

Engine Room

Marine Simulators



PANGAEA R&D

INTERACTIVE COMPUTER SIMULATION FOR EDUCATION



SYSTEM OVERVIEW

The Engine Room Simulator solution for classroom network configuration is comprised of four (4) software application modules, running on the Instructor's station, and the Trainee stations.

These modules are:

1. **Virtual Engine Room Computer based training and Simulation CBT11**
2. **W-X92 - Low Speed Engine Room Simulator**
3. **MER 3D -Medium Speed engine Room Simulator**
4. **LNG-DE3D Diesel electric dual fuel Engine Room Simulator**

The application packages are installed in the Instructor stations and the Trainee stations. The instructor station provides monitor and control over the operation of the trainees.

All simulators are designed and produced in accordance with the requirements of IMO(model course 2.07, 7.02, 7.04, 7.08), STCW 2010 (regulation I/12 and code A / Table A-III) - MARPOL and SOLAS too. The content of the simulator provided, including multimedia presentations, exercises and simulations, is adapted to the standard local educational curriculums while following the above international training standard guidelines, recommendations and regulations.

The simulators are designated for training students of maritime academies, as well as for different types of marine vocational training centers. The simulators have universal features and may be used both for training merchant and navy fleet crew.

The system provides the classroom Debriefing module, installed in the Instructor's workstation, connected to the LAN, and also connected to an interactive board via HDMI interface. The projector for the debriefing station display can also be selected, as per client request.





SYSTEM OVERVIEW

The simulations are designed and based on scientific mathematical models which apply to the marine and electromechanical engineering, for creating a high precision image and operational simulation. Additionally, all simulated equipment are developed with close cooperation and verified data from the original equipment manufacturers.

All solutions for the ER simulators are based on real equipment and have been thoroughly verified by the engine's manufacturers.

The simulator is suitable for training personnel at all levels (familiarization, operation and management). At each level, learning trainee objectives can be realized, recorded, analyzed and assessed.

The classroom network system offers the capability for Remote Software Application downloading and Remote Version upgrading to licensed users.

As part of the training process (theory delivery and simulation practice), assessment tests take place in order to ensure that the students comprehend and perform the tasks correctly. This step-by-step process of performance evaluation covers the whole didactic content. The system includes a set of automatic tests that are used to assess the competences of students.

An e-learning platform is offered (optionally), via internet, for remote training as separate service. This is an optional alternative to Classroom solution, in case the client requests such service.

The curriculum is separated into **Standard mode** of operational training level and **Advanced mode** of operational training level in a sequence of appropriate theory, simulation process practice and testing through problem solving procedures.



The provided solution covers the training in the following:

1. Low Speed Engine Room and Control
2. Medium Speed Engine Room and Control
3. Diesel Electric Dual Fuel Engine Room and Control



SIMULATION FEATURES

The Engine Room Simulation (ERS) simulates the process of the operational, monitoring and control engineering tasks in the engine and control room.

It provides the trainee with all the simulation facilities to operate, monitor and control in real time, the engine room and the control room and all its main and vital auxiliary electromechanical systems.

It provides the capability to perform various simulation scenarios of control and operation as manual, automatic and automated under various operational conditions. The user will have the possibility to accomplish any operational task starting from different setups, both pre-prepared and saved by the user.



Power and Alarm

It provides a detailed simulation of the behavior of the engine with regard to the operational aspects, its functionality and performance. The simulator includes the following systems:

- **Electric Power Plan** simulation with **Power Management System** which contains all standard functions, such as load dependant start/stop, load sharing, synchronizing and load shedding.
- The **Alarm and Monitoring System** allows the operator to control all propulsion (slow-hold, etc.) system equipment parameters. The simulator provides simulated visual and audio alarms, automatic event logger and DeadMan system.





SIMULATION FEATURES

3D Modeling

The ER simulators introduce a “state-of-the-art” 3D modeling of the Engine Room, based on the real equipment. The engine simulations were built in collaboration with the engine manufacturers to depict the real performance and the characteristics of the engines.

