# PMonachus
# INTEGRATED SHIP MAINTENANCE MANAGEMENT SYSTEM

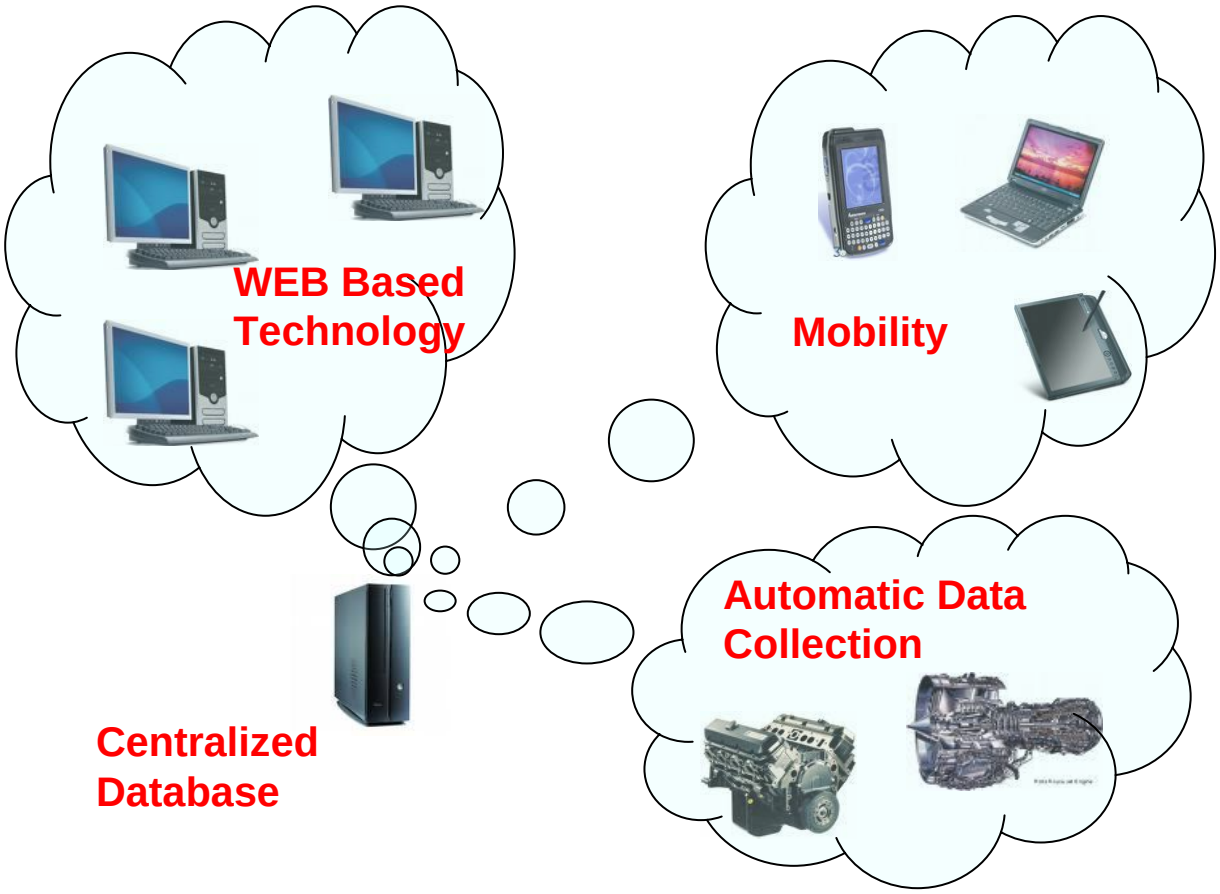
## İçindekiler

# INFRASTRUCTURE

The general information about the system software and development tools is as follows:

The software was developed using MS SQL DBMS and Visual Studio Software Development Tool. It has been in use on board of new design Turkish Navy (TN) platforms. The software is compatible with the US Navy Maintenance Concept (3M) and approach including terminology and methods.

