UNITEST

MARINE TRAINING SOFTWARE, SIMULATORS AND DIESEL ENGINE TESTERS

MARINE TRAINING SOFTWARE Engineering CBT

Operator's Handbook

Part 5

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Installation instruction

1. Do not insert the Hardlock Key before the software installation!

2. Start the computer and load the Windows 98 / Me / 2000 / XP / 2003 / Vista operating system.

3. Please wait for the CD-ROM auto-start sequence, or:

    a. Insert the CD into the CD-ROM drive.

    b. Click the “Start” menu.

    c. Select “Run…”.

    d. Type “[CD-ROM drive letter]:\setup.exe” (e.g. d:\setup.exe), or click ‘Browse…’ button and locate ‘setup.exe’ file on the CD-ROM.

    e. Click “OK” button.

4. Follow the instructions shown on the screen.

5. After the installation has completed, please insert the Hardlock Key.

6. In order to read the manual pdf files, please install the “Adobe Reader”, which is included on the CD-ROM.

CENTRAL COOLING WATER SYSTEM

1. Introduction

The educational program CENTRAL COOLING WATER SYSTEM SIMULATOR is intended for teaching the basic principles of how to operate a typical central cooling water system.

The Central Cooling Water System consists of three circuits:

- seawater
- low temperature freshwater for central cooling
- high temperature freshwater for ME jacket cooling

In the central cooling system only one heat exchanger is cooled by seawater. All other heat exchangers are freshwater cooled and therefore, they can be made of a less expensive material.

The Central Cooling Water System Simulator is divided into 2 sub-systems: freshwater and seawater. The seawater sub-system is responsible for the freshwater cooling. The freshwater sub-system is responsible for the ME jacket, piston and injector cooling, as well as scavenge air and the diesel generators.

The program consists of the following parts:

