MAN Energy Solutions
Future in the making

ME Pre-Dual Fuel Standard Operation - Course Syllabus

PrimeServ Academy Copenhagen

MAN PrimeServ

ME Pre-Dual Fuel Standard Operation Syllabus

Engine type: All types of ME engines.

Duration: Five days.

Target audience: Ship engineers, technical superintendents and electricians.

Prerequisites: Participants should have basic engine experience and knowledge.

The training course has 15 modules which correspond with a unique name to each lesson. Quality presentations and practical exercises on the engine simulator, cover the operation manual and maintenance manual, providing an intensive training course. Each day ends with e-learning and instructions on the dual-fuel platform. The e-learning (modules 11–15) will demonstrate the importance of the ME-C engine platform, that must work perfectly to be able to operate dual-fuel.

Module 1: Introduction to the ME-C engine

This lesson is an introduction the ME-C engine platform and a description of the ME-C engine control system. The lesson focuses on the controller functions.

Learning objectives:
- Designation of MAN B&W two-stroke engine
- New components on ME-C engine
- Electro-hydraulic system i.e. Hydraulic Power Supply (HPS), Hydraulic Cylinder Unit (HCU), fuel system and exhaust valve system

Upon completion of this lesson, participants will gain an overall understanding of the ME-C engine control system as a function and philosophy.

Module 2: The ME-C engine control system

This lesson is a concept description of the ME-C engine and a description of the ME-C engine control system. The lesson also focuses on the controller functions

Learning objectives:
- Engine control system i.e. Multi-Purpose Controller (MPC), control network, Main Operating Panel (MOP) and Local Operating Panel (LOP) MPC installation
- Pneumatic maneuvering system
- Triton Controller in the Engine Control System

Upon completion of this lesson, participants will have an overall understanding of the ME-C engine control system and the main function of the Multi-Purpose Controllers, for example, electrohydraulic control of the fuel injection and exhaust valve activation

Module 3: Engine operation

This lesson is a detailed description of the user interface of the ME-C engine control system, the monitoring of the condition of the engine and the adjusting of the engine performance i.e. MOP's and the LOP.

Learning objectives:

- Alarm handling and reporting
- Engine operation and performance adjustment
- Auxiliaries system
- Maintenance and troubleshooting
- Admin. and software version

Upon completion of this lesson, participants will be able to understand the user interface of the engine control system, how to put one cylinder out of operation and how to adjust the engine performance e.g. Pmax, Pi, Pcomp.

Module 4: Engine operation on the cloud-based simulator

The task of performing engine operation on the simulator is an additional task. Participants must go through below mentioned tasks, to practice operation on the system and to show their understanding of the user interface.

Learning objectives:

- Start - running up - from engine control room (ECR)
- Change control station between ECR and LOP
- Start - running up - from LOP

Upon completion of this lesson, participants will be able to understand the operational features of the MOPs and use them to adjust engine performance.

Module 5: Troubleshooting on the cloud-based simulator

These lessons are practical exercises in using the troubleshooting tool integrated in the control system software - the MOP. This lesson also calls for knowledge gained in previous lessons. During these exercises, participants are to complete the tasks set for them on their laptops. They must use all the screens on the MOP and in the program on our cloud simulation. Failures are introduced throughout the exercise and troubleshooting is carried out by participants.

Learning objectives:

- Overview of the engine control system
- Analysis of below mentioned failure situation
- i.e. alarm description, cause and effect and which actions to execute during the exercises
- How to use 'Maintenance' screens
- Evaluation of input and output channel
- Finding solutions to operate the engine

Upon completion of this lesson, participants will be able to analyze failures and find the proper solution to start the engine, using troubleshooting tools integrated in the control system software.

Module 6: Hydraulic Power Supply

This lesson is a detailed description of the Hydraulic Power Supply (HPS), as a part of the hydraulic system. I will include a description of individual key components and their interaction.

Learning objectives:

- Hydraulic diagram and components
- Filter unit
- Start-up pump
- Engine driven pump including driven system and pump principle
- Safety and accumulator block

Upon completion of this lesson, participants will be able to understand the purpose of each component in relation to the hydraulic oil flow.

