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Shaping shipping for people

In this issue we focus on maintenance related incidents:

- the importance of a planned maintenance system
- hazard identification strategies
- regular and thorough inspections
- operational system testing.

Maintenance

Maintenance is essential for the safety of a vessel, its operations and the crew. Identifying, addressing and managing maintenance-related risks as part of your vessel's safety management system is key to maintaining safe vessel operations.

Maintenance of a vessel and its equipment is an important element of the safety management system and a mandatory requirement under the International Safety Management (ISM) Code. While a critical safety factor, maintenance related issues do not always receive the attention they deserve. Maintenance issues are often difficult to detect and not generally linked to safety and therefore are not recorded, reported or addressed as an incident or near miss as part of the organisation's safety management system.

Case study one[1]

Three crew members sustained minor injuries when a lifeboat fell into the sea during a familiarisation launch onboard a research vessel. The lifeboat fell from the davit onto the vessel's deck and was dragged over the side by the moving davit arms, where it then detached from the wire falls and fell bow first into the sea. The crew on the deck were unable to halt the launch sequence and prevent the lifeboat falling into the water.

The investigation found that a critical interlock device on the lifeboat davits had heavily corroded due to lack of maintenance. The required checks and planned maintenance on the davit had

not been completed since it had been installed on the ship. The corrosion went unnoticed, and the interlock cylinder was not replaced in accordance with the instructions in the manufacturer's manual.

Case study two[2]

The Australian Maritime Safety Authority (AMSA) boarded and inspected a vessel at an Australian port in July 2024. While inspecting the main deck area, the purifier room fire damper was found to be not operational. The damper was seized in the open position and the operating wheel failed. Numerous auto cleats on cargo hatch covers were also found not operational. A significant number of other deficiencies were found

The deficiencies identified were objective evidence that the safety management system as implemented on board failed to adequately satisfy the requirements of the ISM Code. Consequently, the vessel was detained.

The importance of maintenance

Maintenance ensures that a system continues to perform its intended function as per its design in relation to the level of safety and reliability.[3]

As shown in figure 1, there were 3555 technical incidents reported to AMSA in 2023 and 3672 in 2022. Analysis of AMSA's port State and flag State control inspection data shows there were 525 maintenance-related deficiencies issued in 2023 and 415 in 2022. There has been a gradual increase in maintenance-related deficiencies issued since 2019.

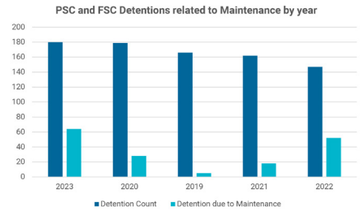


Figure 1: Number of technical incidents reported, and maintenance deficiencies issued for 2019-2023 (source: AMSA)

As seen in figure 2, there were 180 port State and flag State detentions in 2023 and 147 detentions in 2022. Of these, 64 or 35.6 per cent were due to maintenance issues in 2023 and 52 or 35.4 per cent in 2022.

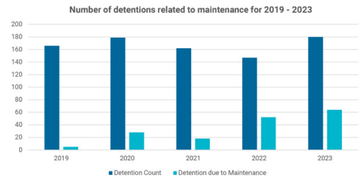


Figure 2: Number of detentions related to maintenance for 2019-2023 (source: AMSA)

Technical failures are often considered isolated incidents and therefore most of these do not undergo further investigation.