The 3D model includes very realistic, animated, virtual controls like switches, gauges and lamps, ensuring the realism of engine room operation and familiarization of the trainers in the ER environment. The systems’ design offers a high degree of 2D and 3D visual effects and behavioral realism of the simulators, which allows and makes available to the instructor and the trainees a digital state-of-the-art training facility.

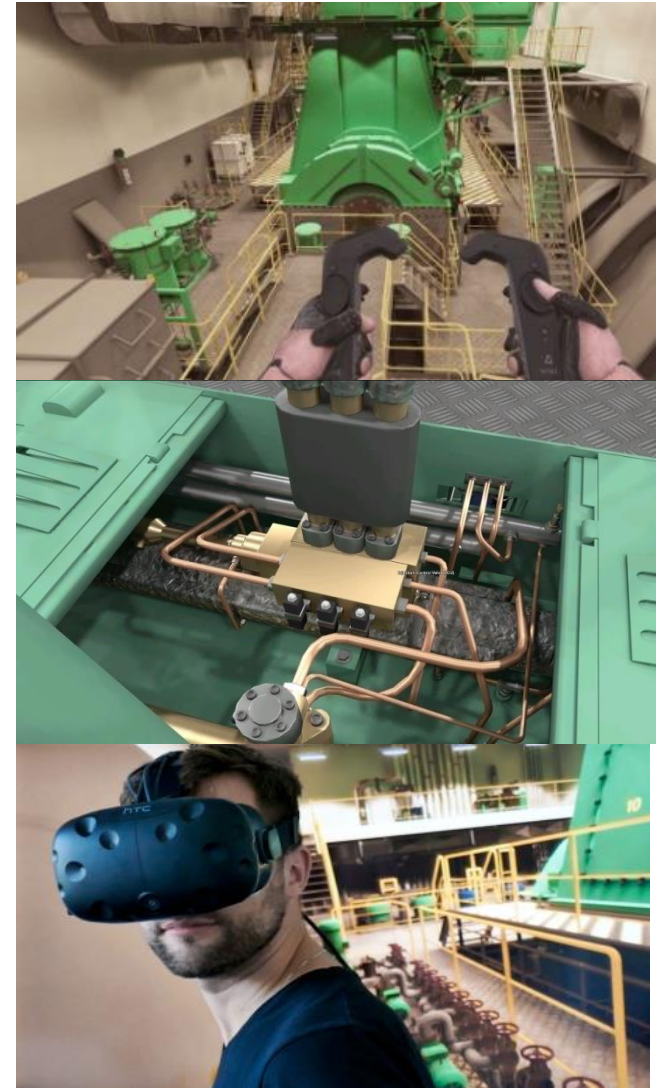
Training is achieved by integrating a very realistic mathematical model and high-fidelity 3D presentation.

Virtual Reality

The program interface has been designed in such a way as to enable efficient and effective navigation around the engine room. At the same time, ER navigation provides the simulator exercises realism very close to reality.

The simulator uses an original navigation technique, based on the Zoom utility in the 3D environment and dedicated navigation maps in the Engine room site. The students can be zoomed and directed to the proper location in the engine room to operate.

The zoom facility submerges the users to a Virtual reality environment and familiarizes them to the Engine room installation and main equipment into a “next to real” visual experience. The program interface has been designed in such a way as to enable efficient and effective navigation around the engine room.





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SIMULATION FEATURES

Sounds

Multichannel 3D digitized sound provides a very realistic engine room feel. The sound effects include engine sound correlated with engine speed. The intensity of other system sounds (alarms, valves, generator, etc.) depends on the space location – proximity of the equipment.

Auxiliary subsystems

The system provides training and simulation on all the vital auxiliary systems in each Engine Room mentioned above. It also provides to the students a coursework for a vast number of auxiliary systems beyond and above the ones that are included in the provided ER engine type simulation.

