W-Xpert

RT-flex50DF
Low Speed Dual Fuel Engine Room Simulator
W-Xpert RT-flex50DF Engine Room Simulator is based on typical solutions and presently used in medium engine rooms such as LNG carriers, handysize tankers and bulk carriers, as well as feeder container vessels.

The propulsion machinery is based on Dual Fuel Electronically Controlled Winterthur Gas and Diesel RT-flex50DF, low speed, 2 stroke, 5 cylinder, turbocharged engine with Controllable Pitch Propeller. The technology is based on the low pressure LGN gas system concept which fulfils IMO Tier III requirements. The electric power plant includes three (3) diesel generators and one (1) emergency generator.

Fig.1. Main engine – top view
LNG bunkering model

Unitest RT-flex50DF Engine Room Simulator is designed for training all LNG procedures such as: LNG tanks preparation (inerting and cooling down), LNG bunkering from different sources, LNG feed gas system preparation and Main Engine fuel change over procedures.

LNG bunkering procedure can be trained in the following situations:

- shore to ship;
- truck to ship;
- ship to ship.

Fig.2. Ship LNG system with LNG tanks on deck

Fig.3. Shore-to-ship bunkering

Fig.4. Ship-to-ship bunkering

Fig.5. Truck-to-ship bunkering
The simulator is designed for training marine engineers and students of maritime academies as well as of different types of marine vocational training centres. The simulator introduces 3D model of Engine Room, has universal features and gives realistic hands-on experience in the ship environment. All diesel generator engines, propulsion plants and equipment behaviours are faithfully reproduced.

The main purpose of the simulator is the practical preparation of the trainee for engine room operation, and more specifically:

- familiarisation with LNG related procedures (LNG bunkering, ME fuel change over procedures);
- familiarisation with electronically controlled common rail technology and flexibility of fuel injection and exhaust valve operations;
- familiarisation with the engine room installations (electric power plant system, compressed air system, fresh and sea water cooling system, lubricating and fuel oil system);
- acknowledgment with diesel generators and auxiliary equipment starting procedure.

![Fig.6. LNG process room](image)
Main Engine model

RT-flex50DF Simulator uses a detailed thermodynamic model to calculate the combustion process in a real time. The thermodynamic model includes different engine operations on diesel and LNG. It is also possible to observe the influence of many engine adjustment parameters and offsets (exhaust valve, injection process) on the calculated indicator curves.

Intelligent Combustion Monitoring System for continuous pressure measurement and analysis with primary features includes graphic presentation of PT, PV and Balance Diagrams, together with Mean Indicated Pressure and Maximum Pressure deviation limits. Calculated values of Effective Power, Mean Indicated Pressure $p_i$, Compression pressure $p_{comp}$, Maximum pressure $p_{max}$ and Scavenge pressure $p_{scav}$ include values for fuel injection and exhaust valve adjustment.
LNG system model

RT-flex50DF fuel gas supply system consists of: two LNG tanks of 300 cbm capacity located on the open deck, the supply gas system at 16 bar to the main propulsion and two sets of LNG booster/spray pumps supply gas fuel to the main engine.

The implemented control systems and LNG equipment enables the trainee to practice the following LNG procedures:

- LNG tank inertion;
- LNG tank cooling down;
- Bunkering;
- Feed gas system preparation;
- Engine LNG supply.

There are also additional engine related procedures:

- LNG manual valve test;
- Exhaust ventilation;
- Engine leakage test.

Fig.10. LNG Gas Valve Unit (GVU)

Fig.11. GVU & VALVE TEST page on ME LDU

Fig.12. Bunkering station with Dev Point and Oxygen concentration measuring equipment

Fig.13. LNG truck
Engine room overview

All operations in W-Xpert simulator can be done in specific system installation and compartments. Each system is presented as a real vessel’s schematic drawing or compartment with the ability to control on the screen. The most important components of the scheme can be zoomed and directed to the proper location in the engine room to operate.

The simulator is divided into the following modules:

- Bridge
- Diesel Generator
- Emergency Generator
- Main Engine
- CPP System
- Compressed Air System
- Cooling and Fire System
- Lubricating System
- Fuel System
- Steam System
- Freshwater Generator
- Sanitary Water System
- Bilge System
- Steering Gear System
- Sewage Treatment Plant
- Steering Gear
- CO2 Fire Extinguishing System
- Water Mist System
- Refrigerating Plant
- AC Plant
- Incinerator
- LNG System
The main features of RT-flex50DF are:

- LNG bunkering procedures (shore-to-ship, ship-to-ship, truck-to-ship)
- LNG feed gas procedures (control systems, feed gas system preparation, fuel change over)
- Highly realistic simulator for engine room training. All engines and propulsion plant behaviours are faithfully reproduced. In order to create the impression of working in the real environment, it emits 3D sounds which can be heard in 2, 4 or even more speakers.
- Familiarisation with electronically controlled common-rail technology and flexibility of the fuel injection and exhaust valve operations which allow users to improve the combustion process in various revolution ranges.
- The thermodynamic model offers visualisation of cylinder pressures depending on operating conditions.
- The mathematical model simulates ship’s main propulsion plant, low speed, 5 cylinder and 2 stroke, turbocharged and reversiblediesel engine.
- All vital auxiliary systems have been implemented.
- The user’s interface includes virtual controls and alarms that create a very realistic environment. The 3D virtual reality with active valves, tank level indicators and selected digital gauges enables comfortable engine room operation and monitoring. Zoom function allows navigation in 3D environment and a very easy access to details.
- Multichannel digitized sound provides a very realistic engine room feel. The sound effects include engine sound correlated with engine speed.
- Emergency procedure training includes fire simulations.
- Operations related to drivers subsystems include valves operations and all auxiliary equipment (pumps, coolers, purifiers, etc.).
- Drives operations from the following stations:
  - Control from the bridge: navigation bridge console panels allow to operate the propulsion plant;
  - Engine Control Room: water mist system, control of propulsion plant;
  - Local control of engine room equipment: Main Engine and Diesel Generator Local Operation Panels,
  - Starting and controlling of air compressors, fuel filters, electric motors, fan starters, boiler and more.
- Engine room operation training. The user will have the possibility to accomplish any operational task starting from different set-ups, both pre-prepared and saved by the user.
- Corrective action learning when faults occur.
- Built-in automatic assessment module.
### Main Engine Data

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<tr>
<th>Type</th>
<th>Winterthur Gas &amp; Diesel 5 RT-flex50DF</th>
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<tbody>
<tr>
<td>Cylinder bore:</td>
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<td>No. of air coolers:</td>
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<td>No. of Turbochargers:</td>
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<td>Rated power:</td>
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</table>

**To meet the requirements:**

RT-flex50DF engine room simulator has been developed to comply with STCW Code:

- Section A-1/12 and Section B-1/12
- ISM Code: Section 6 and Section 8

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For further information contact:

Unitest Marine Simulators Ltd.
Pomeranian Science and Technology Park
Al. Zwycięstwa 96/98 loc. E311-316
81-451 Gdynia, Poland

E-mail: office@unitest.pl

Phone: +48 601 626 680

Monday – Friday, 7:00am – 3:00pm (UTC/GMT+01:00)