Module 7: Hydraulic Cylinder Unit

This module describes the Hydraulic Power Supply (HPS) in detail, as a part of the hydraulic system. It will include a description of individual key components and their interaction.
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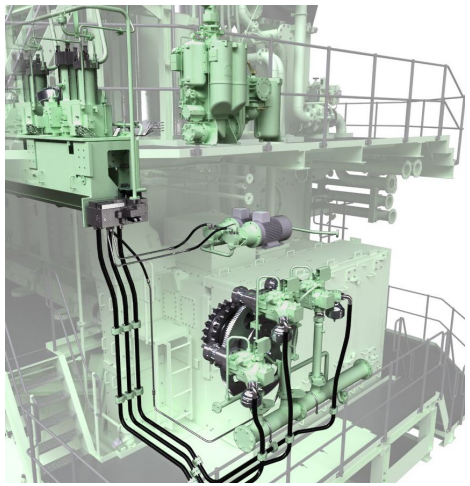
Learning objectives:
- Hydraulic diagram and components
- HCU work safety
- Accumulator maintenance
- Cylinder lubricator principle
- Cylinder lubrication principle
- Cylinder oil feed rate adjustment
- Pipeline design

On completion of this lesson, participants will understand the purpose of each component on the hydraulic cylinder unit, cylinder lubricator and cylinder oil feed rate adjustment based on the latest service letter.

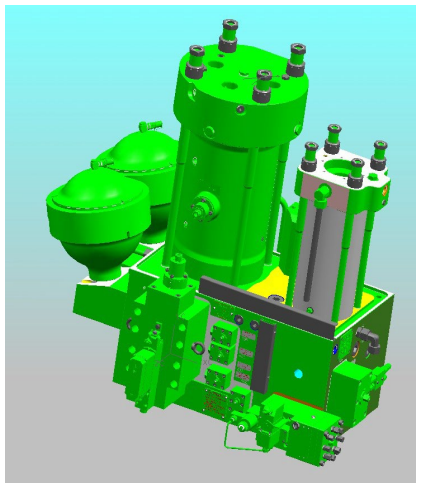


Module 8: Tacho systems

This module describes in detail the crankshaft positioning sensing system (Tacho system), with a description of the MPC and Triton installations.

Learning objectives:
- Tacho system
- Angle encoders
- Angle encoder installation
- Tacho system setup from Engine Management system (EMS)
- Tacho system setup from the MOP

Upon completion of this module, participants will have gained an understanding of the angle encoders, the Tacho system, and the signals for the MPC and Triton installations.



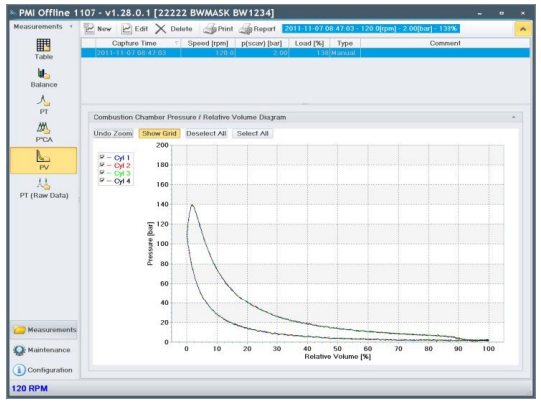
Module 9: PMI, ACCO and EMS systems

This module describes in detail the engine monitoring systems, which are used to measure and monitor the cylinder pressure and display the engine performance. For example, Pmax, Pcomp, Pi and engine power. With these systems, the vessel's crew and management staff can make a monthly engine performance report and plan maintenance accordingly.

Learning objectives:

- Pressure Measuring Instrument (PMI) system configuration
- Performance analysis and balance of the performance on each cylinder of the MOP
- PMI auto-tuning system for automatic adjustment of engine performance
- Computer Controlled Surveillance system (CoCoS) system configuration
- Adaptive Cylinder Control (ACCO) system for automatic adjustment of engine performance.
- Monitoring screens
- Add/remove screens of input and output signals
- Performance report
- Troubleshooting

Upon completion of this lesson, participants will understand the monitoring systems and be able to use their knowledge to analyze the engine performance and balance it using the manual adjustment function and the auto-tuning system on the MOP. In addition, they will be able to carry out maintenance planning and troubleshooting.