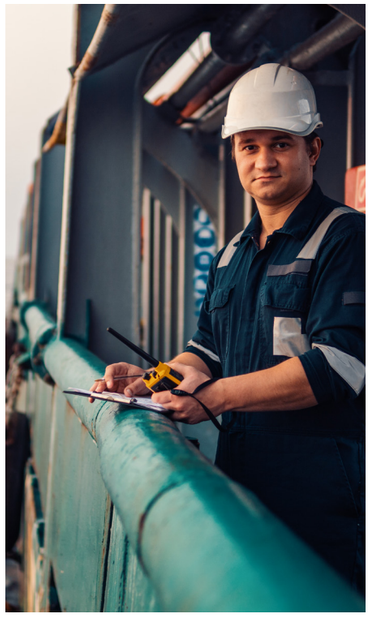
Examples of issues that could lead to technical failures include but are not limited to:

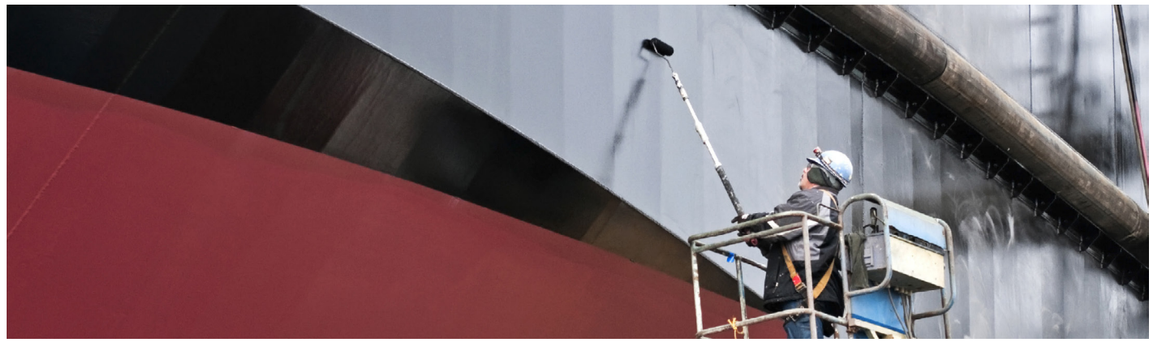
- unsuitable modification to parts
- omission of maintenance checks
- incomplete installations
- a fault not being isolated
- missing equipment.

While many maintenance-related errors may seem inconsequential, they have the potential to remain dormant and can affect the safe operation of a vessel over time. Effective and regular maintenance will result in fewer machinery failures and breakdowns. This in turn will minimise the rate of unforeseen operational delays and serious incidents. There are also the added cost-related benefits of improved productivity and efficiency.

ISM Code

A planned maintenance system to maintain a vessel and its equipment is a requirement of the ISM Code (Clause 10). The ISM Code outlines that the company/operator should inspect equipment and technical systems at appropriate intervals as part of a vessel's safety management system and manufacturer requirements. This includes ensuring non-conformities are reported and appropriate corrective actions are taken, as well as regular testing of equipment or technical systems that are not on continuous use.





Factors influencing maintenance issues

Due to the complex nature of the maritime working environment, maintenance-related issues are often a result of interactions between organisational factors and latent conditions.[4]

Resource pressures

- A study involving 1026 seafarers identified that more than 20 per cent of seafarers reported working more than 69 hours per week with unpredictable working hours.[5]
- Scarce resources mean people and organisations frequently have to make a trade-off between the time and effort taken to prepare for a task, and the time and effort expended doing it.[6]
- Trade-offs involving shortcuts may allow the ship to be operational more quickly, but at the expense of thoroughness and safety. This is identified in phrases such as:

  'It normally works...'

  'It is good enough for now...'

  'Someone else has checked it...'

  'There is no time to do it now...'
- Companies must ensure enough resources are available to encompass all maintenance tasks onboard without compromising fatigue.

Risk assessment

- Consider the risks associated with a maintenance related failure and ensure appropriate resources are available to carry out an effective maintenance schedule.

Fatigue

- Fatigue impairs alertness and the performance levels of cognitive and physiological functions, for example decision-making, response-time and hand-eye coordination. When this coincides with other risks in the environment, incidents may occur.
- A range of strategies are available to manage the risk of fatigue[7].

