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On implementation of the standard operational procedures to the engine room simulators

INTRODUCTION

The sophisticated engine room simulators are very valuable teaching tools but they require high qualified instructors and well prepared trainees. The training and assessment process in the engine room simulators could be simplified with a help of the standard operational procedures which are very important for the training and everyday operational practice of the engineering officers. With their use it could be possible to standardize the training methods and create the solid basis for the objective assessment methods. The modern engine room manuals already include the set of the typical operational procedures which could be transferred to the engine room simulator environment. However the procedures should also comply with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 95) for the officers in charge of an engineering watch [5]. Moreover in some cases they should also comply with the appropriate requirements of classification societies as some of them try to establish their own standards for the simulators [1].

Tab.1. *Example tasks to be assessed in a simulator according Section III-A/1 [5]*

Task	Competences
Maintain a safe engineering watch	The conduct, handover and relief of the watch conforms with accepted principles and procedures. The frequency and extent of monitoring of engineering equipment and systems conforms to manufacturers' recommendations and accepted principles and procedures including basic principles to be observed in keeping an engineering watch
Operate main and auxiliary machinery and associated control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment. Deviations from the norm are promptly identified. The output of plant and engineering systems consistently meets requirements including bridge orders relating to changes in speed and direction. The causes of machinery malfunctions are promptly identified and actions are designed to ensure the overall safety of the ship and the plant having regard to the prevailing circumstances and conditions
Operate alternators, generators and control systems	Operations are planned and carried out in accordance with established rules and procedures to ensure safety of operations
Maintain seaworthiness of the ship	The stability conditions comply with the IMO (International Maritime Organization) intact stability criteria under all conditions of loading. Actions to ensure and maintain the watertight integrity of the ship are in accordance with accepted practice

STCW 95 REQUIREMENTS

The STCW 95 convention includes specification of a minimum standard of competence for officers in charge of an engineering watch for operational and management level. The specifications state clearly which competences can be demonstrated in the engine room simulator environment.

In Tab.1 and 2 some selected tasks are presented as an example.

Tab.2. *Example tasks to be assessed at simulator according Section III-A/2 [5]*

Task	Competences
Plan and schedule operations	The planning and preparation of operations is suited to the design parameters of the power installation and to the requirements of the voyage
Start up and shut down main propulsion and auxiliary machinery including associated systems	The methods of preparing the start-up and of making available fuels, lubricants, cooling water and air are the most appropriate. Checks of pressures, temperatures and revolutions during the start-up and warm-up period are in accordance with technical specifications and agreed work plans. Surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operating conditions. The methods of preparing the shut-down and of supervising the cooling--down of the engine are the most appropriate
Operate, monitor and evaluate engine performance and capacity	The methods of measuring the load capacity of the engines are in accordance with technical specifications. Performance is checked against bridge orders
Test, detect faults and maintain and restore electrical and electronic control equipment to operating condition	Maintenance activities are correctly planned in accordance with technical, legislative, safety and procedural specifications. The effect of malfunctions on associated plant and systems is accurately identified, ship's technical drawings are correctly interpreted, measuring and calibrating instruments are correctly used and actions taken are justified
Control trim, stability and stress	Stability and stress conditions are maintained within safety limits at all times

ENGINE ROOM MANUALS

Many modern ship engine rooms are already equipped with a sophisticated manual (mostly in an electronic form), which include not only the information about the component construction and maintenance, but also include the standard operational procedures. They can be given in the form of a diagram or as written instructions [6].

The complete list of the standard procedures included in the example engine room manual [6] has been shown below :