- Control Panel
- Sea Water System
- Fresh Water System

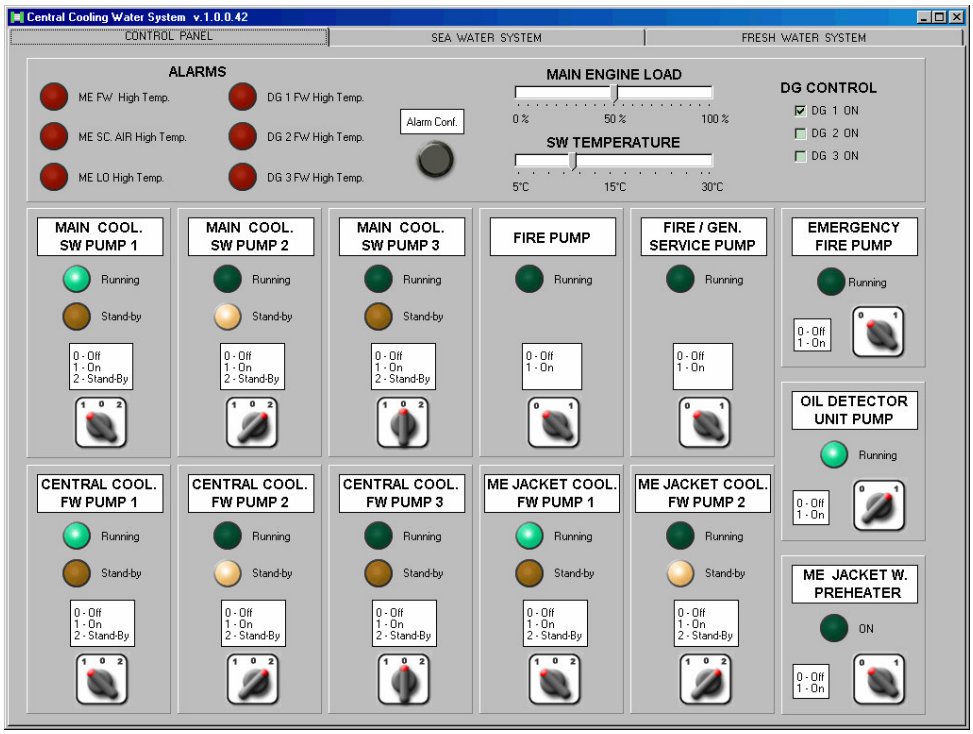


Fig.1 Control Panel

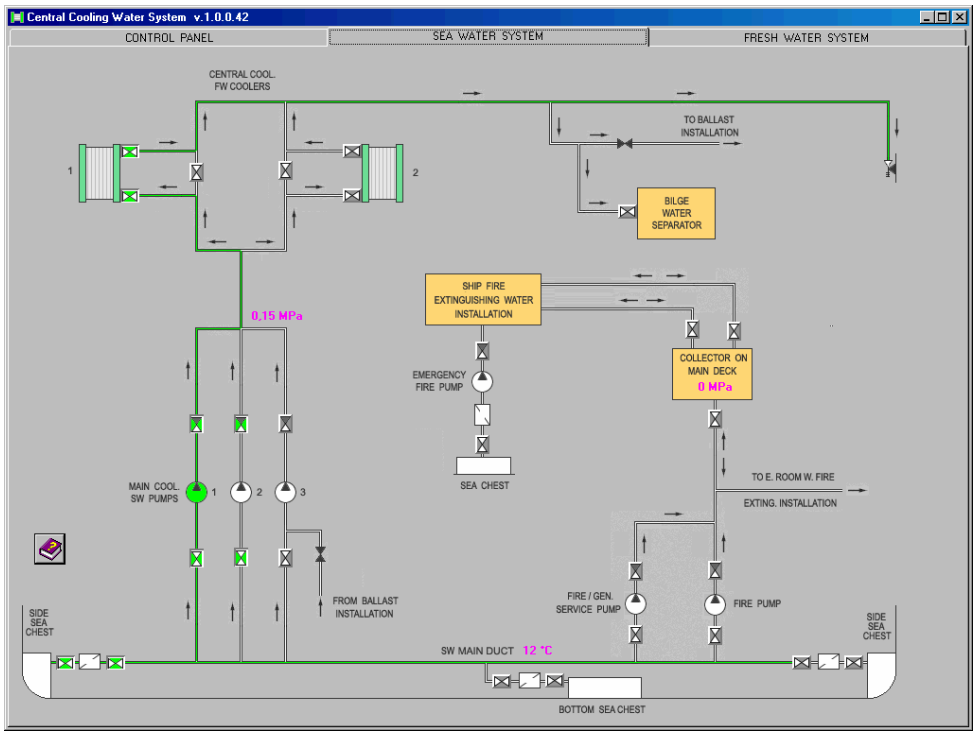


Fig.2 Sea Water System

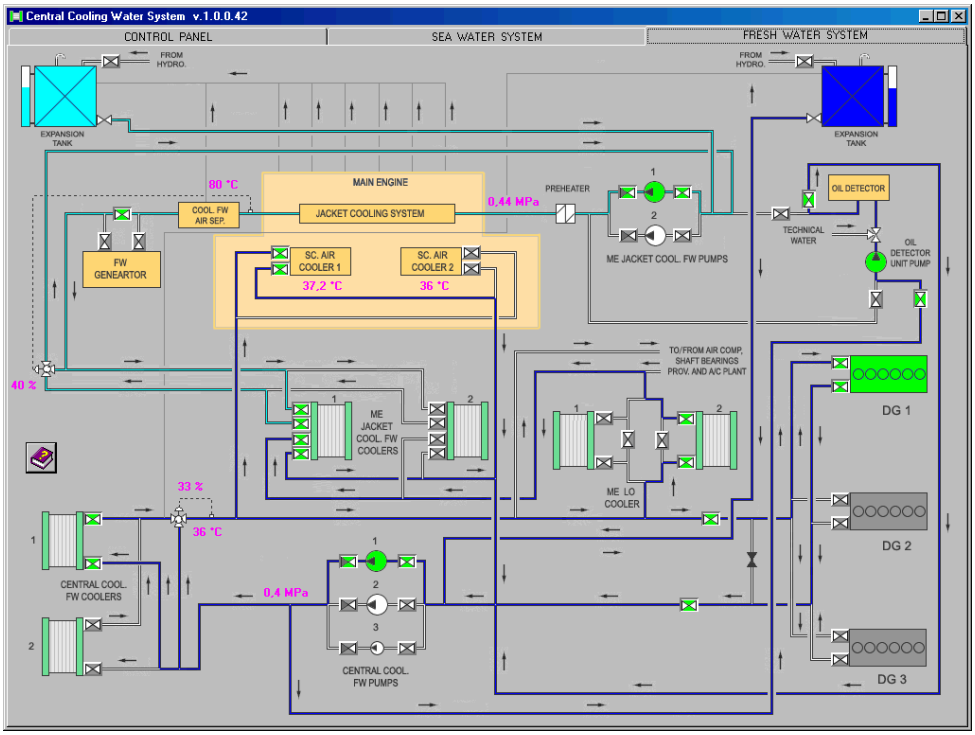


Fig. 3 Fresh Water System

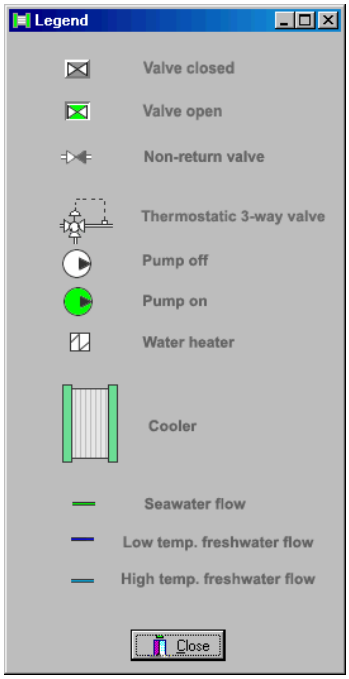
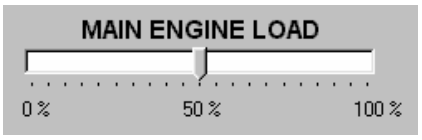


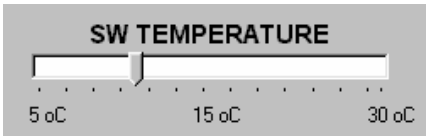
Fig. 4 Legend

The following input parameters can be modified from control panel:

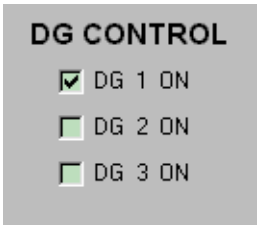
1. Main Engine Load within range: 0 - 100 %.



2. Seawater temperature within range: 5 – 30 ^{o}C.



3. Starting and stopping diesel generators.



2. Operating procedures

2.1. Preparing Sea Water System

1. Open valves from SEA CHEST through MAIN COOLING SEA WATER PUMPS and CENTRAL COOLING SEA WATER COOLERS to overboard valve.

2. Set MAIN COOLING SEA WATER PUMP NO. 1 to position "**On**".

3. Set MAIN COOLING SEA WATER PUMP NO. 2 to position "**Stand-by**".

2.2. Preparing Fresh Water System

1. Open valves to diesel generators, main engine lubricating oil and scavenge air cooling through CENTRAL COOLING FRESH WATER PUMPS and COOLERS.

2. Set MAIN COOLING FRESH WATER PUMP NO. 1 to position "**On**".

3. Set MAIN COOLING FRESH WATER PUMP NO. 2 to position "**Stand-by**".

4. Open valves for main engine jacket cooling through ME JACKET COOLING FRESH WATER PUMPS and FRESH WATER GENERATOR.

5. Set ME JACKET COOLING FRESH WATER PUMP NO. 1 to position "**On**".

6. Set ME JACKET COOLING FRESH WATER PUMP NO. 2 to position "**Stand-by**".

7. Set ME JACKET WATER PREHEATER to position "**On**"

EMERGENCY POWER PLANT

1. General description

The educational program EMERGENCY POWER PLANT SIMULATOR is intended for teaching the basic principles of how to operate a typical emergency marine diesel engine generator.

The program is based on the emergency diesel engine type D2866 E produced by MAN and the generator type **STAMFORD UCM 274 G**.

