

Loss Prevention Standards – Asset Classes

Maintenance Regimes

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A proactive, well-managed and audited maintenance regime is essential for an organisation to operate successfully and reduce the potential of unnecessary interruptions



Introduction

Regulations place duties on organisations and individuals who own, operate or have control over work equipment. Amongst other things, they must ensure that equipment is safe and suitable for the use intended.

The quality of maintenance is a significant factor affecting safety and operational costs, and an effective maintenance programme will ensure plant and equipment is ultimately more reliable.



The Importance of Maintenance

Regular inspection, testing, servicing and maintenance is necessary to keep all business assets operating efficiently and reliably. As a minimum, this should be as recommended by industry standards and by the manufacturer's or supplier's guidelines.

Effective Maintenance

Good, well-planned servicing and maintenance programmes enhance the overall risk management proposition of any company. It will help to reduce unnecessary breakdowns, reactionary repairs, interruptions to activities, and associated delays in the delivery of products or services to customers. Additionally, it will maintain an organisation's reputation, a major risk issue in its own right.

Poor Maintenance

Poor servicing and maintenance can result in equipment failures that may lead to:

- Shortfall in production
- Compromised servicing commitments
- Expensive uninsured costs
- Insurance claims
- Ongoing issues with a supply chain
- Criminal prosecution and fines being imposed on a company or individual
- **An impact on the organisation's financial performance**

Security systems designed to protect your business can be compromised or impaired if not regularly serviced and maintained, increasing the threat of theft and disruption. Similarly, fire protection or detection systems could operate ineffectively if inadequately maintained, exposing the property and its occupants to greater risk.

Insurers often require regular servicing and maintenance of certain types of equipment or machinery as a condition of insurance. Failure to complete these may result in the costs of claims being reduced or even non-payment.

Keeping Records

Inspection, testing, servicing and maintenance activities should only be completed by appropriately trained, qualified and (preferably) certified technicians. All inspections and maintenance activities should be carried out in accordance with agreed and documented procedures drawn up to suit the age, environment and operating conditions of each specific item.

Records should be formally recorded, so that key parameters can be compared with previous documents for trend analysis. This can help to identify and predict when a parameter is trending towards a failure condition, improving maintenance and asset replacement programmes.

Inspections and Testing

Various inspection and monitoring techniques should be used in accordance with the manufacturer's recommendations for the item. In addition to the manufacturer's minimum requirements, the frequency of any activity should also be based on actual experience of that item in situ, operating under the conditions it experiences over a period of time.

Technology

Inspection and testing technology is continually advancing, providing greater insight into equipment condition and service requirements. Some examples include:

- Vibration monitoring – for detecting misalignment and loose components
- Ultrasonic or acoustic emissions analysis – to detect small leaks and defects under stress conditions
- Thermography – for non-intrusive testing methods of electrical systems

The most appropriate techniques should be selected to help deliver greater reliability and provide a deeper analysis on predicted failure rates of equipment. This will help to reduce downtime, increase operational efficiency and reduce the risk of expensive, unnecessary or unrequired maintenance.

Electrical Inspections

As electrical ignition sources are widely recognised as a leading cause of fire, the following tests should be considered fundamental:

- Dielectric fluid testing
- Thermographic imaging of electrical systems, motors, machinery, pipelines, valves, storage tanks, control panels, switchgear, transformers, bearings, conveyors, mobile plant, storage and buildings
- Portable appliance testing
- Fixed wiring tests
- Exercising circuit breakers

Maintenance Programmes

The four main types of maintenance programmes are:

1. Preventive
2. Risk-based
3. Condition-based
4. Corrective

Preventive

Maintenance with a proactive approach, performed before the equipment has broken down. Inspection, testing and maintenance regimes are scheduled based on the criticality of equipment and the risk of it failing. Preventive maintenance is designed to protect equipment, improve its reliability and reduce the potential for production downtime.