Maintenance procedures

- Poorly designed procedures that are unclear, out of date, inaccessible, not written for the task, or difficult to follow will likely result in deviation or non-compliance.
- It is important to align procedures with the way tasks are undertaken and to involve seafarers in their development where possible.

Lack of training

- Companies need to ensure training is relevant and up to date for the tasks at hand.

Hand-over procedures

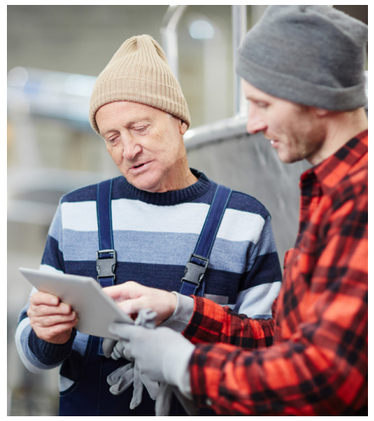
- Maintenance tasks may not finish within a single watch. Seafarers frequently accept work in progress or handover incomplete work to an incoming watch.
- Effective and accurate transfer of information is important to avoid assumptions or misunderstanding about the status of work.
- To reduce errors, allow adequate time for the watch hand-over.

Group norms

- Norms are the unspoken rules about how work happens in a particular workplace.
- Errors may result if faced with an exception to the rule.
- Informal practices or shortcuts may be deemed as acceptable, if not addressed.
- If an action has succeeded in the past, there can be an expectation it will succeed again without incident.

Poor design

- If the system or equipment is incompatible with the practicalities of the task, seafarers will develop shortcuts and work-around solutions that may have unintended consequences.



Managing maintenance issues within the safety management system

Maintenance requires a systemic approach and should form part of an operator's safety management system.

Having an effective planned maintenance system that allows operators to plan, perform and document vessel maintenance at regular intervals, including thorough maintenance, visual inspections and operational tests, will reduce the risk of machinery failure.

It is recommended that a complete database of machinery, equipment and fittings is established. Specific requirements and instructions should be incorporated into inspection, testing and maintenance plans, including any manufacturer's recommendations.

Good recordkeeping helps evaluate the effectiveness and efficiency of planned-maintenance activities.

Key messages

- Plan maintenance to ensure problems are identified early to reduce the risk of system and machinery failure.
- Incorporate the management of maintenance-related risks within the safety management system.
- Introduce specific measures to identify and mitigate hazards to assure the reliability of equipment, machinery and systems.
- Regularly review inspection, monitoring, maintenance action and processes for continued effectiveness.
- Incorporate the manufacturer's recommendations for maintenance frequency where available.
- Investigate technical failures and make improvements to minimise the risk of future occurrences
- Ensure appropriate resources are available to carry out an effective maintenance schedule.

References

1 Marine Accident Investigation Branch (2023) Lifeboat davit failure on polar research vessel RRS Sir David Attenborough. Accident Investigation Report 6/2023.

2 Australian Maritime Safety Authority (2024) Detention report.

3 Reason, J & Hobbs, A. (2003) Managing Maintenance Error: A Practical Guide. CRC Press, London.

4 Reason, J & Hobbs, A. (2003) Managing Maintenance Error: A Practical Guide. CRC Press, London.

5 Andrei D, Grech M, Crous R, Ho J, McIlroy T, Griffin M & Neal A. (2018) Assessing the determinants and consequences of safety culture in the maritime industry.

6 Hollnagel, E. (2009) 'The ETTO principle: efficiency-thoroughness trade-off—why things that go right sometimes go wrong', Risk Analysis, vol. 30,1, pp. 153-154.

7 Australian Maritime Safety Authority (2020) Fatigue guidelines - managing and reducing the risk of fatigue at sea.

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Reporting major failures

It is a legal requirement to report any major critical equipment failure to AMSA. You can do this by completing an incident alert (form 18), followed by a detailed incident report (form 19) within 72 hours of occurrence. Forms are available from amsa.gov.au