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Computerized Planned Maintenance System Software Models

Goran Gašpar, Igor Poljak, Josip Orović

University of Zadar, Maritime Department, M. Pavlinovića 1, 23000 Zadar, Croatia, e-mail: gorangaspar197@gmail.com; ipoljak1@unizd.hr; jorovic@unizd.hr

ABSTRACT

Classification societies certify computerized planned maintenance systems, which have to comply with ISM, IMO and IASC standards. This paper aims at presenting standard requirements and a short history outlook for three planned maintenance software solutions: Amos, Bassnet and Titan. Software packages are scanned through their modules and features. The maintenance module overview, with all related features, is selected for three software solutions where the maintenance module is the only module which is related to the Class requirements. The aim of this paper is to discuss the advantage and disadvantage of each software separately and their application in the shipping industry.

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1 Introduction

As per International Standard of Safety Management (ISM) Code, the shipowner will ensure that the machinery, namely, the hull structure and equipment are maintained and operated according to the rules and procedures established by the company. Each company will decide what planned maintenance system will be chosen: either electronic, paper based or combined [1]. The computerized maintenance system will refer to a software based maintenance programme, which is usually installed both on board the vessel and in the operator's office. The approval for such software is given by the classification societies which are primarily focused on the maintenance management functionality [2]. There are various planned maintenance based computerized software companies today. Sometimes shipping companies develop their own planned maintenance software which has to be recognized by the class. Moreover, even classification societies offer their versions of planned maintenance software which usually incorporates class related items. An example of such software is the DNV GL's Technical management software [3]. In this paper, a short overview of three different planned maintenance software solutions will be

presented: Amos, the greatest of all three, which operates on board approximately 7000 ships [4], Bassnet, which is installed on board 2000 vessels approximately [5] and Titan. The maintenance part of these software solutions and possible differences in various products is in focus in this paper.

2 Planned Maintenance System (PMS) Requirements

Requirements for the planned maintenance software for ships undergo to following requirements [6], [7], [8], [9]:

The ISM Code, with its Chapter 10 and Paragraphs 10.1 through 10.4, defines maintenance of the ship and its equipment, gives general notes and guides for ship maintenance.

According to the ISM Code, the Company should have procedures to ensure that the ship is maintained in a proper way, taking into consideration all rules and regulations. Inspections should be at appropriate intervals and all non-conformities should be reported. If the possible cause is known, it should be reported and a corrective action taken. All records of these activities should be kept.

The company should identify the critical equipment and the systems that might cause hazardous situations. The equipment should be regularly tested in order to provide an operational reliability. All above mentioned facts should be part of the ship's operational maintenance routine.

According to the IACS recommendations for maintenance, it is stated that maintenance instructions have to be according to the manufacturers along with other instructions which have to be issued as to ensure the uninterrupted and safe operation at all times.

Following the above requirements, the machinery PMS system has to have the following essential features [1]:

- all dates of Class survey and items that were dealt with,
- must cover all related ships equipment including: deck, engine, lifesaving equipment, firefighting equipment and etc.,
- maintenance schedules,
- monitor of the machinery running hours,
- details on specifications when certain work has been done (with dates, references and etc.),
- condition monitoring procedures,
- details if some unscheduled maintenance has been done,
- preventive and corrective maintenance,
- marking flagging critical equipment,
- details if some work is to be done in overdue; why and when a specific work is in overdue, reasons why it cannot be done,
- history of components, breakdowns / defects,
- manufacturer's service instructions and work instructions,
- spare part list and information,
- reporting status and if records are regularly sent to the office,
- list of defective equipment,
- spares' quality, quantity, inventory,
- monitor of outstanding requirements,
- log in ID and password,
- access rights to be identified and restricted,
- documentation of the PMS to be in the English language,
- computerized system with adequate backup (backup copy on board or a regular exchange of data between ship and office),
- time saving of work history reports, equipment breakdown and damages for at least five years.

