Planned Maintenance System in shipping

The **PMS** - **Planned Maintenance System** is a paper/software-based system which allows ship owners or operators to carry out maintenance in intervals according to manufacturers and class/Classification society requirements. The maintenance, primarily supervised by the on board personnel, is then credited towards inspections required by periodic surveys. The planning and scheduling of the maintenance, as well as its documentation, must be made according to a system that is approved by classification societies like American Bureau of Shipping, Germanischer Lloyd, Lloyd's Register, Bureau Veritas or Det Norske Veritas, etc. All these classification societies are members of IACS[1] (International Association Of Classification Societies Ltd). Having a planned maintenance system on ships is now mandatory as per ISM (International Safety Management Code).

1 History

The first mention of Planned maintenance was in the Christensen whaling fleet in 1915, which, at the time, was biggest whaling fleet in the world. Although it is not clear who actually invented the system, credit goes to Christensen and Arnesen Christensen & Co.[2] Early systems were written on paper and included only a few of the most important items on board. In time the system grew and improved. During 1950 the same company presented the first comprehensive Planned maintenance program for shipping. The Planned Maintenance system for the U.S. Navy was established by Anthony J Ruffini in 1963.[3] Development of computers give a new boost to Planned Maintenance programs in shipping. In 1984 the first Planned Maintenance software specially designed for ships use was marketed. Named **Asset Management Operating System** (AMOS-D) it ran in DOS, but the development of Windows software gave new boost and today there are a variety of Planned Maintenance programs for shipping use.

2 Planned Maintenance Systems requirements

Selective research performed by insurance companies during the 1980s showed a significant decrease of breakdowns and damage to ships with Planned Maintenance systems. The same research also showed an increase in reliability and safety on board. In 2001 the IACS (International Association Of Classification Societies Ltd) published requirements for Planned Maintenance systems on board.[4] Further regulation was added by ISM (International Safety Management Code), chapter 5, section 10.[5]

Today, there is a minimum requirement that one Planned Maintenance system must contain:

- The description and documentation of the Planned Maintenance system are to be in the English language.

- Reports in Planned Maintenance system should be in English, except when not suitable for the crew. In that case a brief English summary is required.

- Planned Maintenance program must include equipment manufacturer requirements.

- Inventory content, i.e. items/systems have to be included in the maintenance program.

- Maintenance time intervals, i.e. time intervals at which the maintenance jobs are to take place.

- Maintenance instructions, i.e. maintenance procedures to be followed.

- Maintenance documentation and history, i.e. documents specifying maintenance jobs carried out and their results.

- Reference documentation, i.e. performance results and measurements taken at certain intervals for trend investigations from delivery stage.

- Document flow chart, i.e. chart showing flow and filling of maintenance documents as planning cards, job cards etc.

- Signing instructions, i.e. who signs documents for verification of maintenance work carried out.

For computerised Planned Maintenance systems there are several additional requirements:

- Each person working on system must have unique loginID and password.

- Computerised system must have adequate backup, either backup copy on board or a regular exchange of data between ship and office.

Documentation on maintenance of the category "Classification Surveys" carried out on items/systems covered by the rules is to be signed by the Chief engineer. With computerised systems, access to update the related maintenance documentation and the maintenance program should only be granted to the Chief engineer.

For ships trading in specific areas, e.g. ferries, planned maintenance systems using other languages than English may be accepted. This arrangement is automatically cancelled in case of change of trade.

3   Computerised Planned Maintenance Systems for use in shipping industry

The development of computerised PMS was boosted by computer development, especially the development of Windows.[6] A variety of PMS programs for shipboard use appeared, and gradually they become more and more sophisticated and complex. Producers recognized shipping needs and most of the programs today have several (semi)independent modules and the customer (shipping company) can choose what package they want to use. Programs today do not contain only maintenance, they offer almost all what is needed on board the ship. or inside and out side the vessel

Most common modules in modern PMS system include:

- Maintenance *(main and essential part of program)*
- Drydocking
- Hull inspection maintenance program
- Surveys and certificates class society integration
- Stock ordering and purchase
- Stock control (inventory)
- Safety management
- Quality management
- Crewing management
- Crew payroll
- Self-assessment
- Energy and environmental management
- Document management systems
- Enterprise reporting

Modules can vary between different programs, but they are all based and built around main module, Maintenance.

3.1   Maintenance

This module should meet requirements listed in ISM (International Safety Management Code), chapter 5, section 10. The database should be constructed according to the manufacturer's recommendations, and good seamanship practice. The database should include all shipboard vital equipment, and all equipment should have a clearly defined maintenance plan. Performed tasks should be kept in the system as well as notes from crew members performing the task.

Access to various aspects in the system must be selective and programs must have ability to individually recognize users (login ID and password). Best example of this practice is Class requirement that only Chief Engineer have access to jobs linked with Surveys.

Class societies allow special status to ships with well implemented PMS. Survey of various machinery components is performed usually with regular Class surveyor inspection, and it is based on schedule given in Continuous Machinery Survey. Surveyor comes to ship several times per year and inspects various machinery components, determining their condition. Inspection is scheduled every five years and the system is intended to assure good functionality of ship's machinery and therefore safety of the ship. As PMS is increasing overall safety and reliability of the ship, Class societies allow another form of Survey to be performed on the ships with well established PMS. Most of CSM inspections (all except steering gear and pressure vessels) is carried out by Chief Engineer, based on regular PMS jobs, and Class surveyor is coming on board the ship only once a year to inspect items Chief Engineer is not entitled to and to check what items were inspected since last Class inspection.

4   References

[1] International Association Of Classification Societies. IACS Members Listing. Retrieved 28 December 2013.

[2] Bjorn L. Basberg (January 1998). *The Northern Mariner*. Volume 8, issue 1. The Floating Factory. pp. 21-37. Retrieved 28 December 2013.

[3] Anthony J. Ruffini, Bureau of Ships Washington DC (1963). *The Standard Navy Maintenance and Material Management System (3-m), Its Status and Application*. Defense Technical Information Center. Retrieved 28 December 2013.

[4] "IACS certification requirements". 2006. Archived from the original on 2007-04-10.

[5] ISM code, see chapter 5. Retrieved 28 December 2013.

[6] Keith Mobley, Lindley Higgins, Darrin Wikoff (2008). *Maintenance Engineering Handbook* (7th ed.). McGraw-Hill Handbooks. Mcgraw-hill. ISBN 978-0-07-154646-1. Retrieved 28 December 2013.

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5.1 Text

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