The Emergency Power Plant Simulator consists of the following parts:

1. Fuel Oil Tank
2. Diesel Generator
3. Diesel Generator Control Panel
4. Emergency Transformers Boxes
5. Battery Charger
6. Emergency Switchboard

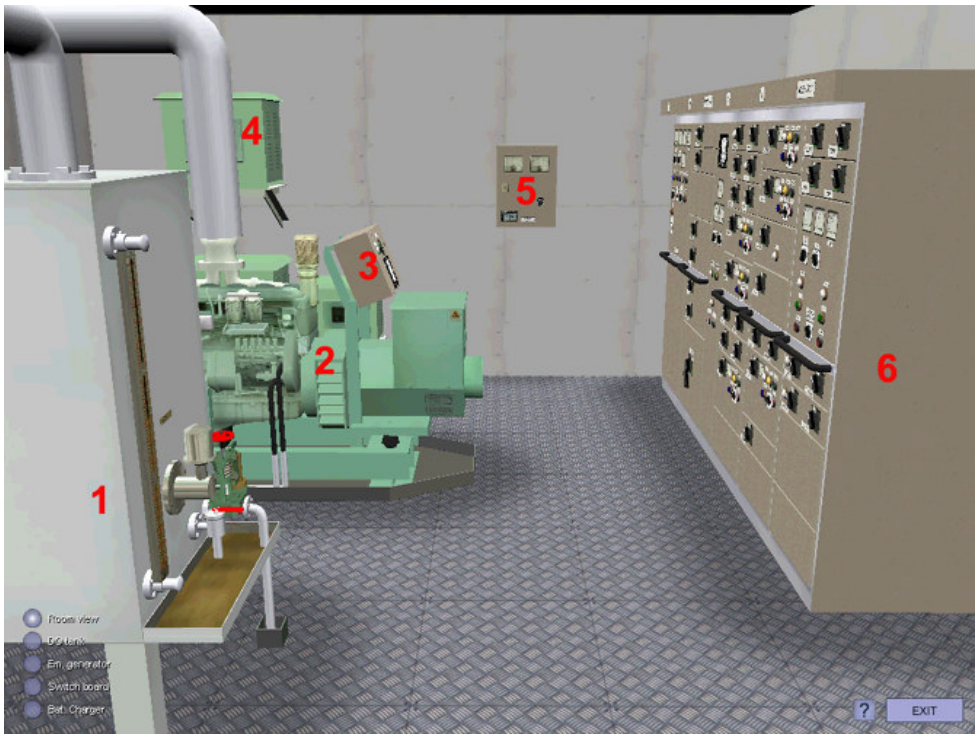


Fig. 1. Emergency Diesel Generator – general view

The emergency switchboard consists of the following fields:

1. Generator Panel
2. Shore Supply Switch Panel
3. Alarm Panel
4. Shore Supply Control Panel
5. Emergency Transformers Panel
6. Emergency Consumers Panels

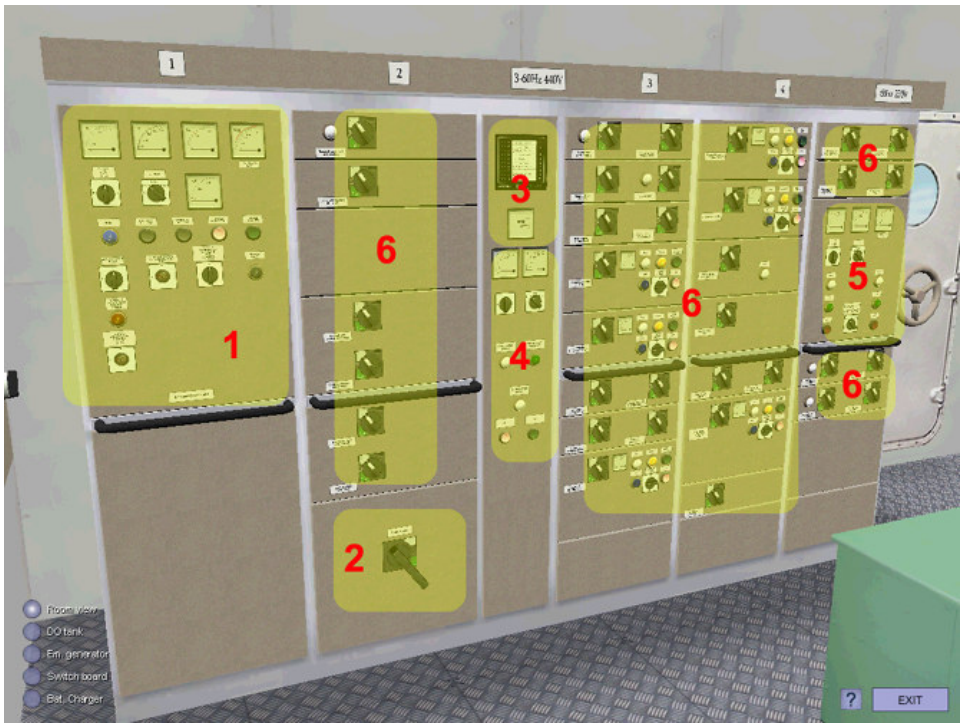


Fig. 2. Emergency switchboard

2. User interface

This simulator allows two way of navigation in 3D environment:

1. Selection of system's views (Room view, DO tank, emergency generator, switchboard and battery charger). This items are available from menu (fig.3).
2. Zooming of selected parts of system's elements (by mouse clicking on yellow boxes fig. 4).