Risk-based

Maintenance completed by prioritising the assets that present a risk to the business should they break down or fail. By integrating analysis and maintenance planning based on the risk and consequences of failure, resources are focused on business-critical equipment, which should be monitored and maintained more frequently. This process reduces the risk of failure in key areas, ensures high levels of reliability, safety and efficiency, and helps lessen the overall risk to the organisation.

Condition-based

Maintenance strategy based on equipment performance monitoring. Through repeated or continual analysis, it uses recognised detection measures on operating parameters that signal or identify when the equipment is deteriorating, and the risk of failure increasing. Inspection techniques include vibration monitoring, oil analysis, thermography and equipment observation.

Condition-based maintenance is usually performed when specific indicators have recognised a decrease in the condition or performance of the equipment being monitored. It can be the most appropriate method of maintenance for high risk, critical, expensive or bespoke equipment.

Corrective

A reactive maintenance programme, requiring the repair or replacement of equipment and components following a breakdown or failure. This type of maintenance presents an organisation with the risks of unplanned machinery and equipment downtime, and should be avoided for all equipment, but especially for any key systems or equipment that is considered critical.

Creating a Maintenance Programme

A good proactive servicing and maintenance regime will keep the business assets working correctly and within accepted tolerances. It will reduce unnecessary breakdowns and repairs, prolong the life of the business assets and reduce interruptions. It can also be used to monitor a wide range of business assets to reduce potential failures that might affect operator safety or even start fires. It will be formal, consistent and reliable 24 hours per day, 365 days per year.

Responsibility

Maintenance activities should be the responsibility of a specifically named individual(s). To remove any potential conflict of interest, this individual should not hold a managerial position relating to production or the principal activities of the business.

Asset Register

The starting point for an effective maintenance system is an understanding of what assets an organisation has and is responsible for maintaining. A comprehensive asset register and accurate formal drawings should be documented, forming the foundation of the programme. New, temporary or replacement machinery and equipment will need to be entered onto the servicing and maintenance programme, with inspecting and checking prior to use. Essential spares must be re-assessed and updated on a continual basis.

Risk Assessment

Maintenance schedules and programmes need to be recorded and well-planned. They should be based on risk assessments that consider actual experience, industry standards and the recommendations of manufacturers and suppliers. A risk assessment should have three key focuses:

1. The health and safety requirements of an item or system
2. The statutory, jurisdictional and regulatory requirements for that item or system
3. The resilience needed and the importance to the business activities – for example, in its inherent value, its lead time to replace, or in the impact to the business for the duration it is compromised

Maintenance Management System

There should be a formal maintenance management system in place which is used to alert and record:

- The required activity schedules
- The type of inspection, service or maintenance that needs completing
- Their priority
- A summary of the task involved
- The required date of completion
- The actual completion date
- The name of the company and or engineer who completed the work
- Description of what they did
- Any issues, faults, results, or feedback associated with the task
- Any sudden failures and breakdowns

Ideally, this should be an automated rather than a paper-based system, which could also be used for spares management. It should be able to provide appropriate management information to assess compliance, identifying any incomplete or missed activities.

A good management system is easy to access, use, navigate and complete. It should automatically alert engineers or supervisors of upcoming inspections, servicing and maintenance events. To verify that the system is meeting its intended task and the Key Performance Indicators (KPIs) are being achieved, it should undergo regular management audits and be supported by occasional external independent third-party audits.

Sign-off

There needs to be a robust task follow-up and sign-off to ensure that all work completed is satisfactory. Adequate numbers and types of spares must be held, particularly those that are considered critical or important to the business. These should be kept **as per the manufacturer's recommendations and industry standards, away from the primary object that they would be used in.**

Suitably trained and knowledgeable individuals should complete a Gap Analysis to review the inspection, testing and maintenance tasks, check available spares and establish KPIs to help prioritise tasks.

Contractors

If you are considering contractors or sub-contractors for some or all of the intended servicing and maintenance works, you must obtain satisfactory evidence that they are suitably trained, qualified and certificated. Prior to accepting any quotation, ensure that their insurance cover is adequate for the task as initially discussed and agreed with your insurer.

