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The role of Computer Based Training for marine engineers

SUMMARY

This paper describes the latest developments in applications of Computer Based Training-interactive programs (CBT) for the familiarization with marine machinery, specially taking into account the safety aspects.

The experience of Gdynia Maritime Academy in CBT applications, as well as benefits and advantages of the use of interactive programs in the educational process of marine officers are also presented. The paper includes an example of CBT interactive program concerning steering gear installation and controllable pitch propeller plant.

Also, the basic tasks for CBT interactive programs in maritime education, based on the new methods and procedures for accident prevention, are described.

In the two programs the newest graphic presentation techniques were applied.

Finally it is concluded that the use of CBT interactive programs in maritime education results in increasing emergency preparedness and reduction of possible human errors in the operation and maintenance of marine equipment.

INTRODUCTION

One of the major factors of accident prevention on board is the perfect theoretical and practical knowledge possessed by engine room officers while operating engines and auxiliary equipment.

For the reasons of great changes taking place in computing, information technology and simulation, CBT is more and more used in maritime academies as a valuable asset for educational process.

The basic role for CBT interactive program is familiarization of the trainees with individual auxiliary machinery and associated systems.In comparison with traditional methods of teaching CBT interactive programs make it possible first of all to use :

- three-dimensional (3D) graphical visualization of machinery elements for better understanding their functioning principles
- simulation of auxiliary machinery operations, which is impossible to realize in laboratories of maritime academies due to size or complication of such installations.

The CBT simulation possibilities are specially important in the case of auxiliary machinery interactive programs where perfect knowledge of different operational modes is required.

DESCRIPTION OF THE CBT INTERACTIVE PROGRAMS

Two typical marine hydraulic installations are analysed in which the knowledge of procedure of basic and emergency operation modes is essential for safe ship navigation, namely :

- controllable pitch propeller
- steering gear installation with variable delivery pumps.

The two CBT programs are first of all designated for marine engineering trainees and their basic purpose is to develop operation skills and to train and refresh emergency procedures (appropriate reactions to emergency situations). Programs of the kind can be also utilized in navigation department.

In Fig.1 to 6 the program for the installation of controllable pitch propeller (CPP) is presented.

The first of the CBT interactive programs contains the following parts :

- Description
- Test
- Operating
- Simulator

Description

This part describes the application, working principles and main components of the installation, together with different kinds of graphic presentation (pictures, photos, diagrams etc.).

The gained experience proves that it is very important to combine the schematic diagram with the real presentation of a given part in the form of a photo. In Fig.2 an image of the CPP mechanism is presented, and in Fig.3 the same part is shown in real form.

Operating

This part of the program includes a detail „step by step" description of the preparation for starting the plant, starting the plant,

Fig.1. General view of the controllable pitch propeller (CPP) interactive program