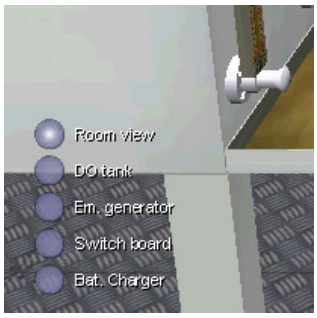


Fig. 3. Zoom Menu

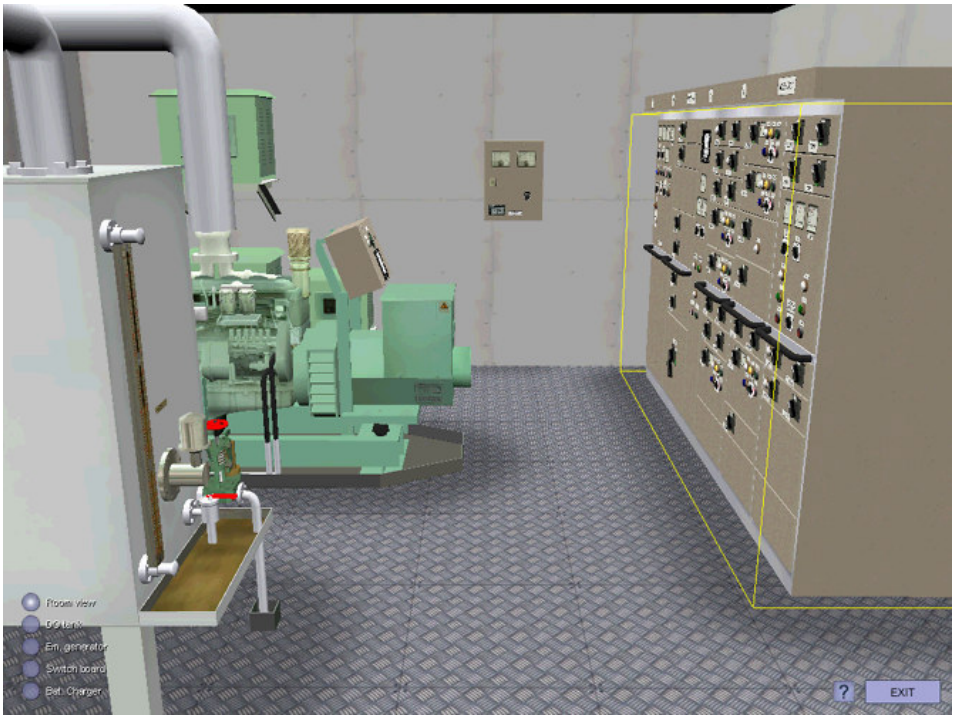


Fig. 4. Zooming selection of emergency switchboard

3. Operating instructions

3.1. Manual start of the emergency generator (hydraulic starter)

1. Set emergency generator operation switch to position MANU on SELCO control panel.
2. Ensure the hydraulic pressure is 30 MPa, if not operate hand pump to charge the system.
3. Do not snatch starting lever.
4. Move starting lever gently until resistance is felt, overcome resistance and without pause complete full lever travel in one movement.
5. When engine fires release starting lever.

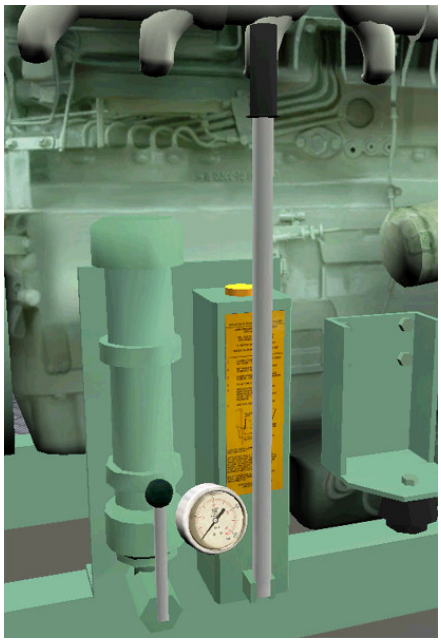


Fig. 5. Hydraulic starter

3.2. Manual start of the emergency generator (main electric starter)

1. Set emergency generator operation switch to position MANU on SELCO control panel.
2. Make sure that the “LED” on the SELCO panel “POWER ON” is emitting light.
3. Reset any possible incoming alarm.
4. Press the combined “START/STOP” push button on the SELCO control panel for about 3 to 10 seconds (constant push).

The “LED 1” (operation) will flash until the electric start drives the diesel engine up to ignition speed. At the approx. 550 rpm the electric starter will discharge automatically and “LED 1” will emit constant light. The set is now operating.

Fig. 6. SELCO control panel

3.3. Manual stop of the emergency generator

1. Active the combined "START/STOP" push button (constant push) on the SELCO control panel until the "LED 1" (operation) start flashing slowly. When the slow flashing has started the engine has reached the ignition speed limit (approx. 550 rpm) and the stop solenoid will remain active for approx. 20 seconds. After the stop solenoid's 20 seconds of activation, the "LED 1" will stop flashing and the diesel engine can be re-started.

3.4. Automatic operation

1. **Operation Selector Switch in Position "AUTOMATIC"**
   The diesel engine can only be started automatically when the operation switch is in auto position. The automatic start signal from the emergency switchboard is connected to the engine control.

   If for some reason the engine is to be stopped during automatic operation turn the operation selector switch in position "OFF".

   During the start process "LED 1" will flash for as long as the electric starter is active, and it will emit constant light when the diesel engine has reached approx. 550 rpm. The diesel engine is the operating.

   Should the diesel engine against all expectations not have reached 550 rpm within 17 seconds the time of the first start the second automatic start attempt will be made. When the engine reaches approx. 550 rpm the engine controller will block for further starting attempts.

Should the engine not start, this procedure is repeated. At the third failed start attempt the “LED 2” indicates “START FAIL” on the alarm panel and any further attempt to start the engine is blocked. To re-start again with 3 start attempts press the reset push button two times.

2. **Automatic stop**
   Automatic stop signal is received from emergency switchboard. As soon as this signal is received, the “LED 1” will start flashing slowly as accept, but the diesel engine will continue running for approx. 5 minutes to cool down. Then the stop solenoid will receive the stop signal automatically and will remain activated for approx. 20 seconds. The “LED 1” will then stop flashing. The set is now ready for automatic re-start.

3. **Operation Selector Switch in Position “OFF”**
   The engine does not start even if the automatic start signal is given or if the manual start push button is activated.
   If the selector switch is turned to “OFF” during engine operation or in stand-by periods, the stop solenoid will be activated and remain so for 20 seconds.

3.5. Manual connection of the emergency generator to bus bar

1. Set **Control of EG breaker and tie breaker to MSB** switch to position MANU in the emergency generator’s field of emergency switchboard.
2. Press the **Gen. breaker ON** push-button in the emergency generator’s field of emergency switchboard.

