Maintenance of recovery boilers from VLCC shipboard

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Abstract. The integrated maintenance and diagnosis system is intended for the measurement, monitoring, diagnosis, prediction and analysis of the main technical and functional parameters of a mechanical plant for its safe operation. Various software versions are implemented on modern ships that can ensure constant and efficient surveillance of all systems. These integrated systems of maintenance can focus on a category of aggregates and can prevent a great part of the defects that result from the incorrect exploitation of the respective aggregate or the lack of ensuring an efficient maintenance process. Integrated automatic diagnostics systems for onboard installations are the most efficient means of operation used for a wide range of applications. Also, integrated systems for automatic fault diagnosis - ISAFD is intended for measuring, monitoring and analyzing the technical parameters of machines used in the energy, chemical, metallurgical, food, construction or naval.

1. Introduction - the main objective and novelty

Fleet management system programme that offers a wide range of features for maritime business. It is simple and easy to use a system for maintenance, procurement and performance. Often fleet managers rely on several incompatible solutions to optimize performance. With the management system programme, you can easily plan, execute and monitor the entire process in one system. Includes a planned maintenance system designed to manage, monitor and document maintenance activities in all areas of activity. By structuring the maintenance data, the operating time is reduced and the internal efficiency is improved. For example, a kind of programme is SERTICA, as shown in figure 1.

Regarding the "Machinery", to ensure that the ship is maintained in good conditions, the Technical department of the company prepared the present booklet under the heading "PLANNED MAINTENANCE PROGRAM OF MACHINERY" which is a great assistance to crew in preparing and carrying out your vessel's machinery "Planned Maintenance".[1,2]
2. Planned maintenance system
A preventive maintenance system incorporates different capacities for enhancing and planning maintenance management to make expanded fleet effectiveness and decrease the absolute expense of proprietorship. The electronic programme supports planned maintenance, preventive fleet maintenance, corrective maintenance and condition-based maintenance, which is included in a single global maintenance management system, as shown in figure 2. Planning and executing jobs based on an advanced list of jobs, which also shows the relationships between jobs. An outline of stock and segments can be gotten, which can be moved between ships to decrease costs. Tracking and acting on the maintenance history and reducing the service life of the equipment.[2]
Structured fleet upkeep information
Reduction of interference times with preventive fleet upkeep
Extended life of the fleet hardware
Maintaining information about hardware and machines
Complete stock control with our electronic support the board system. Improvement of the workplace, including task the ships and time observing
Efficient interior work processes

It wipes out manual procedures, just as the confused and ungraceful assortment of spreadsheets, records and messages with our upkeep arranging system. The program offers day by day clients valuable functionalities, just as the apparatuses for overseeing and estimating the accomplishment of the upkeep office. Intended for coordination between fleets of various sizes, the framework is completely prepared to address the issues of private companies and enormous organizations. With a powerful engine that works even in the most shakiest conditions, the framework offers administrators all out significant serenity that they need to trust.[2]

3. Centralized data management
Centralized information encourages the focal development and control of hardware all through the fleet utilizing the implanted information packet framework. This implies data about a similar system utilized on various ships is shared and put away midway. The module permits putting away and moving significant subtleties of advantages, for example, work history, planned jobs, spare parts, adjustments, details, reports and records. By sharing this information, it is conceivable to streamline upkeep and lessen personal time. Information can be worked to guarantee uniform execution over the fleet, taking into account simple authorizing, information the executives and detailing over the fleet. What's more, information can be arranged and leaned to show explicit resources and operational status. A preventive maintenance schedule with JOB description for air conditioning plant is shown in figure 3[1, 3].

| JOB DESCRIPTION FOR AIR CONDITIONING PLANT |
|-------------------------------------------|
| **JOB** | **MP** | **NFT** | **DAG** | **NPS** | **NPS** |
| PROD | 001 | NUC | | | |
| Run plant if not used during previous week for | | | | | |
| 18 minutes to lubricate gland axle | | | | | |
| PROD | 001 | NUC | | | |
| Check oil separator oil level + replenish as necessary | | | | | |
| PROD | 001 | NUC | | | |
| Test fan leaks with test lamp | | | | | |
| PROD | 001 | NCM | | | |
| Tube vibration readings record in equipment log | | | | | |
| PROD | 001 | NCM | | | |
| ONLY TYPE | | | | | |
| Collect vibration data and upload to MOMIS (UWMM) | | | | | |
| Database | | | | | |
| PROD | 001 | NCM | | | |
| Test protection devices | | | | | |

Figure 3. JOB maintenance.

