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Ships and marine technology — Specification for software-based planned maintenance systems

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents shall be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 11, *Intermodal and Short Sea Shipping*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

In its International Safety Management Code, the International Maritime Organization (IMO) defines a mandatory regulation on planned maintenance systems (PMS) for ships, for the purposes of promoting efficiency of maintenance and safe operation. Although PMS are regulated to be operated on paper or software, software-based PMS are preferred due to systematization and computerization of the shipping industry. Hence, software-based PMS have already been used to help implement ISM Code 2018 Part A/10. However, a standardized software-based PMS is needed to meet further demand in the era of e-navigation or maritime autonomous surface ships (MASS). In addition, even though shipping companies have been developing their own PMS software and equipping ships, this has been proving difficult for medium to small size shipping companies. This document will prove useful to shipping companies when developing the software program of PMS, by providing the method of inputting, planning, reporting and managing the data of maintenance of items and spare parts.

Ships and marine technology — Specification for software-based planned maintenance systems

1 Scope

This document specifies the minimum functions for software-based planned maintenance systems (SPMS) and related aspects, that shipping companies are intended to provide to ships. It includes requirements for planning and implementing a maintenance schedule, as well as for recording, reporting, analysing and optimizing the maintenance of onboard equipment and systems, in support of ISM Code 2018 Part A/10, which addresses maintenance, spare parts, procurement, personnel, and voyage planning; these aspects can be covered in one or more applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IACS E22, *On Board Use and Application of Computer based systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
planned maintenance system
PMS
system that supports efficient maintenance, such as planning, scheduling, implementing, recording and reporting of actions taken for onboard equipment and systems

3.2
software-based planned maintenance system
SPMS
planned maintenance system (3.1) that fulfils functionalities via software

4 SPMS functions

4.1 General

4.1.1 Language

The SPMS should be implemented in English, other languages may also be used.

4.1.2 Backup capability

All tools related to the SPMS shall provide methods for software and data backup in regular intervals to ensure that the user can repair or re-install the software, and restore the relevant data for the recovery after a dramatic system.

4.1.3 Ship-shore communication

The SPMS shall enable the user to send and receive data on maintenance and spare parts, to and from the shore-based database via digital transfer. Such data includes, but is not limited to:

a) the new maintenance item and spare parts code;

b) the implementation of the maintenance plan;

c) the stock transaction;

d) the requisition for purchase.

4.1.4 PMS code

The SPMS shall enable the user to create a code structure complying with the requirements of the ISM code.

4.1.5 Database

The following requirements shall be met:

a) the database shall be timely updated;

b) the SPMS shall be capable to self-check normal errors in the database, and to guarantee the validity of the data;

c) downward (backward) compatibility of database and software updates shall be ensured, so that a change of database or software does not affect data access and system availability.

4.1.6 Authentication and authorization

The following requirements shall be met:

a) the setup and login of a user account shall be achievable through the SPMS;

b) the access rights shall be identified and restricted by designated accounts;

c) the logs of user's activities shall be kept so as to be queried when necessary.

4.1.7 Update

The system shall be updated using the latest version through version management covering specific procedures and protective measures, including mechanisms for validating updates before deployment and reverting to preceding revisions in the case of corruption.

4.1.8 Failure recovery

In the event of a failure, the system should be able to be recovered to a previous state in which the system was stable, so as to restore intact the related data.

The SPMS should alert the user of any expected adverse influences or risks resulting from the failure recovery.

4.1.9 Cyber security

The transmissions of data that are critical to the safety of the ship should be protected against unauthorized access.

Cyber security measures in accordance with MSC. 428(98) and related instruments shall be implemented to protect against cyber threats and to ensure data integrity.

4.1.10 Notifications

The SPMS shall:

a) enable the user to set a pre-notification date for maintenance, before the planned maintenance date;

b) notify the user when the notification date and planned maintenance date are due;

c) enable the user to check all overdue or failed tasks according to the maintenance plan within a user-defined time window;

d) notify the user when the tasks have been overdue, and propose a maintenance date for overdue tasks based on the existing maintenance plan;

e) enable the user to provide a description of related reasons of overdue or failed tasks;

g) notify the user in the case of self-malfunction, such as disk full, exceptional error, network malfunction, database management system (DBMS) failure, etc.

4.1.11 Queries and printout

The function of query and print out of history data shall be provided by the SPMS.

4.2 Initialization function

4.2.1 Registration of machinery and parts

When first installed, the SPMS shall at least include the following particulars for the equipment and systems of the ship:

a) the machinery number;

b) the machinery name;

c) the manufacturer;

d) the machinery type;

e) the spare parts.

4.2.2 Initialization of the SPMS tasks

Maintenance details of each equipment or system shall be defined, according to the machine's characteristics, the manufacturer's recommendation and the maintenance policy of the company; at least it shall include the following:

a) the task description;

b) the maintenance frequency;

c) the maintenance method;

d) the person in charge;

e) the last work date, or the date when the equipment or system was new;

f) the total running hour as of the last work date.

The task period shall be determined by maintenance frequency, defined change in a component value or judgment of the person in charge, and the initial maintenance date and the initial value shall be set as the standard for maintenance.

4.3 Maintenance process

4.3.1 Maintenance planning

The running hours of the equipment or systems shall be updated by visual inspection or average running hours.

The SPMS shall enable the user to establish a maintenance plan for a period of time (e.g. for a given number of months) or for a voyage, based on manpower, scheduling and dependencies of the maintenance tasks, at least including:

a) the machinery;

b) the maintenance task and description;

c) the planning method;

d) the spare parts needed;

e) the person in charge;

f) the due date.

If the maintenance plan period is determined, the SPMS task times for the selected period shall be automatically listed up, so that the user can confirm the SPMS tasks to be performed during the period and establish the detailed implementation schedule.

The SPMS shall enable the user to establish unplanned and unexpected maintenance tasks as the need arises according to 4.2.2.

The SPMS shall enable the user to reschedule a due date before the calculated due date, and record the related reasons.

The SPMS shall provide a forecast for the material resources required for a set future period of time in a range of equipment and systems to be produced, based on the existing maintenance plans.

4.3.2 Reporting

When a maintenance task is completed, details on the maintenance task shall be reported, at least including:

a) the maintenance date;

b) the person in charge;

c) the time used;

d) the spare parts used;

e) the quantity of spare parts used;

f) a picture (if any);