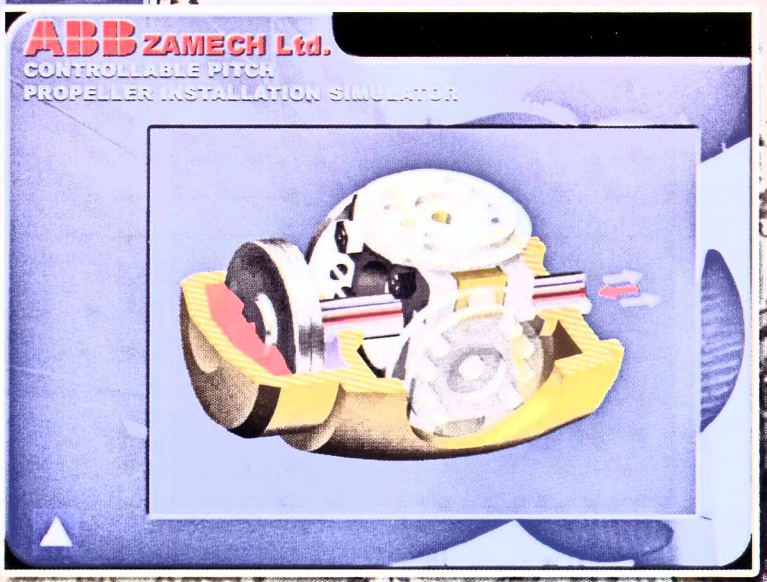

Fig.2. *CPP functioning principles (3D presentation)*

Fig.4. *Example of a test question*

Fig.3. *Real image of CPP hub mechanism*

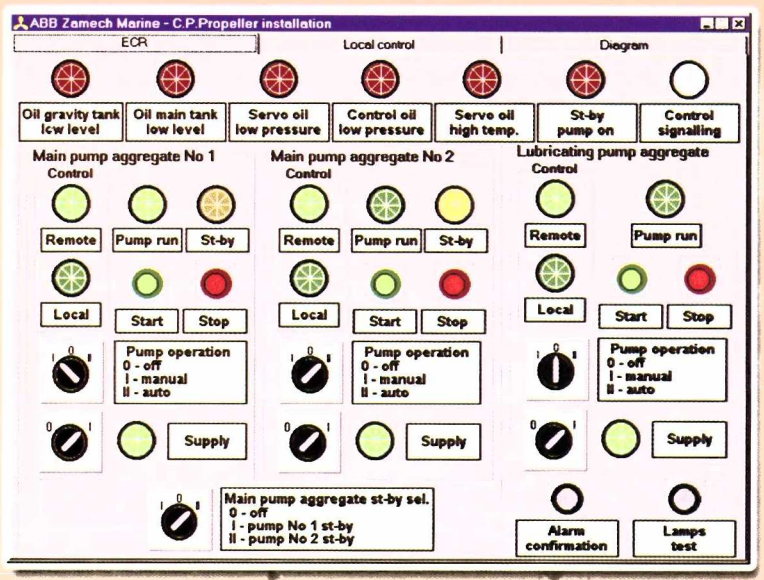

Fig. 5.
ECR control panel of CPP

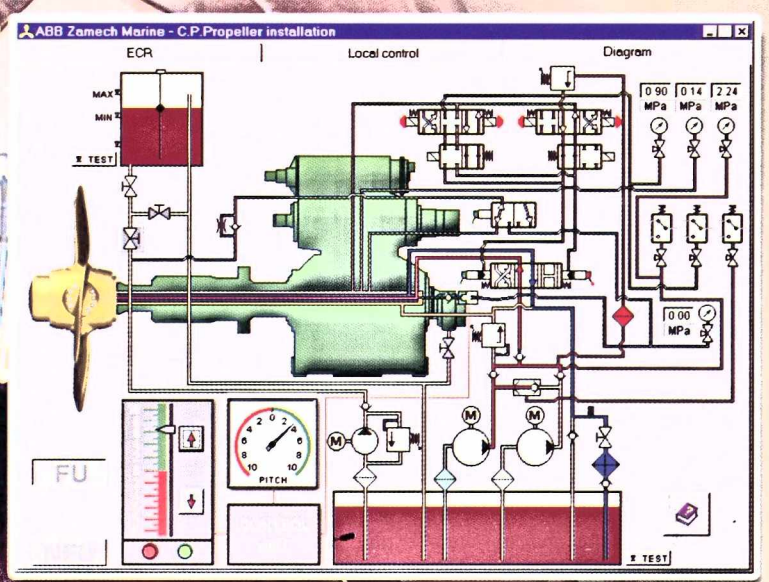

Fig. 6.
CPP installation diagram

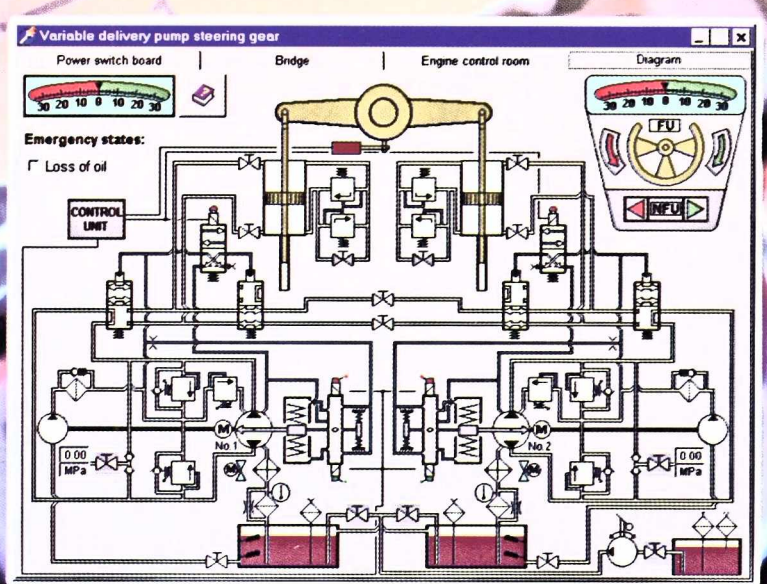

Fig. 7.
Steering gear installation diagram

automatic and manual control functioning and stopping the plant procedure, together with the application of the emergency procedures. This part Diagrams illustrating the consecutive phases of the plant operation are also presented here.