All contractors' and sub-contractors' quotations for specific works must be to an agreed specification and standard that meet the business requirements. Once accepted and inducted on any site, they must be adequately supervised. Their works should be inspected and recorded in your maintenance management system, which must formally identify any third parties. It is essential that any third parties follow all site rules and procedures.

Items for Consideration

Here are some examples of items to consider including in your maintenance programme.

Plant and Equipment

- Cranes and lifting equipment
- Hot work, welding, cutting equipment and fume extraction systems
- Forklift trucks, mechanical handling equipment and battery charging
- Bailing machines and shredding machines
- Ovens, conveyors, mixing and weighing machines, extract ducting systems
- Tools, machinery and plant, including bearings
- Production equipment
- Air compressors, pressure vessels, receivers, dryers, drain and pressure relief valves
- Vehicles and mobile plant

Property and Premises

- Perimeter fences, gates, locking devices and locks, security lighting, closed circuit television (CCTV) cameras and systems, monitoring equipment, intruder alarm systems, access control systems, and remote signalling systems
- Doors and shutters, door locking and latching systems, including safety interlocked systems
- Access roads, service yards, car park surfaces, external lighting systems
- Trees, landscaping and vegetation
- External storage areas and bunkers
- Building structures, including walls, doors, windows, glazing, roofs, chimneys, drainage systems, transmission aerials and masts, stairs, hoists or lifts and lightning protection systems

Fire and Explosion Safety

- Fire compartment walls, doors, dampers and shutters
- Fire stopping and fire resistive coatings
- Fire escape stairs
- Fire protection systems, including automatic sprinklers, water spray deluge, valves, water monitors, tanks and fire pump sets, water mist systems, fire water systems, hydrants, dry and wet chemical systems, gaseous fire protection systems, portable and fixed extinguisher appliances, and fire blankets
- Fire and security safety interlocks and signalling systems
- Blast walls, explosion relief, and spark detection and suppression systems
- Automatic fire alarms and detection systems, including fire safety interlocked systems and remote signalling systems
- Ductwork fire dampers
- Smoke extraction systems

Tanks and Fuel

- Tanks and tank farms, tank supports and pipe brackets, valves, pipework, spillage containment systems, tanker loading and offloading areas
- Fuel dispensing pumps, storage tanks, earth bonding connections, spillage containment bunds, weighbridges, drainage systems including surface water holding ponds, penstock valves and interceptor pits
- Spillage containment systems
- Pipework and service gantries

Electrics

- Electrical systems, including transformers, power and lighting, substations, switchgear and controls, circuit breakers, emergency lighting systems, portable appliances, batteries and UPS systems
- Standby generators, including associated switchgear, control panels and fuel storage tanks
- Solar panels and wind turbines

Heating and Cooling Systems

- Boilers, including flame failure devices, drop valves, cabling, fusible links, pressure relief valves, solenoid valves, shell and tube welds, expansion tanks and safety interlock systems
- Heating systems, both for building and process use
- Stratification fans
- Refrigeration systems and plant
- Cooling towers and fan coil units
- Air conditioning systems

Storage

- Racking and storage systems

Water Systems

- Portable water supply systems, sluice gates, valves, filters, fittings, strainers, pipework and pumps
- Escape of water and leak detection systems
- Effluent water treatment and plant

Checklist

A generic Maintenance Programme Checklist is presented in Appendix 1 which can be tailored to your own organisation.

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Aviva Risk Management Solutions can offer access to a wide range of risk management products and services at preferential rates via our network of Specialist Partners.

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[Aviva Risk Management Solutions – Specialist Partners](#)

Additional Information

Relevant Loss Prevention Standards include:

- Electrical Installations – Inspection and Testing
- Fire Doors, Fire Shutters and Fire Dampers
- Thermographic Surveys

To find out more, please visit [Aviva Risk Management Solutions](#) or speak to one of our advisors.