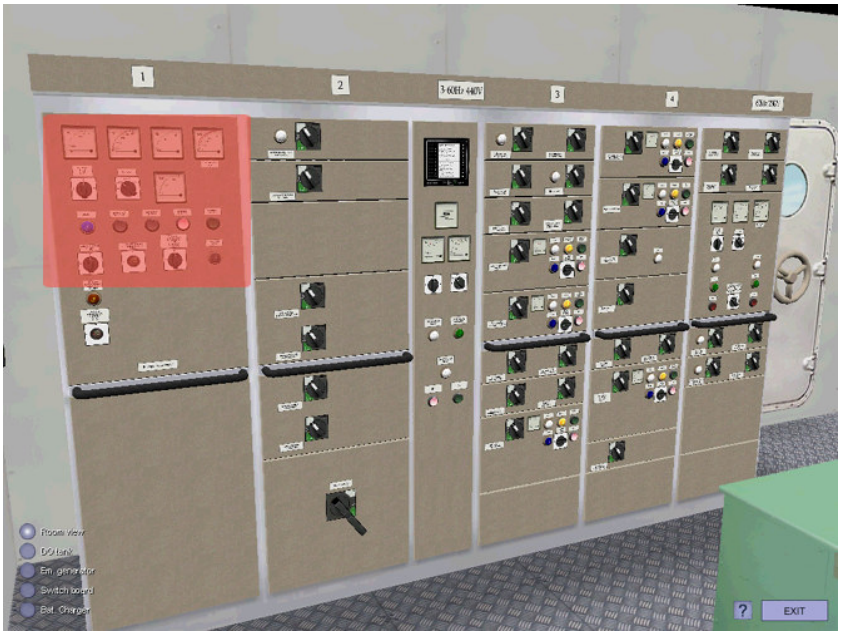


Fig. 7. Emergency generator’s field of emergency switchboard

3.6. Automatic connection of emergency generator to bus bar

1. Set **Control of EG breaker and tie breaker to MSB** switch to position AUTO in the emergency generator's field of emergency switchboard.

3.7. Shore supply connection

1. Set **Shore Supply** switch to position ON in emergency switchboard.
2. Press **ESB to MSB connector ON** push-button Shore Supply Control Panel.

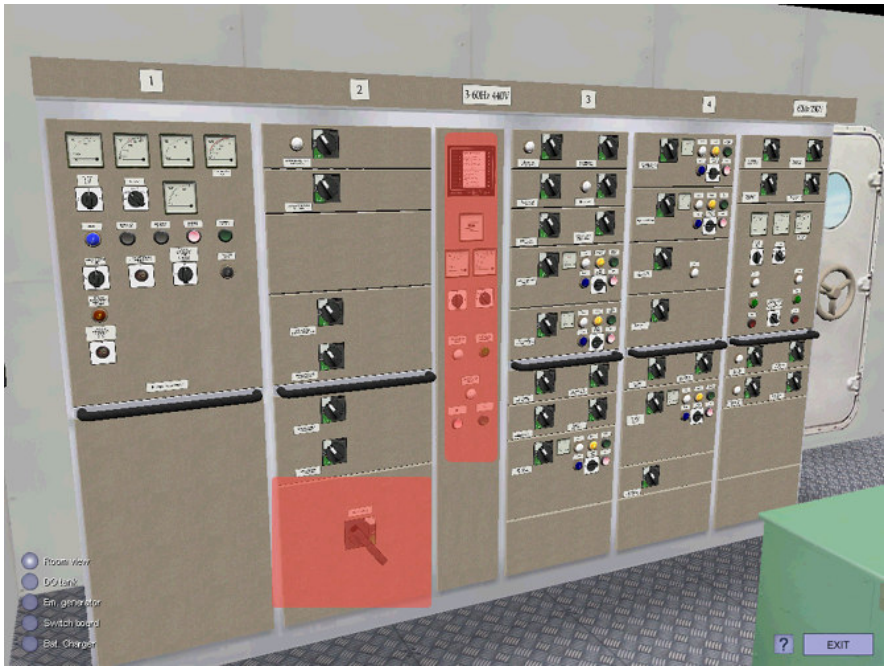


Fig. 8. Shore supply fields of emergency switchboard

3.8. Pre-Alarm and Auto Trip System

1. **Pre-Alarm, Alarm without Trip:**
   Acoustic and visual alarm is given for:
   - Low lubricating oil pressure
   - High cooling water temperature
   - High lubricating oil temperature
   - Leak in Fuel pipe

   The wiring for the above alarms is secured against circuit failures. Should such occur on an alarm switch, the alarm channel "LED" for the switch in question will start to flash slowly.
   Should a pre-alarm occur, the channel in question "LED" will start to flash slowly. Simultaneously with visual "LED" alarm the acoustic alarm will be activated.

2. **Alarm with TRIP:**
   Shut-down, start blocking, visual and acoustic alarm is given for:
   - Start failure
   - Overspeed

   Should shut-down failure occur, a stop signal is immediately given to the set and the alarm channel in question “LED” will flash rapidly.

3. **Alarm for rpm Fail:**
   If the ignition speed signal during operation is disconnected alarm will be given (delayed 30 sec.) and “LED 3” will emit constant light.

Alarm and Buzzer Reset:
When the “RESET” button is pressed the first time (once) the alarm indication diodes will stop flashing, but will continue to emit light, and the buzzer will be de-activated.

When the “RESET” button is pressed the second time the alarm indication lamps will be eliminated unless the cause for the alarm has not been settled.

ROTARY VANE STEERING GEAR SIMULATOR

1. General description

The educational program Rotary Vane Steering Gear Simulator is intended for teaching the basic principles of how to operate typical electro-hydraulic rotary vane steering gear.

The steering gear is composed of one hydraulic rotary vane actuator mounted directly on the rudder stock, served by two pump units delivering the necessary oil pressure for operating the rudder.

The two pump units may be operated together or separately. Each pump unit will provide oil with sufficient pressure to develop the specified rudder torque.
In normal operation at sea, only one pump unit is in operation while the other is acting as a stand-by unit. During maneuver of the vessel, when the shortest possible steering time is required, it is possible to run both pump units simultaneously and in such case the rudder rate will be doubled.

The pump units are equipped with solenoid valves, which are normally operated by means of signals from the bridge steering controls.

The pump is submerged in the oil tank. The tank is divided into three chambers, one for each pump unit and one for the integrated storage tank, with one low level alarm-switch in each of the pump unit chambers.