Test

The test is intended to assess the knowledge gained by the trainee from the two first parts of the program. In this module, the trainee should indicate the correct answers to randomly selected ten questions – see Fig.4. This enables the trainee to effectuate the test many times without having to answer the same questions. At the end of the test the trainee is given a certain mark indicating the rate of correct answers.

Simulator

In this section of the program an interactive software simulator is applied – see Fig.5 and 6. The trainee must set the valves on the installation diagram - by mouse clicking - to proper position and start the pump by operating the switches and push buttons on the panel. The trainee must follow the instructions given in the Operating Instruction. This enables the trainee to apply in practice the theoretical knowledge acquired from the Operating Instruction. The trainee is confronted with real-life reactions of the installation. CPP installation program enables not only to execute the operation in normal exploitation conditions, but also the operation in emergency mode.

The following operational modes are possible :

⇒ Basic operation : one of the main pump aggregates works under remote propeller pitch control from the bridge (follow-up or non follow-up).

⇒ Emergency operation at which one of the main pump aggregate works with local control. The pitch propeller control is done by acting manually on the sliding valve position of pitch control block by means of the lever unit.

⇒ Emergency operation at which main pump aggregates do not work and the propeller pitch control in AHEAD direction is done by means of the lubricating pump aggregate.

In Fig.7 a typical steering gear installation with variable delivery pump is presented.

This program offers the same possibilities of simulating different operation modes, as those above mentioned. Additionally, in this CBT program it is possible to introduce a malfunction scenarion, namely loss of oil from one of the reservoirs. In this case the trainee is able to observe system reactions (low level alarm activation, hydraulic system separation, stand-by, pump starting-up etc.) and to proceed a relevant emergency procedure.

FINAL REMARKS

The five-year experience with the utilisation of CBT interactive programs in Gdynia Maritime Academy shows that the programs constitute considerable development in the training process of engine room officers, as they introduce a new, active approach to training which shortens the learning process and facilitates the reception and understanding of operation of marine devices.

It is possible to obtain the best results of application of CBT interactive programs when the learning process is divided into two stages :

- **1st**, a introductory lecture on the systems in question, with application of PC multimedia projector
- **2nd**, trainee exercises in PC station – classroom, conducted individually.

The exercise classroom with 8 to 12 PC stations is optimal for proper instructor's control.

This way, the trainee not only acquires the knowledge regarding the operation of the equipment in normal exploitation conditions, but also he is familiarized with emergency situations. In consequence, the trainee become better prepared to deal with emergencies during operations on board. The emergency situations may be simulated and repeated as many times as it is necessary for the trainee to achieve proper preparedness.

Appraised by Jerzy Girtler, Prof.,D.Sc.

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Conference

EXPLOITATION OF TECHNICAL FACILITIES

The Utility Foundations Section, Mechanical Engineering Committee of the Polish Academy of Sciences together with Exploitation Technology Institute, Radom, organized :

9th Congress on Exploitation of Technical Facilities

which was held in Krynica on 25÷28 September 2001.

It was aimed at performing an analysis and assessment of the present state of exploitation of technical facilities in domestic economy, development of exploitation sciences, as well as presentation of research results, their applications and development prospects.

Basic and applied research, R&D work as well as forms of personnel education and improvement in the area of the exploitation were presented during topical sessions on :

- Diagnostics
- Exploitation systems
- Reliability and safety
- Application of scientific research results into practical economy
- Tribology
- Fatigue wear (surface and volumetric).

The Congress program contained 54 papers prepared by representatives of 37 universities, scientific research institutes and centres, among which there were also specialists from Russia, Lithuania, Czech Republic and Slovakia. The fact showed the broad interest paid to the exploitation problems of engineering facilities.