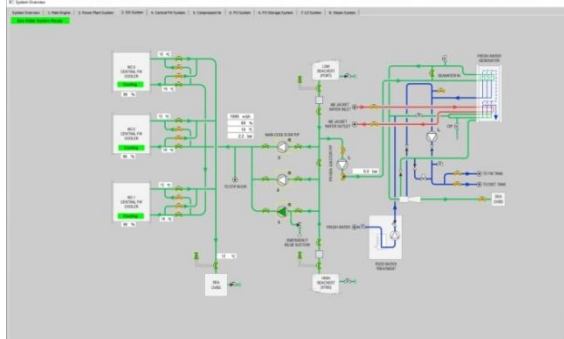
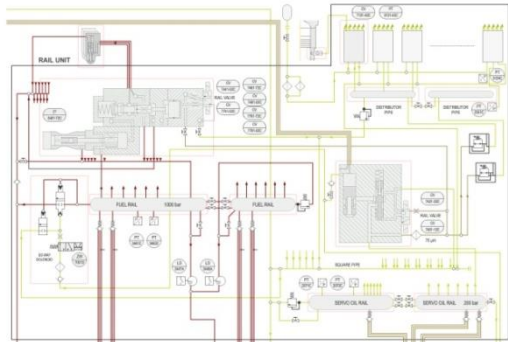
Controls

- Simulates control from the bridge.
- ER control room for remote control.
- Local control.

Scenario editor

The simulator provides the scenario editor mode for setting the simulation training in various realistic operating or emergency procedures, with various levels of difficulty, subject to the trainers' decision.

The overview windows on the simulation enable a quick overview of the situation in the engine room. The green color means "ready for the operation" while orange means "not ready for the operation". The particular statuses are displayed for the whole subsystems and the individual equipment (coolers, generators).



System	Status
1. Main Engine	Ready for operation
2. Electric Power Plant	Ready for operation
3. Sea Water	Ready for operation
4. Central FW	Ready for operation
5. Comp. Air	Ready for operation
6. Fuel	Ready for operation
7. LO	Ready for operation
8. Steam	Ready for operation

WORKSTATIONS AND CLASSROOM LAYOUT



The Instructor workstations consists of:

- Instructor simulator software
- Standard Hardware:
 - ❑ 1 PC with keyboard and optical mouse
 - ❑ 2 displays (monitors)
 - ❑ 1 set of speakers
 - ❑ 1 printer

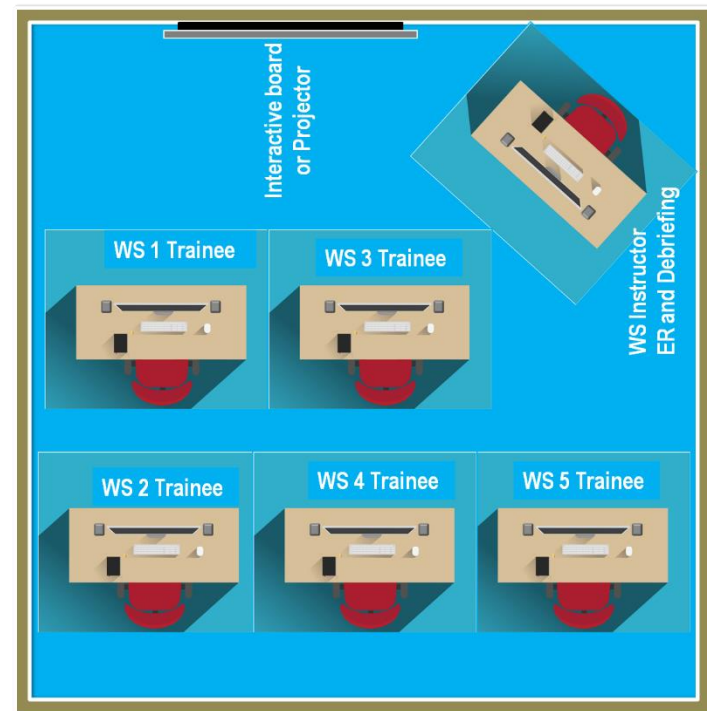
The Trainees Classroom configuration consists of:

- Engine Room Simulator Trainee Console display software
- Basic Standard Hardware:
 - ❑ PC with keyboard and optical mouse
 - ❑ Monitors
 - ❑ Set of speakers

It also offers two projection system configurations, depending on the clients request:

- 1 Projector or touch screen monitor **or**
- 1 Interactive system (interactive board 65").

Two classroom configurations are offered, depending on the number of trainees.





HARDWARE - DATA SHEET

Computers

Instructor PC & Trainee PC	Dell OptiPlex 3000 Small Form Factor Intel Core i5-12500 (6 Cores/18MB/12T/3.0GHz to 4.6GHz/65W), Internal Speaker, Dell Wired Keyboard-KB216, Dell Optical Mouse-MS116, 180 W internal power supply unit (PSU), Waves Maxx Audio, AMD Radeon 550 2GB LP (DP/DP), 16GB (1x16GB) DDR4 non ECC memory, M.2 2230 512GB PCIe NVMe Class 35 Solid State Drive, Win11/Win10 Pro DGR Natl Aca STANDARD. K12 EDU only.
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Visual Systems

Monitor	Dell 24 Monitor - SE2422H- 60.5cm (23.8")
Projector / Interactive system	Projector or touch screen monitor Recommended option: Dell 65 4K Interactive Touch monitor - C6522QT

Networking and accessories

Network Switch Gigabit unmanaged	TP-Link 24-Port Gigabit Switch, 24 Gigabit RJ45 Ports, 1U 13-inch Rack-mountable Steel Case - TL-SG1024D
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Printer and Accessories

Printer	Epson ECOTANK L1250 - A4 color printer USB Wi-Fi
Cables	As required



Details - Software Specification

W-X92 - Low Speed Engine Room Simulator

W-X92 engine room simulator was created with close co-operation with many manufacturers of the ship machinery like Winterthur Gas & Diesel (Main Engine), Alfa Laval (Fuel Conditioning Module, LO & FO Purifiers, Fresh Water Generator, Ballast Water Treatment System) and Aalborg (Oil-Fired & Exhaust Steam Boiler).

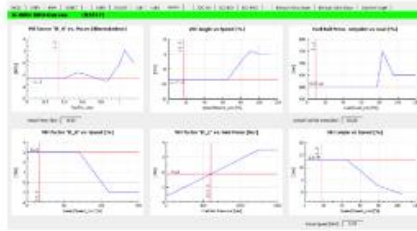
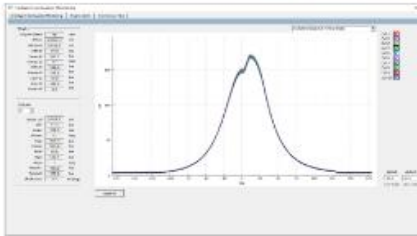
The W-X92 simulator has also several unique features. One of them is the graphic visualization of the dynamic engine working point within the engine limits curves. The software is also equipped with a unique compressor map characteristic, on which surging margin is presented. In combination with the possibility of turbocharging system faults simulation, it is an extremely valuable teaching tool.

The control and setting of engine control parameters are performed in the same way as in the real engine via the FlexView interface, which is a copy of the original WinGD engine control software.