The Rotary Vane Steering Gear Simulator consists of the following parts:

- Bridge Control Panel
- Control Room / Local Control Panel
- Diagram

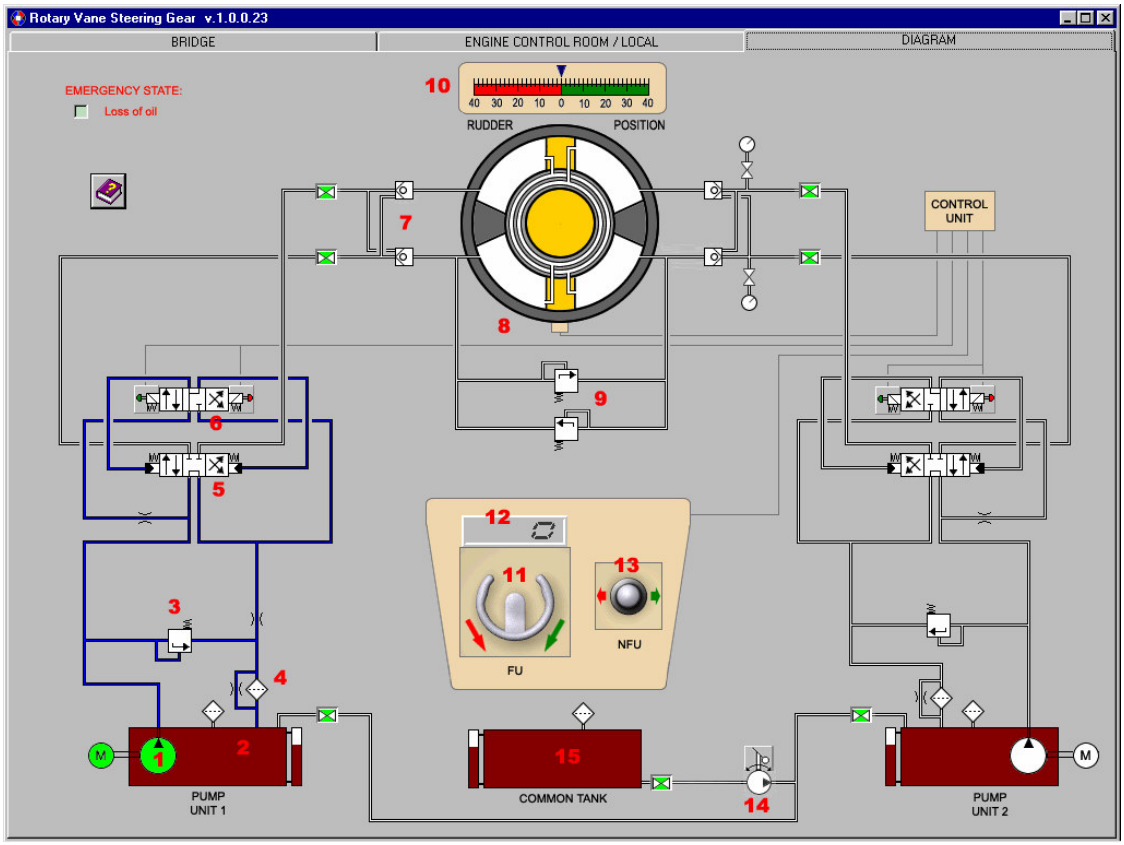


Fig. 1. Steering gear - installation diagram

Legend:

1. Screw pump
2. Oil reservoir
3. Safety relief valve
4. Return line oil filter
5. Control valve
6. Solenoid – pilot valve
7. Lock valve
8. Steering gear actuator
9. Safety valves
10. Rudder position indicator
11. Follow-up controller
12. Rudder setting position indicator
13. Non-follow-up controller
14. Refilling pump
15. Oil storage reservoir

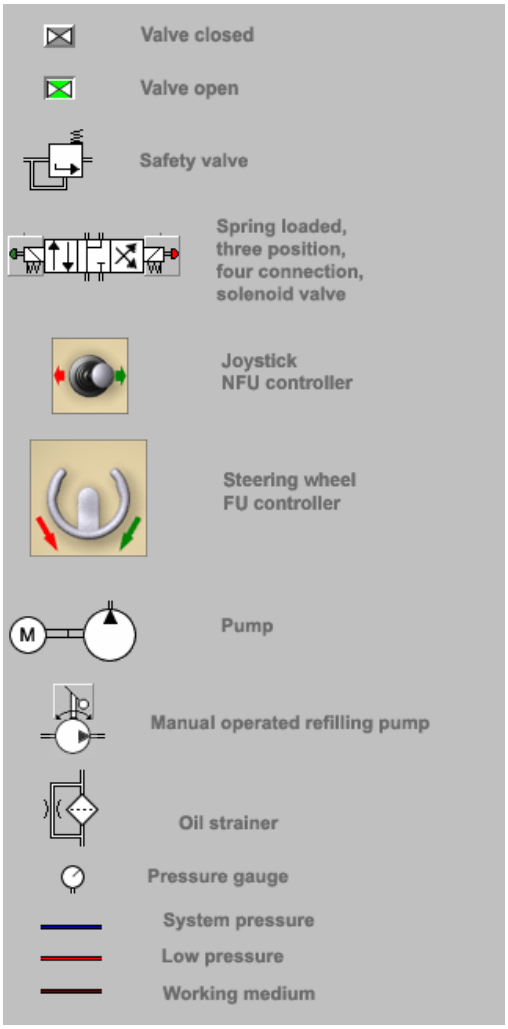

Valve closed
Valve open
Safety valve
Spring loaded,
three position,
four connection,
solenoid valve
Joystick
NFU controller
Steering wheel
FU controller
M
Pump
Manual operated refilling pump
Oil strainer
Pressure gauge
System pressure
Low pressure
Working medium

Fig. 2. Legend

2. Bridge Control Panel

The remote start-stop push buttons are normally mounted in the bridge panel together with alarm lamps. There is one push button for start and one for stop per each pump unit. The start button is equipped with running indicator light. Indication lights for automatic stand-by start is also installed.