3 Computerized PMS Software Amos

PMS software Amos was designed by SpecTec Company which was founded in 1985 at Oslo, Norway, and is the world's leading maintenance management system. Amos PMS software is a Windows based programme capable of handling daily functions of PMS on board vessels and in the office at multiple locations. Amos clients are well known names in maritime affairs such as: MOL, Golar, Hyproc, Tankerska Plovidba and Grieg Shipping.



Figure 1 Log ID and Secured Password Access [10]

Depending on the version, a full Amos package software consists of the following modules:

- Maintenance and Purchase
- Quality and Safety
- Personnel
- Mail
- Voyage Management

To start the AMOS PMS package, a log in ID and Password (Figure 1) is required. This is in compliance with the regulations previously explained. The given log in ID has restrictions on the access level in accordance with the organization hierarchy.

In the Maintenance and Purchase part of the software, the clients can plan and report maintenance, track, estimate and update parts on stock and etc. The basic Amos software options are [10]:

- regularly performed works and maintenance schedules can be defined,
- works that should be done in the near future can be printed as print lists or check lists with full details of the work,
- extraordinary maintenance with Work Orders can be planned,
- manually or semi-automatically reporting of planned maintenance,
- keeping records of all inspections by the authorities,
- maintenance records can be easily printed or displayed,
- routine checks and unexpected maintenance can be reported,
- work order can be created and a particular work can be reported based on the created work order.

Filter option is provided by the software to navigate inside maintenance module and search filter is provided as the programme consists of a great number of data. Filter tool is given in two versions: basic and advance.

4 Computerized PMS Software Bassnet

BASS was founded in 1997 and is another Norwegian roots based company, which created their own planned maintenance software. BASSnet™ software suite is based

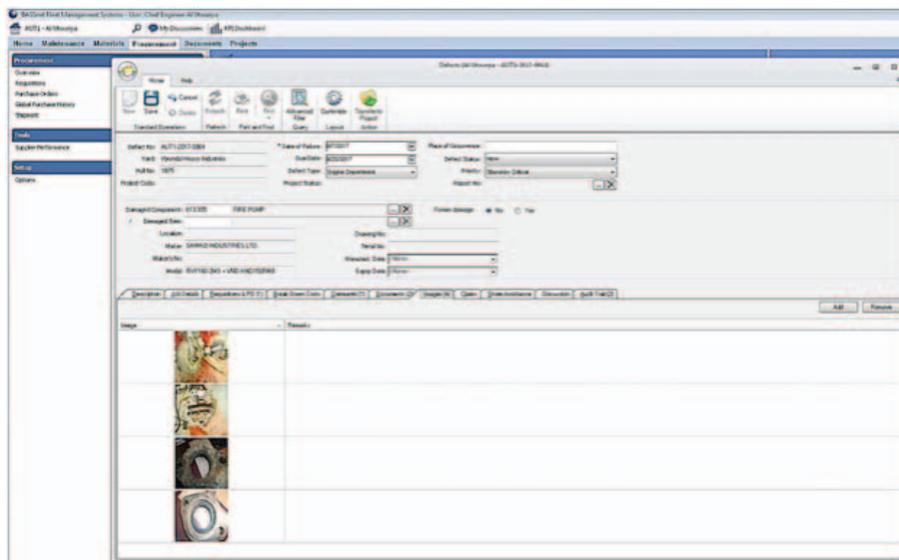


Figure 2 Defect Manager, Part of Maintenance and Material Module [14]

on Microsoft NET development. The software enables the building of integrated solutions covering all main areas of maritime operations [11]. Bassnet CPMS has a large list of the client names in the shipping industry such as: Wilh.Wilhelmsen, Neptune Orient Lines, CMA Ships, IMC Shipping, Hapag-Lloyd, NYK, Oldendorff Carriers and K-Line. BASSnet™ is a modular-based software which employs a single-platform strategy offering complete flexibility as each organization can define its own processes and avoid duplication. BASSnet™ consists of the following modules [12]:

- Maintenance and Materials,
- Projects
- Ports Managements
- Procurements
- Documents
- Review and Improvements
- Operations
- Financials
- Risks
- Human Resource Manager
- Safety

Maintenance and material as a module which is subjected to class approval offers the following features:

- List of Main Components
- List of Subcomponents
- Maintenance
- Materials
- Location Manager
- Routine Task
- Defect Manager
- Claims Management
- Hull Inspection
- Fleet Management
- Counter Adapter
- Create Sister Vessel DB

BASSnet maintenance and material module allows a quick approach to reports. In that option, it is possible to

generate and export to Excel spread sheets works done in the past for a particular component.

