is based on weak basic data. This creates errors in the control and performance of the maintenance work, and it disrupts the alignment of plans across departments.
Systems supporting maintenance management systems enable control and overview

- Failure, cause and consequence tracking and analysis
- Work order generation, prioritisation and scheduling
- Integrated planning of all resources. People, parts, tools ...
- Handling work permits and isolations
- Historical tracking of all maintenance activities, scheduled and unscheduled
- Storing maintenance procedures as well as all warranty and certificate information by component
- Storing all technical documentation
- Real-time reports of ongoing work activity
- Calendar, run-time or performance-based preventive maintenance work order generation
- Capital and labour cost tracking by component enabling lifecycle cost analysis
- Complete parts and materials inventory control with automated reorder capability
- PDA interface to streamline input and work order generation
- Outside service call/dispatch capabilities
Decisions regarding the optimisation of any maintenance management system should always be based on a balanced set of performance measures revealing the current level of the main maintenance objectives – service level, cost, compliance and safety – broken down into measurable and relevant sub-measures.

At the same time, the performance system should be designed to reflect customer, value creation and flow perspectives and to have the right balance of lead and lag indicators.

It requires leadership, frequent measurements supported by automated reporting systems, a structured approach to breaking down KPIs and an action-oriented culture if you want to ensure that the performance measurement system is alive, has impact and becomes more than just “numbers on a piece of paper”.

- Mean time between failure
- Mean time to repair
- Quality of master data
- Availability in %
- Degree of planned maintenance
- Usage of safety equipment
- Frequently failing equipment
- Preventive hour ratio
- Competence level
- Etc.
Planning maintenance is often met with questions on whether it makes sense to plan on breakdowns. But planning maintenance should be handled with a balanced view on planned, preventive maintenance and breakdown handling.

When setting up a preventive maintenance system, finding the right balance between corrective/reactive and preventive maintenance is key.

Risk is a key driver for maintenance. It should be measured and a risk methodology should be in place. Risk is not only the potential loss of lives or having emergency procedures in place. Hence, the total risk picture should be uncovered and monitored.
Planning maintenance is a battle for resources

In most cases, planning maintenance will encounter conflicts with production plans and project plans.

The key success factor is ensuring maximum production time whilst balancing the cost for maintenance.

To ensure plan stability, clear governance is needed:

- Planning principles – how to compare plans
- Clear roles and responsibilities – of all involved
- Prioritisation rules – how to choose
- Clash handling – what to do when
- Data requirements – the exact data required for each plan entry
- Toll gate criteria – a checklist for allowing content into plans
- Meeting schedule – to ensure fixed tact
- Plan KPIs – to support the correct balance
Spare parts categorisation is key to inventory policy

The key business objective is to balance capital tied up in inventory, service levels and operating costs with process quality. Knowledge of what spare parts to stock is based on how quickly they will be required, and this provides knowledge on where to stock them. Equipment criticality (e.g. RCM analysis) is important to evaluate spare part responsiveness.

The decision on how much to stock should be based on the consumption pattern, price, size, delivery time and criticality. Spare parts for planned maintenance shall only be ordered based on demand or to maintain safety stock levels. The demand for spare parts including refurbished components must be entered into work instructions for planning.
Data capturing enables good decisions, planning and continuous improvements

Have a clear, strong business improvement purpose for collecting maintenance Key Performance Indicators (KPIs) so that you collect the right maintenance data, at the right time, for the right reason.

Data collected and used correctly leads to:

- A better analysis of failure, cause and consequence
- A better foundation for improvement and investment decisions
- A clearer picture of the risk levels on various equipment
- Transparency in the equipment/plant cost
- Transparency in where the maintenance work hours are spent
- Input for material planning of stock optimisation
- Precise cost forecasts and input for budgeting
- A better overview of the condition of equipment
WE HELP CHANGE THE WORLD A LITTLE BIT