The system has been developed by using WEB Based Technology; hence any Intel-based PC with any type of web browser (IE, Firefox, etc.) is enough to be a user of the system. One of the major goals of the system is to collect data which effective in maintenance planning independent from user attention. In order to achieve this goal automated data collection is developed.



# BASIC FUNCTIONS

The basic functions of the Integrated Ship Maintenance Management System is listed and then described as follows:

- System Configuration Management Subsystem
- Maintenance Management Subsystem
- Supply Support Subsystem

## *SYSTEM CONFIGURATION MANAGEMENT*

System Configuration is one of the core functions of the system. All the equipment/assets which are subject to maintenance are managed in this subsystem. All items are organized in tree structure. By simply selecting any item you will be one click away from all of the information about the item such as characteristic information, all the maintenance history of the item, all the maintenance requirement information related with the item etc.

System supports serial numbered control. All the information related with specific equipment is kept with respect to its serial number as long as it is in use, even after it is disposed.

# *MAINTENANCE MANAGEMENT*

Maintenance Management Subsystem is the most essential module of the system. It consists of the following sub functions:

- Maintenance Requirements/Maintenance Tree
- Maintenance Planning
- Maintenance Personnel Management
- Document Management
- Counter Management
- Maintenance Operations
- Maintenance Analysis

## MAINTENANCE REQUIREMENTS/MAINTENANCE TREE

The systems which are subject to maintenance operations are kept in hierarchical order using US Navy SWAP (Ship Work Authorization Boundary) Numbering Structure which is used for functional separation of onboard equipment. Some examples of this structure are as follows:

4000 - COMMAND CONTROL, COMMINUCATION, COMPUTER AND INTELLIGENCE SYSTEMS (C4I)

4200 - Navigation Systems

4230 - Electronic Navigation Systems, Radio

4231 - Navigation Radars

42311C - GPS System, AN/WRN-6(V)2,7 Radio Receiver

2000 – PROPULSION SYSTEMS

2600 – Propulsion Support Systems (Fuel And Lube Oil, Service)

2610 – Fuel Service System

2611 – Piping And Miscellaneous, Fuel Service

25211Q – Fuel Relieve Valve

Each system depending on its design characteristics and usage has maintenance schedule, and each schedule contains certain maintenance requirements. Each maintenance requirement is documented in Maintenance Requirement Cards (MRC).

A Maintenance Requirement Card contains every information related with a certain maintenance requirement of the equipment, such as; equipment information in the SWAP number structure described above, periodicity or the conditions which triggers the maintenance operation, maintenance duration along with “man x hour” information, maintenance personnel skill requirements, material requirement (consumable, spare parts, special tools and meters, hand tools and technical documentation, safety precautions, step by

step maintenance procedure, waste disposal methods and all technical drawings, schematic plans, pictures, audio and video records required for the maintenance operations.

An example of a Maintenance Requirement Card (unfortunately in Turkish) is as follows:

| | | | |
|---|---|---|---|
| **GEMİ/BİRLİK SİSTEMİ**<br>Genel Tahrik Sistemi<br>2000 | **ALT SİSTEM**<br>Yakıt Servis Sistemi<br>2610 | **BİK KODU**<br>2611 Y-3 | |
| **SİSTEM**<br>Tahrik Destek Sistemleri (Yakıt Ve Yağ)<br>2600 | **CİHAZ**<br>Yakıt Rilif Valfı<br>26111C | **RÜTBE**<br>211/A00/CL0 | **AxS**<br>0.3 |
| **BAKIM İŞLEMİNİN TARİFİ**<br>1. Yakıt servis tulumbasının rilif valfını test et ve ayarla. | | **TOPLAM AxS**<br>0.3<br>**BAKIM SÜRESİ**<br>0.3 | |

**EMNİYET TEDBİRLERİ**

1. Yüzer birlikler bakımlarda "NAVOSH Program Manual for Forces Afloat, OPNAVINST 5100.19" serisi dokümanlarda yer alan hususlara riayet edeceklerdir.