The Bridge Control Panel consists of following fields:

1. Alarm Panel.
2. Steering Mode Panel.
3. Pumps Control Panel.
4. Override Panel.
5. Control Column.
6. Wing Panel.

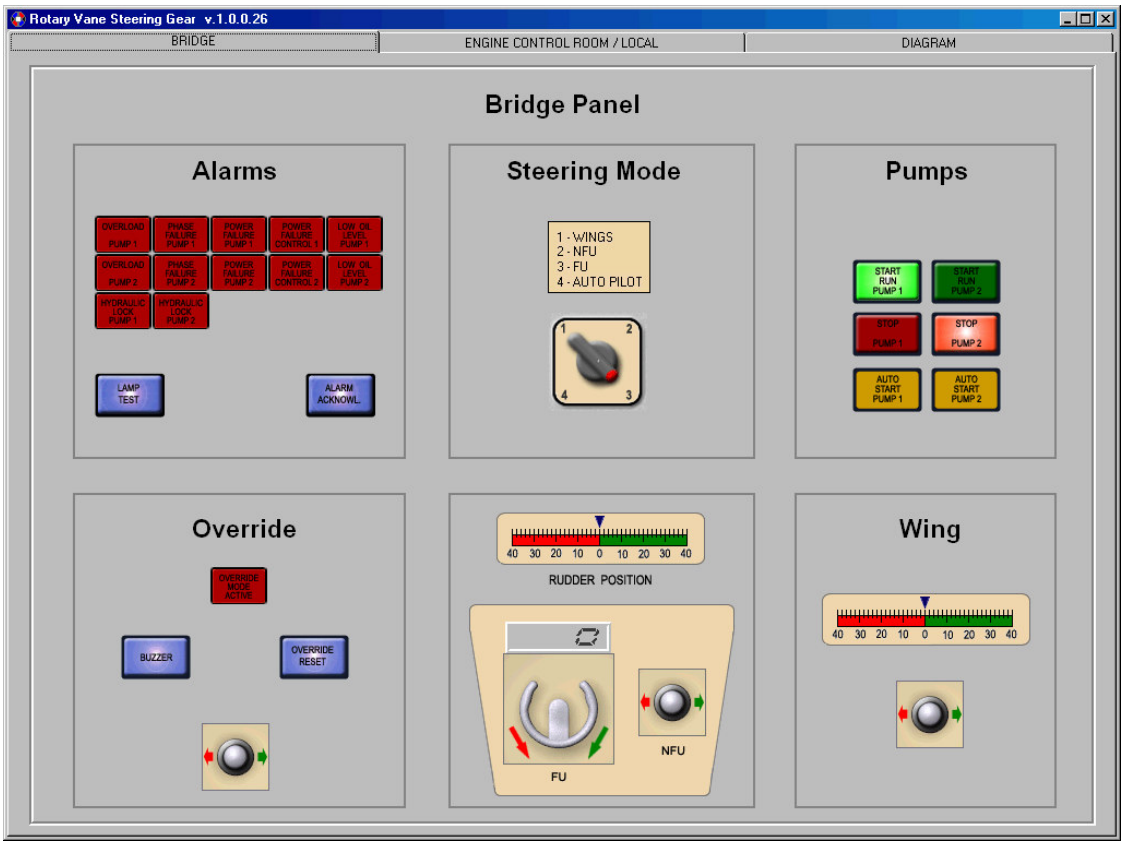


Fig. 3 Bridge control panel

2.1. Alarm Panel

The main components of the alarm system are: the alarms unit, main alarm panel, and slave alarm panel. The alarm unit is equipped with terminals for the alarm panels and sensors. Output signals to the ship's general alarm system are also provided.
The main panel and the slave panel are the systems interface to the operator.
The main panel is located in the engine control room and the slave panel is mounted on the bridge.

Alarm Panel contains the following elements:

- OVERLOAD PUMP 1 - lamp
- PHASE FAILURE PUMP 1 - lamp
- POWER FAILURE PUMP 1 - lamp
- POWER FAILURE CONTROL 1 - lamp
- LOW OIL LEVEL PUMP 1 - lamp
- OVERLOAD PUMP 2 - lamp
- PHASE FAILURE PUMP 2 - lamp
- POWER FAILURE PUMP 2 - lamp
- POWER FAILURE CONTROL 2 - lamp
- LOW OIL LEVEL PUMP 2 - lamp
- LAMP TEST – push button
- ALARM ACKNOWL. – push button

Standard alarm function.
Overload pump – electric motor overload.
Phase failure pump – phase failure to electric motor.
Power failure pump – power failure to electric motor.
Power failure control - power failure to steering control system.
Low oil level pump – level switch mounted in the oil reservoir.
Hydraulic lock - alarm may occur where the hydraulic system is arranged in such manner that failures (for example, in directional valves) can cause power units to work in closed circuit with each other rather than in parallel delivering fluid to the rudder actuator. Where a single failure can lead to hydraulic lock and loss of steering, an audible and visual alarm, which identifies the failed system, is provided on the navigation bridge.

2.2. Pump Control Panel

The Pump Control Panel contains the following elements:

- START RUN PUMP 1 – push button
- STOP PUMP 1 – push button
- AUTO START PUMP 1 - lamp
- START RUN PUMP 2 – push button
- STOP PUMP 2 – push button
- AUTO START PUMP 2 - lamp

2.3. Override Panel

The Override Panel contains the following elements:
- Override control joystick
- OVERRIDE RESET – push button
- BUZZER – push button
- OVERRIDE MODE ACTIVE – lamp

2.4. Control Column

The Control Column contains the following elements:
- Follow-up controller (steering wheel)
- Non-follow-up controller (joystick)
- Rudder position indicator

2.5. Wing Panel

The Wing Panel contains the following elements:
- Wing control joystick
- Rudder position indicator
- MANUAL – lamp

3. Engine Control Room / Local Panel

This panel consists of two main parts:
1. Control Room Panel.
2. Local Control Panel.

The Control Room Panel serves only as alarms and pumps status indicators. It is not possible to put into service any devices of the steering gear from this panel.

The Control Room Panel consists of following fields:
1. Alarm Panel.
2. Pump Panel.

On the Alarm Panel the following elements are placed:
- OVERLOAD PUMP 1 - lamp
- PHASE FAILURE PUMP 1 - lamp
- POWER FAILURE PUMP 1 - lamp
- POWER FAILURE CONTROL 1 - lamp
- LOW OIL LEVEL PUMP 1 - lamp
- OVERLOAD PUMP 2 - lamp
- PHASE FAILURE PUMP 2 - lamp
- POWER FAILURE PUMP 2 - lamp
- POWER FAILURE CONTROL 2 - lamp
- LOW OIL LEVEL PUMP 2 - lamp

- LAMP TEST – push button
- ALARM ACKNOWL. – push button

The Pump Control Panel contains the following elements:
- START RUN PUMP 1 – lamp
- STOP PUMP 1 – lamp
- AUTO START PUMP 1 - lamp
- START RUN PUMP 2 – lamp
- STOP PUMP 2 – lamp
- AUTO START PUMP 2 - lamp

The Local Control Panel consists of following fields:
1. Pump 1 Local Control Panel.
2. Pump 2 Local Control Panel.