Email us at riskadvice@aviva.com or call 0345 366 6666.*

*Calls may be recorded and/or monitored for our joint protection.

Appendix 1 – Maintenance Programme Checklist



Location	
Date	
Completed by (name and signature)	

	Maintenance Programme	Y/N	Comments
1.	Is there a manager responsible for the site's maintenance programme? If so, who?		
2.	Is there a formal asset register, and does it include: <ul style="list-style-type: none"> • Buildings • Services and utilities? • Plant and fire protection or detection systems? • Processing or manufacturing equipment? • Spares? 		
3.	Are there formal up-to-date drawings for the: <ul style="list-style-type: none"> • Buildings? • Services and utilities? • Plant and fire protection or detection systems? • Processing or manufacturing equipment? 		
4.	Have the buildings, objects, equipment, processes, utilities, and activities on site been risk assessed to understand what is considered important to the site? Has the anticipated downtime, outage and recovery of these been assessed, and is it considered acceptable to the organisation's risk appetite? Have these been specifically identified?		
5.	Have all statutory or regulatory required objects and systems been identified, such as pressure systems, lifting equipment, DSEAR, etc.?		

	Maintenance Programme Contd.	Y/N	Comments
6.	Have any bottleneck, bespoke or long lead-time objects or equipment been identified and their exposure quantified?		
7.	Is there an appropriate system in place for managing all inspections, testing, servicing and maintenance activities?		
8.	Is there an appropriate mechanism in place for ensuring the frequencies for inspection, testing, servicing and maintenance activities are appropriate, based on: <ul style="list-style-type: none"> • Regulatory requirements? • Manufacturer or OEM guidelines? • Industry standards? • Site experience and learning? • Risk to the business? • Your insurer? • Best practice? 		
9.	Does the management system enable you to prioritise tasks? How are priorities established?		
10.	Does the management system enable you to identify task completion rates and measure this against the number of tasks due, based on the: <ul style="list-style-type: none"> • Priority of the tasks? • Total number of tasks? • Length of time outstanding? 		
11.	Does the management system enable feedback and recommendations resulting from a completed task?		
12.	Does the management system track any feedback and recommendations through to completion with periodic reminders? How are ownerships assigned?		
13.	Does the management system enable the completion rate of the task feedback/recommendations to be tracked? <ul style="list-style-type: none"> • Versus the total number of items raised in the system? • Versus the length of time since it was raised? 		

	Maintenance Programme Contd.	Y/N	Comments
14.	Does the management system enable trending of any parameters tested for specific tasks, such as temperature, pressure, or moisture content?		
15.	Is the management system auditable? Are changes made to the system recorded in the system? If so, when and by whom?		
16.	Are the task frequencies periodically audited to verify their applicability?		
17.	Does the management system enable you to identify and manage spares?		
18.	Have the types of spares needed and the minimum levels of these spares been identified?		
19.	Have critical, important or difficult-to-replace spares been identified?		
20.	Are spares stored in line with the manufacturers' recommendations?		
21.	Are spares stored in a separate fire area or building to the primary equipment they belong to?		
22.	Are spares for consumables stored in a separate fire area to equipment or production-related spares?		
23.	Is there a robust system to replace spares as soon as they are used?		
24.	Is there a separate capital expenditure budget set aside for maintenance activities and spares? How are replacement spares funded? Has an acceptable time been established for replacement of spares once used?		
25.	Are spares inventories audited?		

	Maintenance Programme Contd.	Y/N	Comments
26.	<p>Are any OEMs, service providers, or spares providers no longer trading?</p> <p>If so, what are the contingency plans?</p>		
27.	<p>Does the learning from any near-misses, accidents, failures and incidents feed into the inspection, testing, servicing and maintenance management system?</p> <p>How is this formally and consistently completed?</p> <p>How is this shared among any other departments or locations within the group or company?</p>		
28.	Additional comments:		

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