Key performance indicator (KPI) dash board allows KPI overview of various modules inside the software. Maintenance efficiency target for SIRE inspection for LNG vessels according to VIQ [13] states that outstanding works should be in the range of less than 3%, according to the following formula:

$$KPI = \left[\frac{(A + B) - C}{D} \right] \times 100\%$$

where:

A = Total amount of jobs on monthly basis

B = Jobs from previous month

C = Number of jobs done

D = Total amount of jobs

Defect manager tool (Figure 2) is a part of the breakdown machinery or equipment maintenance. Generating and advising reporting tool for highlighting urgent conditions has to be attendant either with spare parts or with services.

5 Computerized PMS Software Titan

Shipping PMS Titan was made by AVECS Corporation AG from Germany which was founded in 1994, [15]. Interschalt maritime systems AG were founded in 2007 by merging of AVECS Corporation AG, Interschalt GmbH, Stein Shon GmbH and Seacos GmbH. Some of the shipping operators which use Titan CPMS are: Reederei NSB, Ahrenkiel Shipmanagement, Leonhardt & Blumberg, Interorient Navigation and Feederlines [16]. Titan software, shown in Figure 3, primarily covers three core modules:

- Components
- Stock Control
- Requisition Center.



Figure 3 Titan Main Menu Page [17]

Maintenance features are [17]:

- Reporting on planned and unplanned maintenance
- Creating maintenance lists with details and work delays
- Circulating parts
- Viewing and surveying the existing maintenance reports
- Working with counters / updates
- Viewing units and adjustments
- Locations of spare parts and their allocation
- Stocktaking
- Purchase basket
- Activating and receiving requisitions
- Adding and linking spare parts
- Changing work parameters
- Working with external forms
- User management: adding new users and changing the rights of a user

6 Comparative Analysis

All three software solutions have very good maintenance features which allow to schedule the work effectively,

analyze, monitor and track performances, increase operational efficiency, plan and optimize inventories thus producing cost savings, share information between ship and shore and etc.

The difference in the three solutions is in using complexity, additional software tool options and user interface. Table 1 shows a short overview of the basic advantages and disadvantages of the aforesaid software solutions.

7 Conclusion

It is clear that all three computerized planned maintenance software have the same maintenance features which are submitted to the class approval and differ only in their variations. Slight difference from one to the other CPMS is that they have different (but similar) modules and module features.

The simplest is Titan with only three modules, which are offering different options. As this programme is simpler, as compared to the other two, it is presumable more stable in operation without critical programme mistakes and with a higher operational reliability. On the other hand, excessive maintenance module features can be useless for the vessel and are usually not in use on board merchant vessels.

The other two programmes, Amos and Bassnet, are more complex and, besides maintenance, they have aspiration to go deeper in the whole fleet organization of a company. Amos tends to replace mail service in order to unify all electronic data exchange from the vessel to the company and to other official correspondence from the parties. Such centralized system is easy to control and to access to correspondence history.

Bassnet is slightly more business oriented as it is opened for reviewing and improvements. However these two programmes are more complex and they will require frequent support from programme administrators compared to the first one.

All three programmes are well ergonomically designed and they are easy to use what is in compliance with class requirements for such software packages.

Table 1 Advantages and Disadvantages of CPMS Solutions

	Amos	Bassnet	Titan
Advantages	widely used and known	more business oriented	easy to use
	accessible from web browsers [18]	has cloud solution [19]	highly visual
	good filter options and additional software tools	has many useful additional software tools	good user interface options
	very good maintenance, purchasing and stock control features	user friendly maintenance features with very good reporting system	stable in operation/ operational reliability
Disadvantages	complex	complex	simple in use
	large amounts of data	large amounts of data, excessive module features	no additional software options/ tools
	need for technical support	need for technical support	no cloud or web solution

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