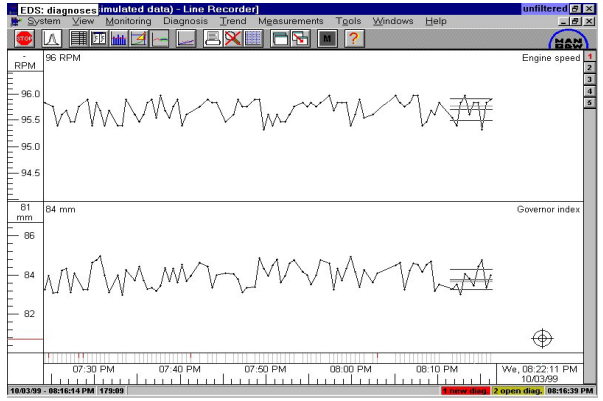
Module 10: Controller change on simulator

This lesson is a practical exercise in changing an MPC in the engine simulator. Participants will replace an MPC by following the guidelines of the instructor. This exercise will enhance the topic of the previous lesson, "ME-C concept", regarding automatic upload of software.

Learning objectives:

- New MPC unit replacement procedure
- Used MPC unit replacement Procedure

Upon completion of this exercise, participants will be able to replace an MPC in the case of it failing during engine operation.



e-Learning modules in eAcademy

Module 11: Intro

The engine in the general overview of the dual-fuel system will be outlined in this chapter including the technical background and the benefits of ME-LGIM dual-fuel engines. Moreover, participants will be made aware of the different types of engines in the market by comparing the different fuel systems.

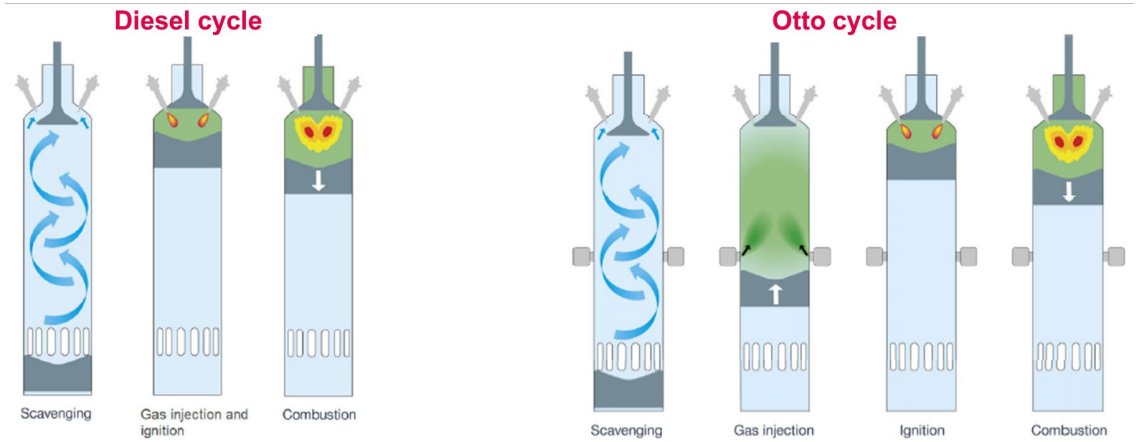
Learning objectives:
- The technical background and benefits of the ME engine
- General specification and quality of methanol fuel
- Operation modes for the ME engine
- Introduction of major dual-fuel injection components and system
- Dual-fuel injection sequence and safety concept

Module 12: Diesel v's Otto

This lesson is detailed description of the Diesel cycle vs Otto principle. The burning process in dual-fuel is a diesel cycle, and the participant will learn the process and why the Diesel solution is the way of a MAN-ES Two Stoke B&W engine.

Learning objectives:
- Working principle
- Fail safe function
- Working principle of Otto engine design
- Adjustment of Pcomp

Upon completion of this course, participants will have gained an understanding of the deal-fuel process and benefits



Module 13: Dual-fuel set up

This lesson is a detailed description of the dual-fuel engine setup systems, which are used to run the engine in dual-fuel mode. With these systems, the vessel's crew and management staff can relate to how the system works together accordingly.

