

ENGINE ROOM SIMULATOR AND IMPORTANCE OF APPLIED MARITIME EDUCATION

Kaan UNLUGENCOGLU¹, Burak YILDIZ¹, Eda TURAN²

^aDepartment of Marine Engineering Operations, Yildiz Technical University, Istanbul, 34349, Turkey

^bDepartment of Naval Architecture, Yildiz Technical University, Istanbul, 34349, Turkey

E-posta: kunlu@yildiz.edu.tr

Abstract: Marine Engine Room Simulator involves simulation with the support of main engine and auxiliary systems in the engine room. The machines and systems that have been simulated are main engine, diesel generators, boiler, evaporators, heat exchangers, purifiers, steering gear, pumps, compressors, valves and any other related parts.

The operating condition of machines and systems in the simulation is exactly the same with the real ones. Therefore, with simulation method, seafarer candidates get knowledge and skills at management level.

With in different failure scenarios that may be seen in practice in machine and systems, main aims are to increase capabilities of the students through operating and managing, and to raise qualified seafarers who have teamwork skill and use technology.

The Engine Room Simulator is a full mission simulator designed to meet the training requirements of marine engineers and plant operators from basic to advanced level with special reference to the requirements of Standards of Training, Certification and Watchkeeping (STCW), International Safety Management (ISM) Code and International Maritime Organization (IMO) Model Course 2.07. (DNV, 2000)

In this study, importance of applied Engine Room Simulator education, purpose and capabilities of Engine Room Simulator and knowledge and skills of future seafarers who have teamwork skill and use technology are examined.

Key Words: Engine Room Simulator, Education, Technology

INTRODUCTION

Ship's equipment improves from year to year, involving many advanced technologies. Engine Room Simulators have been developed to meet the demands of maritime training with technology, which is very effective for improving the engineers and officers' management experiences and operation skills in emergency situations. (Huayao, 2005).

International and national requirements for shipping safety are becoming more and more detailed. Safety at sea begins with comprehensive training. Approximately 80% of maritime accidents are the result of human error. Simulation training, in a controlled environment, gives marine engineers the opportunity to learn experiment and interact with a variety of realistic situations that would be dangerous or expensive to recreate in real life. Training with Marine Engine Room Simulator offers potential benefits:

- Increased Safety at Sea
- Experience in Operating Typical Marine Propulsion Plants
- Lower Running Costs
- Reduced Insurance Premiums
- Specialized Seafarer Training

- Understand of STCW requirements
- Assessment of Competence for Recruitment and Evaluation Purposes

Purpose of Engine Room Simulator

Engine Room Simulators are designed for the education and training of marine engineers in the operation of the ship’s engine room machinery and keeping watch in the engine control room of vessels with a high level of automation. Aims of Engine Room Simulator are shown in figure 1.

Marine engineers have for decades used Engine Room Simulators for training in the understanding of engine room systems. The engine room simulator is designed to simulate various types of machinery and equipment as used in the engine room of a ship using a diesel engine as propulsion system. A general view of Engine Room Simulator is shown in figure 2. (IMO, 1998)

The purpose of Engine Room Simulator is to prepare the trainee for engine room operation including:

- Basic engine room installation (compressed air system, fresh and sea water cooling system, lubricating, fuel oil system etc.)
- main engine and auxiliary equipment procedures
- propulsion system maneuvering (main engine – reduction gear – CPP)



Fig. 1 Aims of Engine Room Simulator

The simulator must have developed in compliance with:

- STCW Code: Section A-1/12 and Section B-1/12. (STCW, 1996)

- ISM Code: Section 6 and Section 8.



Fig. 2 General view of Engine Room Simulator (Kongsberg, 2008)

Configuration of Engine Room Simulator

Engine Room Simulator can be equipped with hardware consoles and panels to operate and control main engines, gear, CPP, auxiliary machinery and electric systems. There are three types of simulator configurations. These are:

1. Operational configurations
2. Workstation configurations
3. Combined operational and workstations configurations

The Engine Room Simulator can also be connected to a Ship's Bridge Simulator through a Local Area Network (LAN). (Kongsberg, 2008)

In figure 3 you can see an example of a combined engine room simulator system with detailed stations defined below.