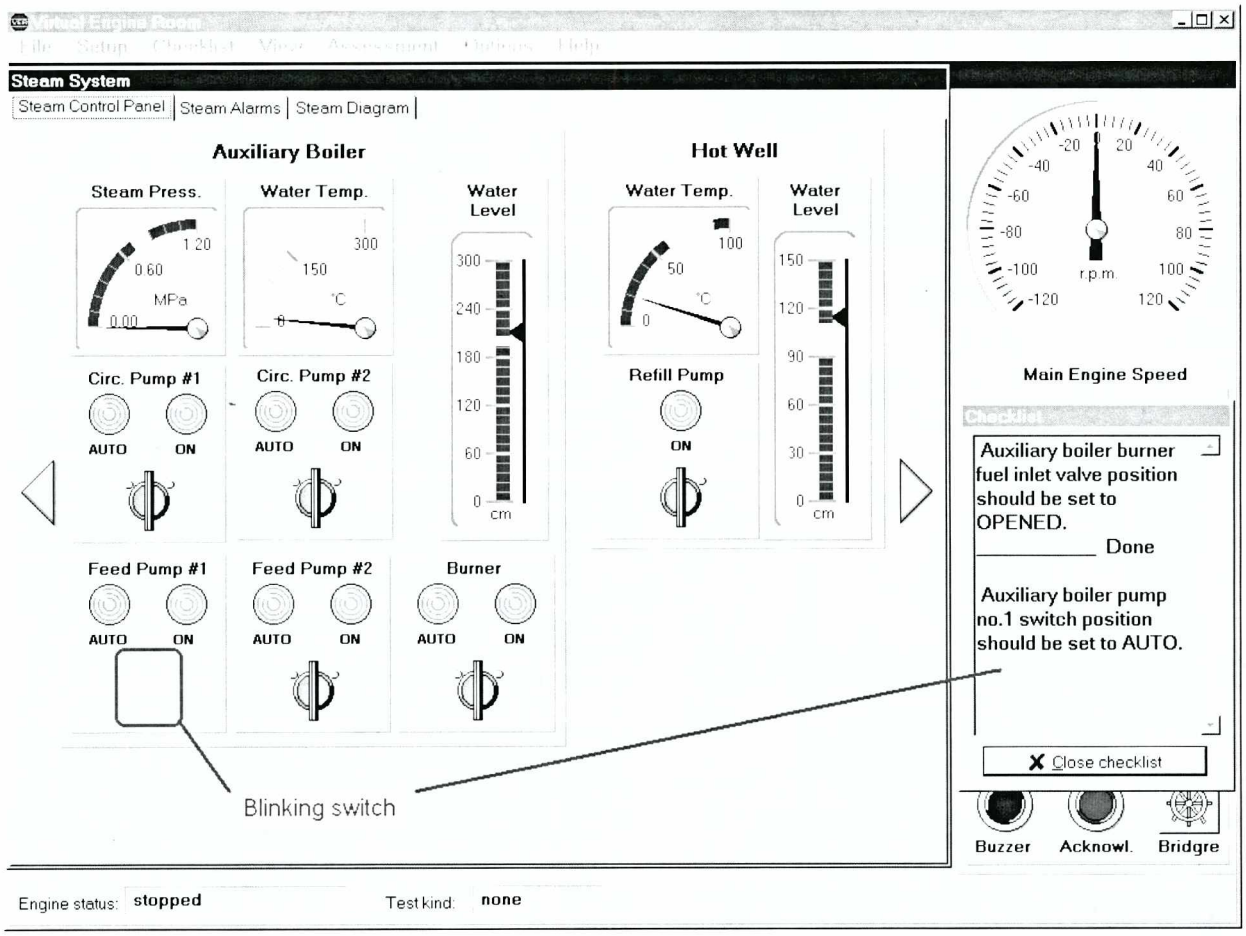

Fig.2. The example of checklist implemented in Virtual Engine Room Simulator [3]

- To bring vessel into Live conditions
- To prepare main plant for the operation
- To prepare main plant for Manoeuvring from „In Port" condition
- To change main plant from Manoeuvring to Full Away
- To prepare for UMS (Unattended Machinery Space) operation
- To change from UMS to Manned operation
- To change main plant from Full Away to Manoeuvring condition
- To secure main plant at Finished with Engines
- To secure main plant for dry dock
- Preparing the engine for starting
- Slow turning
- Operating the main engine
- Manoeuvring
- Operation at low loads
- Procedures after shutting down the engine
- Emergency procedures.

This list is rather long and shows how wide and complex should be operational training with the use of the engine room simulator. It is worth to mention that the above presented procedures were developed for a specific engine room. Therefore they can be applied only in the simulator in which the same engine room is modelled.

IMPLEMENTATION EXAMPLE

They are several ways of the standard procedure implementation in the engine room simulator. The easiest way is to use the procedures in a written form, however this way is not most effective. It is easy to omit or bypass certain actions; accidentally or under the time pressure. More complex implementation method is the integration in a form of so called checklists . In this case, the user can select a specific task to learn (a main engine start for example) and he will be guided step by step until the task is successfully completed [3,4]. At the beginning of the so-called scenario, the appropriate engine room set-up has to be loaded or the previous scenarios have to be completed. Later, a set of precise instructions will be shown one by one, and only the fulfilling of the present instruction enables progress to the next instruction. Despite the text information, the appropriate control (i.e. switch, push-button or lever) will blink until it is set in the correct position (see Fig. 2). Fulfilling the necessary conditions can also include a period of waiting until specific parameters are reached. Obviously every scenario is based on a hidden checklist but from the students point of view it provides friendly instruction offered by a very patient expert.

FINAL REMARK

The work on further implementation of the standard procedures into the environment of the Virtual Engine Room Simulator is underway.

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