The simulator is divided into the following modules:

- Bridge
- Diesel Generator
- Emergency Generator
- Main Engine
- Compressed Air System
- Cooling System
- Lubricating System
- Fuel System
- Steam System
- Ballast System
- Steering Gear System
- Bilge System
- Steering Gear
- CO2 Fire Extinguishing System
- FW & Sanitary Water System
- Bilge System
- Stern Tube Seal
- Sewage Treatment Plant
- Refrigerating Plant
- AC Plant
- Incinerator





Details - Software Specification

MER3D - Medium Speed Engine Room Simulator

MER3D Engine Room Simulator is based on typical solutions, presently used in medium-sized engine rooms (two, four-stroke type main engines with reduction gear and controllable pitch propeller).

This simulator is designed for training students of maritime academies as well as of different types of marine vocational training centers. The simulator has universal features and can be used for training both merchant and navy fleet crews.

The propulsion system includes **two MEs**, which drive through reduction gear the controllable pitch propeller (CPP). The propeller's revolutions and pitch are controlled simultaneously.

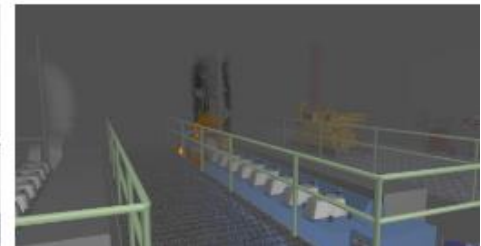
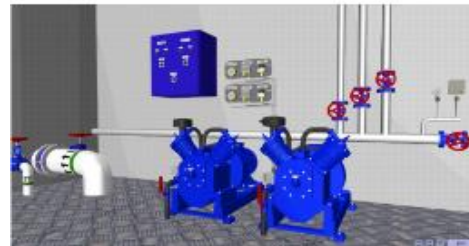




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The simulator is divided into the following modules:

- **Fuel System**
- **Cooling & Fire System**
- **Lubricating System**
- **Compressed Air System**
- **Power Plant**
- Emergency Generator
- **Sanitary Water System**
- **Bilge System**
- **Steering Gear**
- **Sewage Treatment Plant**
- Air Conditioning Plant
- **Water Mist System**
- **CO₂ System**
- Reverse osmosis system
- Hot water boiler
- Refrigerating Plant





Details - Software Specification

LNG-DE3D - Diesel Electric Engine Room Simulator

LNG-DE3D Engine Room Simulator is based on engine room equipped with diesel electric dual fuel propulsion system powered by Liquefied Natural Gas and Diesel Oil. This type of propulsion is widely used in modern propulsion systems on various types of vessels. The simulator is based on a ferry vessel used for carrying vehicles and passengers. Generally, the propulsion system includes three DF Diesel Generators 3 x 1489 kW and two Azimuth Thrusters 2 x 1750 kW.

The operator can go through LNG bunkering and supply process, choose between different tank filling options (top filling, bottom filling, top and bottom, auto pressure control filling).

The following procedures can be trained:

- inerting of gas/vapour return hose,
- inerting and pre-cooling of LNG hose,
- hose leakage test,
- hose leakage test and ESD Valve test.



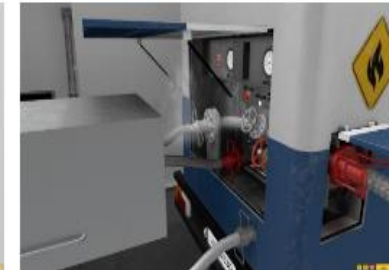
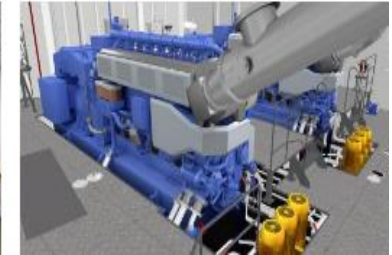
The most of the control of LNG bunkering valves is done through automatic control sequences. The operator has the opportunity to go through all the procedures in the manual mode.

Starting the gas supply to the engines and boiler in automatic and manual mode.

Depending on the state of LNGPac and pressure build up evaporator, the operator can start the procedure of supplying gas to DG. The System includes Process Stop and Sequence Overview to understand and acquire knowledge.