- A – Engine control room
- B – Engine room
- C – PC class room
- D – Instructor's room

1. Engine control room hardware consoles
2. Electrical switchboard
3. Console in engine room
4. Speakers
5. Projectors with screens
6. Students' PC stations
7. Instructor's PC station

Operational Configurations

The operational configurations consist of:

- Instructor Room
- Engine Control Room with main engine control console and main electric switchboard
- Engine Room

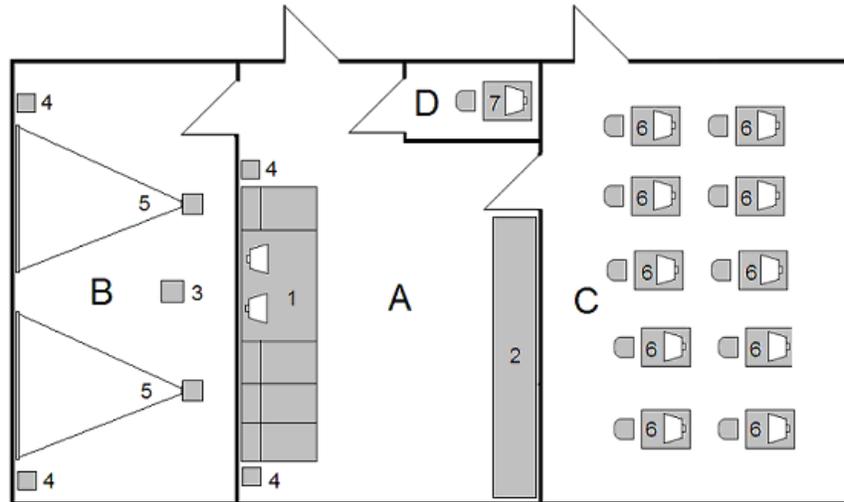


Fig. 3 An example of combined operational and workstations configurations

Instructor Room

The Instructor can configure the system to support individual student training and connect to any of the student stations to monitor, assess and control student performance. The instructor has the possibility to print out assessment reports for each individual student reflecting his performance, including pass or fail.

The instructor room can be configured to include one or more of the following separate units: (Kongsberg, 2008)

- Instructor station (PC station-console)
- Sound system
- Printer (event log)
- Hard copy printer
- Internet connection for remote diagnostic, SW updates and support
- Voice recorder system

The instructor's console has a panel for remote control of the main engine, a start switch for start-stop control of the simulator, an initial start condition setting panel for simulation start conditioning, and an abnormal condition setting panel for simulation condition changing. (Deniz, 2002)

Engine Control Room

The engine control room can be configured to include the following:

- Main Switchboard
- Engine Control Room Console
- Communication
- Alarm/Log Printer

Main Switchboard

The main switchboard may consist of the following sections:

- Diesel generator sections
- Shaft generator section
- Turbo generator section
- Synchronizing section
- Starters section
- Feeders section
- Miscellaneous section

Engine Control Room Console

The Main Engine Control Panel provides all controls and gauges for Main Engine remote control. The engine control room console consists of the following sections:

- Generator/pump/compressor control section
- Monitoring/alarm and control section
- Main Engine remote control section

SIMULATOR TRAINING

The opportunities to experiment on specific problems and get answers on questions as: "what happens if...?" The best way to acquire practical experience is to learn from real life in a real engine room. Simulation can be an effective alternative to shipboard experience (Figure 4).

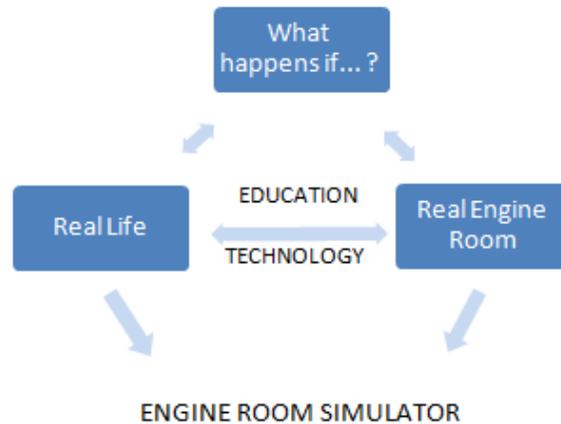


Fig. 4 Shipboard Experience

In maritime education practice, there is a good combination for seafarer candidates;

- Simulator
- Computer simulation
- Laboratory exercises.