The following elements are placed on each pump panel:
- Pump mode selector switch
- Pump running status indicator - lamp
- Pump heating status indicator - lamp
- Pump supply status indicator – lamp

The selector switch has the following position:
- Remote control (steering from bridge)
- Stop (maintenance)
- Local control (only emergency steering from the steering gear room is possible).

Remote control is the normal position of selector switch. Start, stop and steering commands are effectuated from the bridge.
The stop position is used to prevent unintentional start from the bridge during repair of the steering gear or rudder.
Local control is used for function testing of the steering gear, or emergency operation of the maneuvering valves. In this position the steering control from the bridge is disconnected. A fault in this system will therefore not interfere with the emergency steering. The motor controller will turn on the power supply to the electric motor. The maneuvering valves on the rudder motor can then be operated manually by use of the emergency device on the solenoids.
The alarm “Power failure control” will be activated in position Stop and Local control as an information to the crew on the bridge that remote control is out of function.

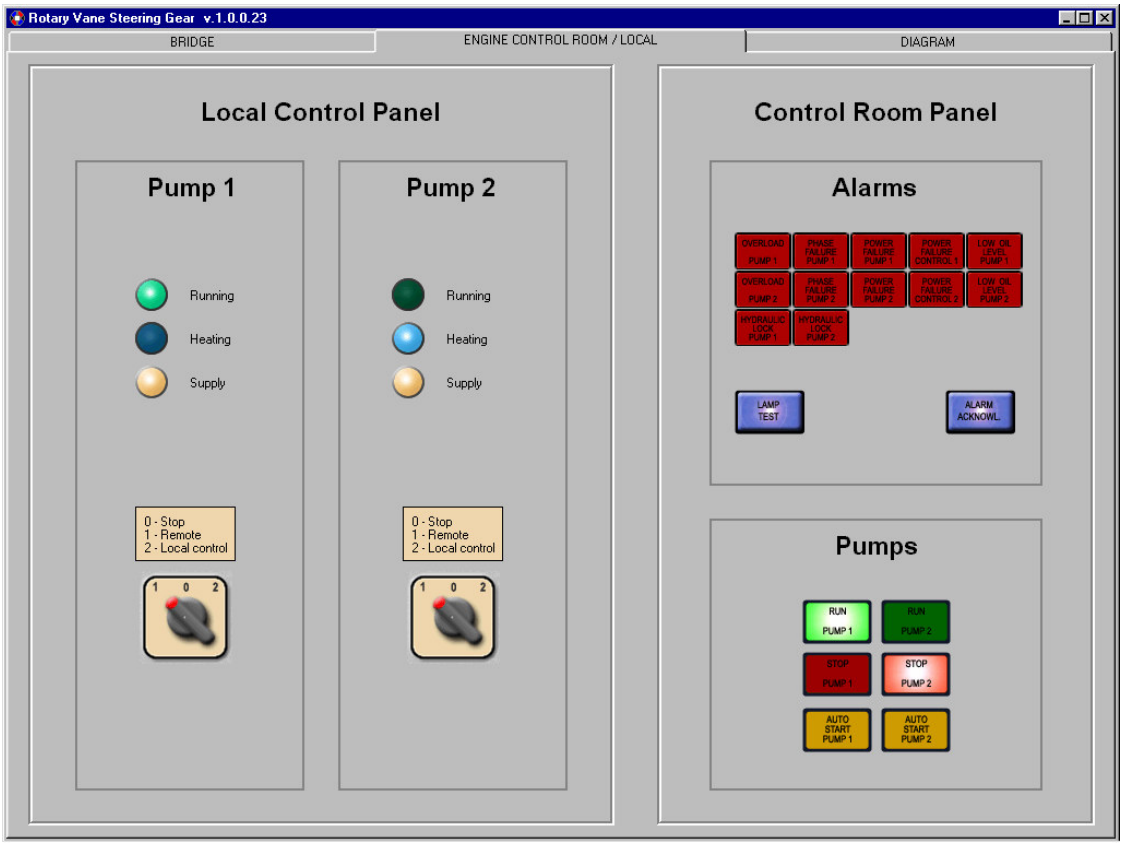


Fig. 4 Control Room / Local Control Panel.

4. Steering gear operating mode

The steering gear may operate in one of the following steering modes:

1. **Follow-up control (FU).**
2. **Non-follow-up control (NFU).**
3. **Local control.**

4.1. Follow-up control

Setting adequate set rudder deflection value is performed by means of steering wheel (**follow-up control FU**). This mode of controlling is performed in the program by clicking the appropriate side of steering wheel in the FU part of the control column. One mouse clicking corresponds to approx. 1° of rudder deflection angle. To keep the desired course of the ship it is necessary to hold the left mouse button continuously. Releasing this button causes return of set value into zero position. Rudder deflection set angle is visible on the rudder setting position indicator.

4.2. Non-follow-up control

This kind of control can be performed from:
- Main Control Column,
- Wing Control Panel,
- Override Control Panel.

Clicking on the adequate control joystick selects non-follow-up control.
Override control joystick is often equipped with priority so that other steering modes are disconnected when the steering is operated. If the priority steering is used an audible alarm will be activated, the alarm can be reset with the BUZZER push button. To regain normal steering, push the OVERRIDE RESET push button.

4.3. Local control from steering gear room

The maneuvering valves on the rudder motor can be operated manually by use of the emergency device on the solenoids. The selector switches on the motor controller must be turned to position Local control.

Note!!!
Emergency procedures are supplied with each steering gear. These are to be displayed on the bridge and in the steering gear room.

5. Starting procedure

To put the steering gear into service the following duties should be performed:

- at the diagram

    1. Check the oil level in Pump Unit 1 and Pump Unit 2 tanks.
    2. Open valves to rotary vane actuator from Pump Unit 1 and Pump Unit 2.

- at the Local Control Room Panel:

    1. Set Pump 1 Control Switch to position – Remote.
    2. Set Pump 2 Control Switch to position – Remote.

- at the bridge control panel:

    1. Start pump 1 by PUMP RUN 1 – push button.
    2. Set Steering Mode Switch to adequate Steering Mode.

From time to time, during steering gear exploitation a loss of oil may occur. Oil reservoirs are refilled by manually operated refilling pump. Clicking the left mouse button at the active field above the pump carries out this operation. All suitable valves should be opened earlier (depending on the fact which tank is to be refilled).