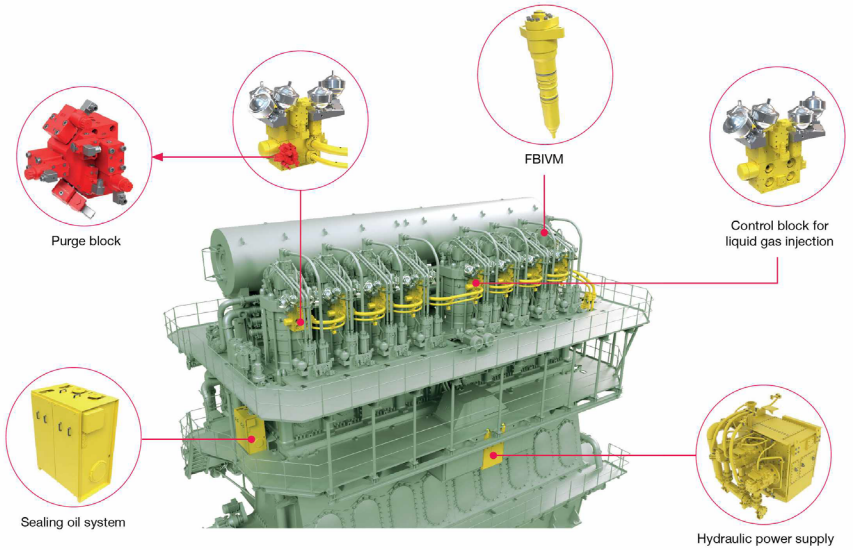
Learning objectives:
- LFSS system configuration
- FVT
- N2

Upon completion of this lesson, participants will understand the dual-fuel setup and how it works together .

Module 14: Dual-fuel MOP simulator

Participants will gain knowledge on how to prepare and operate the methanol mode on the MOP with a real-base dual-fuel engine simulator by practical exercises. Additionally, new MOP pages for dual-fuel operation will be explained for their daily work.

Learning objectives:
- Introduction to new MOP pages for the dual-fuel operation including maintenance pages
- Port to port engine operation on dual-fuel

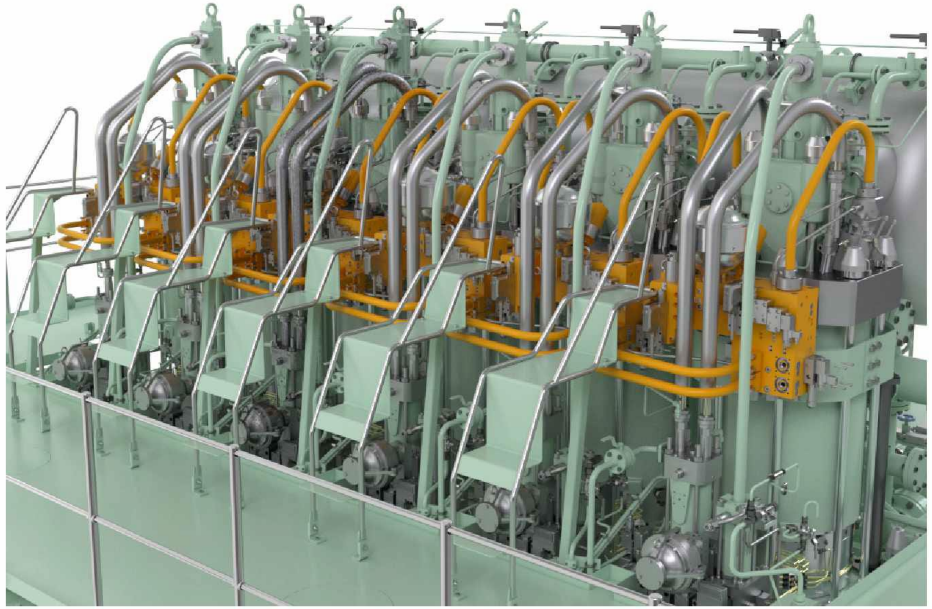


Module 15: Dual-fuel engine simulator operation

Participants will on the simulator learn how to prepare and operate the methanol mode on the MOP with a real-base, dual-fuel engine simulator by practical exercises. Additionally, new MOP pages for dual-fuel operation will be explained for their daily work.

Learning objectives:

- Use the new MOP pages
- Start-up dual-fuel operation
- Port to port engine operation on dual-fuel mode



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