An economical and safe operation of the ship is based on reliable equipment and skilled engineers taking correct decisions at the right time. The simulator training experience allows the mariner to go through

understanding of plant operation and fault finding in a timely and effective manner. The simulator allows us to work in real time or whatever speed meets our training requirement. It also allows for creating just about any engineering plant problem one could come across at sea. As we all know, one problem with the plant normally leads to others, until the lights go out. The simulator can demonstrate all scenarios (Figure 5).

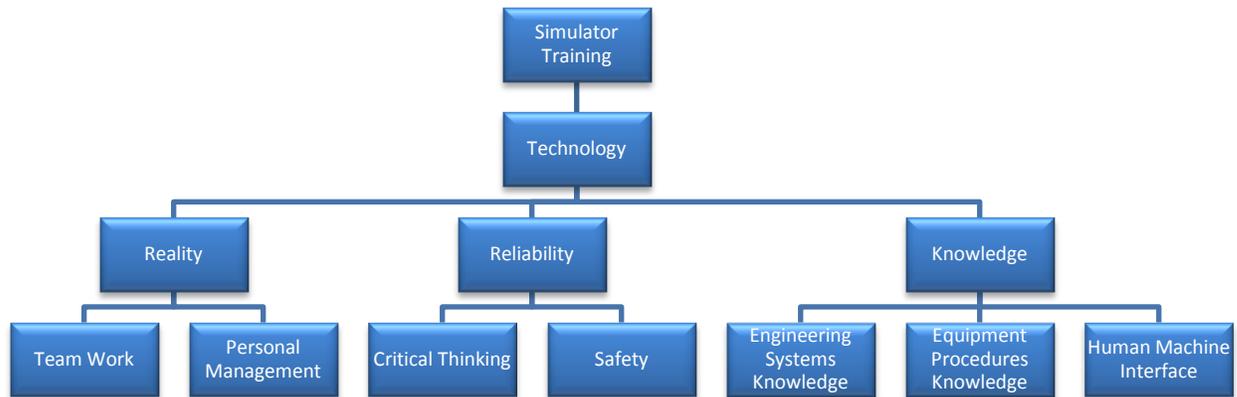


Fig. 5 Simulator Training

CONCLUSION

The application of engine room simulators in maritime education leads to a better understanding of the marine engineering systems, equipment procedures and results also in increased safety and reduces the risk of human error in the operation and maintenance of marine equipment.

Safety reduces the risk of injuries to personnel and minimizes the risk of damage to the environment and engineering systems. A well run engine room managed by competent people improves economy. Onboard training using real equipment presents a number of challenges. Simulator training will reduce accidents and improve efficiency (risk assessment) and give the engineers the necessary experience and confidence in their job-situation. Increased risk to personnel and equipment combined with limited access to required marine assets and related escalating costs are creating increased demand for simulation technology.

To summarize, the application of engine room simulators will help to accelerate the understanding of marine engines, engine room, and auxiliary systems ... through an interactive learning process. It is not always possible to note the effects of damage on a part of the vessel's systems in the normal work condition. This is the reason of simulating certain damages effects by computers and by means of a simulator.

REFERENCES

Deniz C. , Paksoy A. , Sarisakal N. (2002), “*Computer – Based Training For Sea – Going Engineers*” Istanbul University Engineering Faculty Journal Of Electrical & Electronics Volume 2, Number 2

Det Norske Veritas, Standard for Certification of Maritime Simulator Systems, Standard for Certification on No.2.14, January 2000.

Huayao Z. , Shanheng L. (2005), “*Education Method On Marine Power Plant Simulator Combined With Multimedia Teaching Software*” ICERS7 Conference on Engine Room Simulators, Portoroz, Slovenia, 14-16 November.

IMO (1998), Engine Room Simulator –Model Course 2.07, IMO Publication

KONGSBERG MARITIME AS (2008) “Neptune ERS Product Catalogue - Engine Room Simulators “

STCW - Standards of Training, Certification and Watchkeeping for Seafarers 78/95 Convention
International Maritime Organization, London, United Kingdom, 1996

<http://www.mpri.com/maritime>

<http://www.pcmaritime.co.uk/comm>