**TAKIM, AVADANLIK, MALZEME, TEST CİHAZLARI**

**EL ALETLERİ**

1. **[1463]** Anahtar, ayarlı, kurbağacık, 8 pus, ağır hizmet tipi, NSN: 5120-00-2405328
2. **[2239]** Pense, papağan, kayar göbekli, 10 pus, NSN: 5120-00-2780352

**BAKIM YÖNTEMİ**

DİKKAT : Test işlemlerinin devredeki sistem veya eçhizenin çalışmasını olumsuz yönde etkilemeyeceğinden emin ol.

DİKKAT : Rilif valfın testini yaparken, tulumba disçarc basıncını 88 psig'in üzerine çıkartma.

1. Yakıt Servis Tulumbasının Rilif Valfını Test Et ve Ayarla.
   a. Tulumbayı devreye alarak normal devirde çalıştır.
   b. Disçarc valfını yavaşça kapatarak, tulumbanın disçarc geycini izle. Disçarc valfı tam olarak kapandığında, rilif valf 58 psig disçarc basıncında tüm tulumba kapasitesi kadar yakıtı bypass edebilmelidir.
   c. Disçarc valfını açarak, rilif valfın yerine oturduğundan

## MAINTENANCE PLANNING

Maintenance Planning is he most sophisticated function of the system. Periodicity and the counter information are the main input sources for the maintenance planning. Maintenance planning works both ways implicitly and explicitly. Maintenance Plans can be prepared either by maintenance center supervisor or by the system itself when a certain condition occurs which makes a certain maintenance operation necessary. The draft maintenance requirement list can be modified by the supervisor if it is necessary.

## MAINTENANCE PERSONNEL MANAGEMENT

Personnel management handles the right person for the maintenance. All maintenance personnel information including their skills, all the training related with maintenance are kept up-to-date. Also daily personnel roster is kept in the system to support maintenance operation assignments.

## DOCUMENT MANAGEMENT

Technical documents are one of the essential modules of the system. Electronic Technical Manuals (ETM) and Interactive Electronic Technical Manuals (IETM) are supported depending on the document availability.

## COUNTER MANAGEMENT

Counter management is the most essential part of the Maintenance Planning operations. The types of the counters supported by the system are as follows:

- Periodicity/Counters
- Number of Usage
- Operating Hours
- Operational Conditions
- Number of Rounds
- Environmental Conditions
- Material Condition/Performance
- Lubricant Analysis
- User Defined Conditions

One of the major goals of the system is to collect counter data independent from user attention. In order to achieve this goal automated data collection is developed. It is performed by either integrating with the system control consoles or other technical methods depending on the equipment interfaces.

## MAINTENANCE OPERATIONS

All maintenance operations either corrective or preventive is recorded in step-by-step fashion including “what, when, why, who, how and where” information. Also the material which are used or replaced is recorded.

## MAINTENANCE ANALYSIS

All the maintenance operations performed in the past are analyzed in order for determining current reliability and maintainability values, work load and failure statistics.

## *SUPPLY SUPPORT*

Supply Support is the supporting module of the system. It contains the following sub-functions:

- Depot Management
- Order Management
- Material Requirement Planning
- Procurement

### DEPOT MANAGEMENT

This sub-function gives all necessary information related with the material, such as on-hand amounts, stock-levels, lot (shelf life) information etc.

### ORDER MANAGEMENT

Order List can be produced, according to the material requirement for the maintenance operation, through this function.

### MATERIAL REQUIRMENT PLANNING

The material needed for a certain period is determined by this function regarding the maintenance plans.

### PROCUREMENT

Procured material is controlled and managed through this function.

# WHY INTEGRATED SHIP MAINTENANCE MANAGEMENT SYSTEM?

- The software is compatible with US, EU and NATO maintenance concept, hence it is functionally proven in Turkish Navy and Turkish Coast Guard.
- The very first version was developed in 1996 and has been in use on board all TN surface ships, submarines and some shore based facilities since than.
- The team that develops the system consists of retired naval officers with more than 30 years of theoretical and practical experience on different areas in Turkish Navy.
- What is offered is not just the software but all the necessary data (configuration, maintenance requirements etc.) for performing maintenance operations. It is a turn-key offer.
- The design team is available throughout the project for any customization requirement. The requirements can be met easily because it is an in-house developed system.