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New developments in Computer Based Training (CBT) interactive programs for marine engineering students and ship engineers

SUMMARY

This paper describes new developments in application of CBT interactive programs intended for familiarization with individual equipment devices such as boilers, fresh water generators, steering gear, anti-pollution plants, fuel separating plant, diesel electric generators etc. Experience gained in CBT applications, benefits and advantages of the use of interactive programs in the education process of ship's engineers are also presented.

INTRODUCTION

Extensive training of the marine engineers is required to effectively operate a modern ship power plant. Today many major maritime academies have turned towards simulators as a training tool. Also, an appropriate preparation of trainees is needed for effective application of a full-mission power plant simulator.

In particular it is essential for the trainee :

- to have theoretical knowledge and practical aboard experience for at least six months of ship service
- to be familiar with individual auxiliary equipment devices.

At present many maritime academies begin realizing that computers are also a valuable asset for education purposes and commence using CBT interactive programs.

Once teachers have learnt to use effective and well designed CBT programs they begin structuring the training processes in such a way as to be able to accommodate the actual possibilities and needs.

The basic aims of CBT interactive programs are :

- familiarization with individual auxiliary shipboard systems or equipment
- developing operation skill
- training and refreshing emergency procedures (reacting to emergency situation)
- combining simulations with multimedia techniques such as diagrams, pictures, sound etc.
- improving command of English
- preparation for pre-promotion assessment of competency
- intensifying trainee's activity during education process
- making the skill assessment process of the trainee more objective
- making the learning process shorter and of a higher quality.

DESCRIPTION OF CBT INTERACTIVE PROGRAMS

Gdynia Maritime Academy has carried out an extensive research work in the field of computer based training for five years using interactive programs developed by the UNITEST Company of Gdańsk.

The following CBT interactive programs are currently in use at the Academy :

- Water Pumps
- Hydrophore Installation
- Fresh Water Generator
- Piston Compressor
- Refrigerating Plant
- Diesel Engines
- Diesel Generators
- Steering Gear Installation
- Oily Water Separator
- Biological Sewage Treatment Plant
- Auxiliary Steam Boiler Installation
- Marine Diesel Engine Monitoring Systems
- Fuel Treatment Plant

The marine training software is aimed at teaching the basic working principles of the marine power plant equipment. The programs are intended for training the students and ship engineers. The educational software is based on the technical solutions being actually in use on ships.

The programs in question are interactive i.e. they make it possible to realistically present the marine power plant equipment functioning by means of control panels and system installation diagrams. The control panels contain switches, pressure gauges, control and alarm lights. The control panels and main switchboard were so designed as to be as close to the real equipment design as possible.

Some programs offer possibility of regulation of the system parameters.

All operations (such as valve opening, pump starting etc) can be effected by mouse-clicking on the PC's screen. The automatic valves are controlled by control panel.

Graphic symbols used in programs are highlighted in the displayable legend. Most of the programs generate sound effects.

The use in the program of an appropriate mathematical and logical model of the equipment or system ensures that during trainee's action the program reacts exactly in the same way as the real object would react. In the case of a faulty operation the program will react identically as it would happen during real operation.

Information about an action performed by student is displayed in the form of digital or analogue data, colour change of pipes and sound effects as well.

The UNITEST typical CBT interactive programs whose examples are shown in Fig.1 and 7 consist of the following parts :

- ◆ System Description
- ◆ Operating Instruction
- ◆ Test
- ◆ Simulator.

SYSTEM DESCRIPTION

In this part the application, working principles and main components of the installation are described and presented by means of different kinds of screen imaging (pictures, photos, diagrams etc, see Fig.2,3 and 4). An example of the installation diagram legend of the steering gear is presented in Fig.8. The name of a selected part can be displayed in result of mouse-clicking at the appropriate field on the installation diagram.

The gained experience proves that it is very important to associate the symbol of a given part on the schematic diagram with its real presentation in the form of a photo. In Fig.9 such description and image of the steering gear directional valve are presented. The location of the directional valve within the installation diagram, displayed by mouse-clicking at the „i” field, is indicated in Fig.10.

OPERATING INSTRUCTION

This part of the program includes the step-by-step description procedures of :

- ▲ preparation for starting the plant
- ▲ starting the plant
- ▲ automatic and manual control
- ▲ stopping the plant.

Also, diagrams illustrating the consecutive phases of the plant operation are displayed.

Test

The test is intended to assess the knowledge gained by the trainee in result of using the two preceding parts of the program. By using this module, the trainee should indicate the correct answer to randomly selected questions (see Fig.5).

Simulator

In this section of the program an interactive software simulator is applied (see Fig.6,11 and 12). The trainee has to set, by mouse-clicking, the valves shown on the installation diagram into the proper

position and to start the pump, compressors etc. by operating the switches and push-buttons on the displayed panel. The trainee has to follow the instructions given in the Operating Instruction. In this way the trainee is able to apply in practice the theoretical knowledge acquired from the Operating Instruction. The trainee is confronted with possible reactions of the real installation.

CONCLUSIONS

- ⇒ The experience gained from the extensive use of the CBT interactive programs in the Academy shows that they constitute an important development in the training process of ship engineers. The CBT interactive programs introduce a new active approach to training which shortens the learning process and facilitates understanding the operation of the ship power plant equipment. Also, possibility of objective assessment of the trainees' progress in gaining skill and knowledge is an advantage from the use of the programs.
- ⇒ Moreover, the CBT interactive programs have been successfully used in the educational schemes for the participants returning to train after a few years of professional activity and facing problems of being adapted to traditional training processes.
- ⇒ The CBT interactive programs can be applied to many educational activities such as :
 - lectures
 - exercises and seminars
 - laboratory
 - examination centres
 - vocational training centres
 - individual self-training
 - on-the-job training.
- ⇒ However, the main role of the CBT interactive programs is preparation of the effective use of a full-mission ship power plant simulator.

To achieve the expected training results the CBT interactive programs were so designed as to meet the following requirements :

- ⇒ simplicity of use
- ⇒ availability for single PC configuration
- ⇒ applicability to typical ship equipment and installations with accounting for the latest technical solutions
- ⇒ to be prepared in close co-operation with equipment manufacturers (CBT program could be a part of the Operator's Guide)
- ⇒ to contain an operation guide
- ⇒ low cost
- ⇒ to realistically simulate operation of the systems or equipment inclusive of the process peripherals such as control panels with push buttons, switches, signalling and alarm lights, gauges, levers etc.
- ⇒ high descriptiveness due to moving pictures
- ⇒ to include interactive learning by computer dialogue means.

The above given list of requirements has been established in result of close observation of the trainees' needs and capabilities.

To summarize, the use of CBT interactive programs greatly increases effects of a training process and finally leads to improvement of the cost effectiveness of application of the full-mission power plant simulator.