The activity list is the primary screen for most clients in every day cooperation with SERTICA. The Job List, figure 4, the screen gives an outline of all employments due, extraordinary or enacted
over a specific period time and takes into consideration all the fundamental connections with these activities. From this focal screen, all the works are begun and finished. A search can be utilized to refine the determination of employments as indicated by the period time, parts, assets or explicit areas. For instance, separating through presents related to the class or basic occupations. The activity list gives a moment diagram of each undertaking and their status by utilizing colour codes. When initiated, SERTICA gives a report on work orders, remembering perceptions for the most recent finished work, work content, systems, evaluated save parts and apparatuses, and an expected workforce. The activity list likewise offers the capacity to print or view screen-related documentation, for example, drawings, manuals, instructional recordings, pictures, and so forth. Join this module with the Job application to oversee support take a shot at your mobile device. Jobs can be sent out to your mobile device - giving you a finish and modern rundown of convenient employments whenever. The client can make occupations without any preparation and use layouts for standard employments. It is conceivable to actuate and finish chip away at mobile devices, both on the web and offline.[1-3]

Key highlights:
- Planning, organizing and overseeing support work in electronic format
- Spare parts
- Creation and meaning of jobs
- Read archives or add extra data to work
- Management report on finished and future occupations

Advantages:
- Planning before support work is rarely overlooked
- Reduction of creation time
- A screen to get a review of the upkeep
- Create a superior workplace
- Less worry because of unforeseen tasks [2]

4. Maintenance onboard ship
This integrated automated maintenance system represents a much more advanced and expanded version of previous systems. It is designed so that it can meet the demands of any shipyard or shipowner, being configurable in a range from 16 to 20,000 channels. The modular design based on the integrated standard modules allows configuring the system according to the individual

Figure 4. Menu for purchasing parts for maintenance.
requirements, covering a wide range that includes alarm systems with reduced complexity up to alarm and monitoring systems with an advanced command and control process, also covering the technical details regarding the management of the energy sources on board the ship. In order to configure the system, different selections of these modules can be used, each system is selected individually, this one is designed to perfectly match the requirements imposed by the user or the one who operates the main engines on board the commercial vessels. This is a decentralized system, for safety reasons is very easy to install, but its operation is performed in a centralized way, its operation being done from the operating stations that can be located in different places on the ship. Each I/O module has a well-defined role and is configured to suit the operating requirements of the specific operating area.

Due to the flexibility of its architecture, this system allows the interconnection of several type I/O modules, within the network, at any time. This can be done to allow the control of new operating areas or to extend the functionality of some already connected to the system.[4] The extent of the item:

- Monitoring and alert framework, as shown in figure 5;
- Auxiliary control;
- Ballast automation and checking;
- Control and automation of the cargo load system;
- The fire system; Air conditioning and heating system;
- Support dedicated to the management process;
- Maintenance of energy sources on board the ship;
- Command, supervision and diagnosis of the main engines;
- Monitoring and diagnosis of refrigeration installations;
- Analysis of the ship's path.[4,5]

![Figure 5. Visualization of the monitoring processes on board the ship.](image)

In accordance with Section 10 "MAINTENANCE OF THE SHIP AND EQUIPMENT" of the ISM code, each company should establish procedures to ensure that the ship is maintained in conformity with the provisions of the relevant rules and regulations. The officer in charge (Chief Engineer, 2nd Engineer, Electrician etc) is responsible to carry out the task described on the "PLANNED MAINTENANCE PROGRAMME", shown in figures 6 and 7, related to each specific item at the stated interval. After the completion of the requested job, the relevant entry into the electronic planned maintenance system will take place.[6]
5. Conclusions
The new interface between the installations and the user (HMI - "human machine interface") and its open architecture ensures the highest standards in terms of quality and functionality, being one of the first choices when considering the operating price and of purchase. The integrated maritime automation system complies with all specifications regarding the compatibility of the systems imposed by IMO, as well as by all local authorities, but also by IACS and all classification societies. It is designed in such a way as to meet the requirements imposed by the classification societies regarding the operating processes in the machine room not user-assisted. The system confirms the requests of all the laws and regulations and all the modules included in it are accepted globally.

6. References
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[4] www.km.kongsberg.com Accessed on: 23.02.2020.
[5] International Association of Classification Societies 2010 Shipbuilding and Repair Quality Standard No 47 (London).
[6] http://www.imo.org/SafetyManagement/Pages/ISMCode.aspx Accessed on: 16.04.2020

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