The simulator is divided into the following modules:

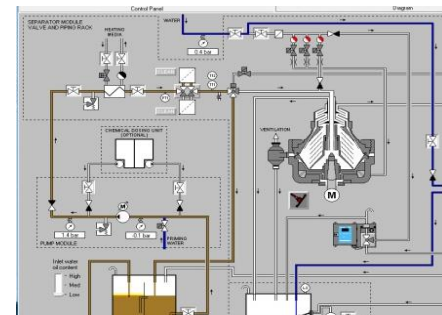
- Bridge
- Diesel Generator
- Emergency Generator
- Main Engine
- Compressed Air System
- Cooling System
- Lubricating System
- Fuel System
- FW & Sanitary Water System
- Sewage Treatment Plant



VIRTUAL ENGINE ROOM – CBT Computer based training

This additional computer-based training module provides a comprehensive training and simulation of more than 45 vital auxiliary systems found in marine power plants. The module provides theory and description, operational training, assessment tests and simulation, performance, control, operation and fault fixing for most of the auxiliary systems. This application familiarizes the students with all the electro-mechanical auxiliary equipment and system prior to operating the engine simulation as a complete operational system. It simulates the **following individual auxiliary systems:**

- Marine Diesel Engine Monitoring Systems
- Marine Heat Exchangers
- Marine Hydraulic Machinery
- Marine Pumps
- Oily Water Separator
- ORCA offshore
- ORCA offshore
- PureBallast Treatment System
- PureBilge – Bilgewater Cleaning System
- R.C.S. for MAN B&W LMC engines
- R.C.S. for SULZER RTA Engines
- Refrigeration Plant
- Refrigeration Plant 3D
- Reverse Osmosis Desalination System
- Rotary Vane Steering Gear
- Steam Boilers (steam production)
- S-type Separation System
- Variable Delivery Pump Steering Gear
- Alfa Laval Pure-Ballast 3
- Alfa Laval -Bilgewater Cleaning System
- Fixed Firefighting Systems
- Diagnostics of Modern Marine Diesel Engines.
- ALFA Laval ORCA Offshore.
- ALFA Laval Steam Boilers
- Alfa Laval Fuel Conditioning System (FCM 1.5).
- DESMI Compact Clean.
- DESMI OptiSave
- Air Conditioning Plant 3D
- Auxiliary Steam Boiler Installation
- Biological Sewage Treatment Plant
- C.P.Propeller Installation
- Comb. Oil Fired and Exhaust Gas Boiler
- Diagnostics of Modern Marine Diesel Engines
- Diesel Engine Generators
- Diesel Engines
- EcoStream
- Emergency Power Plant 3D
- Electric Power Plant
- Fixed Delivery Pump Steering Gear Inst.
- Fixed Fire Fighting System
- Freshwater Generator
- Freshwater Generator 3D
- Freshwater Generator 3D AQUA Type
- Fuel Conditioning Module 3D
- Fuel Oil Treatment Plant
- Gas Turbine
- Hydrophore Installation
- Hydrophore Installation 3D
- Marine Compressors
- Marine Diesel Engine Monitoring Systems
- Marine Heat Exchangers
- Marine Hydraulic Machinery
- Marine Pumps
- Oily Water Separator





Installation Training and Support

- **Installation** and **commissioning** of the simulator systems will be performed by a certified (of the simulators manufacturer) territorial integrators **POLYTECH SA** and **PANGAEA R&D**
- Prior to any installation, a detailed **study of requirements** will be provided for the network and power facilities for each site of delivery.
- **Training the trainers:** Simulator operation training and instructor certification for training completion will be provided by a manufacturer's certified instructor, after installation is completed per site.
- With each system, a complete **3 set of documents** will be delivered in electronic form, containing all the appropriate technical, operational and didactic material for each simulator system and its components.
- Assigned, certified system integrator for the territory of Greece: POLYTECH S.A.