

Fuels Bunkering Simulator

Automated Laboratory
For Hands-On Training

System Overview
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Fuels Bunkering Simulator

Hands-On Training Automated Laboratory

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Overview

The procedures for bunkering vessels are themselves a subject of specialization and certification. The certification of the bunkering surveyor requires knowledge of all procedures, continuous update on relevant regulatory framework and long experience in the field.

This document describes an automated laboratory system intended for training and certification of new surveyors in vessels bunkering. To this end the integrated laboratory system is able to simulate the entire bunkering process, including specific conditions, and often unforeseen situations that arise during the long tenure of younger junior executives in the field.

As a result, by applying this laboratory system, faster, better and lower cost education is delivered. At the same time this simulator is assisting in building-up the necessary experience, while transparent and merit-based evaluation is possible for the student to conduct ship bunkering.

Introduction

The primary aim

This document describes an automated laboratory system intended for training and certification of new bunkering surveyors. It provides for the establishment of a Bunkering Simulator for Education purposes, as well as an associated Lube and Oil Lab.

By applying this laboratory system, faster, better and lower cost education can be delivered. At the same time this simulator is assisting in building-up the necessary experience, while transparent and merit-based evaluation is possible for the student to conduct ship bunkering.

The Educational Mission

Through lab and simulator, the students are practicing the complete vessels bunkering process, in accordance with international standards and certified processes. Upon successful completion of the training programs the students meet the certification requirements as bunkering surveyors.

Educational Framework Description

The Laboratory provides the opportunity of in-depth theoretical and practical training of trainees in the following items:

1. Fundamentals of bunkering ships within the internationally accepted standards, regulations and rules
2. The institutional and legal framework with particular reference to EU
3. The role of Marine Bunkering Surveyor
4. Basic knowledge of fuels and lubricants for ships
5. Necessary equipment for Bunkering Ships
6. Procedures and practices for safety and environmental protection

7. Preliminary procedures (before commencement of bunkering)
8. The process of bunkering vessels
9. Procedures following the bunkering
10. Fuel Sampling
11. Certification of delivery (by quantity and quality)
12. Handling complaints doubts / reservation and reporting

Description of the Simulator System

The Structure

The "system" will cover two "dimensions" in dealing with fuels and lubricants to ships. These are:

- • the "**quantitative**" dimension and
- • The "**qualitative**" dimension

The "**quantitative**" dimension refers to the proper and in accordance with the international standard procedures, handling of ship bunkering, particularly in points 6 to 12 in the previous section "Educational Framework Description". The "System" addresses this particular dimension with the "**Ship Bunkering Simulator**".

The "**qualitative**" dimension covers all matters relevant to the qualitative composition of fuels and lubricants, as constituents, compliance with standards, identification of unwanted elements and composition. Especially in the case of lubricants may be given the symptoms "diagnostic" interpretation, i.e. the primary causes. The later is in the context of the "**Lube and Oil Laboratory**".

Where to Install the System

The "system" involves the establishment of laboratories in an autonomous and open space where the equipment is installed and conducted the laboratory workshops.

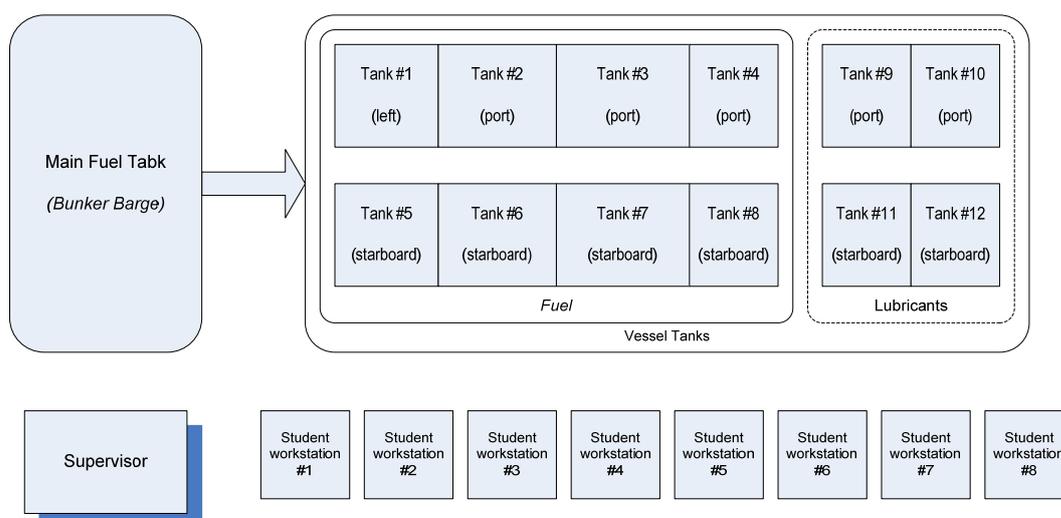
Part I : Bunkering Simulator

Overview of system components

As mentioned above, this part of the "SYSTEM" is intended to simulate the process of ship bunkering.

It is designed to enable:

- As far as possible faithful simulation
- Training of many students
- Supervision by a representative of the faculty
- Automated processes with supervisor remote control, using the central computer terminal



As shown schematically above, this part of the "SYSTEM" includes:

- A "large" reservoir of four (4) metric tons, which in the simulation represents the bunker barge.
- Eight (8) "small" tanks, as shown in the schematic diagram, which simulate the fuel tanks of the receiving vessel. Their overall capacity is 2.4 metric tons.
- Four (4) "small" tanks as shown in the schematic diagram, which simulate the lubricant tanks. Their total capacity is 1.2 metric tons.
- One (1) supervisor workstation, equipped with computer stations interconnected to the central computer system responsible for the simulation monitoring and control (referred to below as "KYSDEP")
- Eight (8) trainee stations, each one equipped with workstation PCs interconnected in KYSDEP. From this position, the trainee performs the bunkering procedure by remote control. Simultaneously KYSDEP monitors and "scores" the actions of the trainee. Sometimes, if the student tries to make inconsistent or other inappropriate actions, prevents him from executing them, while "scores" the performance respectively.
- The KYSDEP central system is an integrated system including all subsystems necessary for processing, storage, communications, control (PLC, etc.) and appropriate software.
- Other necessary computer equipment (workstations interface with the local network of the faculty and the Internet, and anything else necessary for the operation of the "SYSTEM")
- Wiring and institutions that enable remote control and simulation monitoring

Bunkering Process

Before the commencing the educational process of bunkering simulation, the supervisor has the opportunity to prepare for simulated "conditions", creating a new scenario, which will may differ for each trainee, or use and modify an existing one.

Simulation Scenario Parameters

The main parameters of the simulation scenario are as follows:

- The total quantity to be delivered
- The specification of the fuel (or oil)
- The bunkering estimated time duration
- The tank initial fuel / Oil contents

Fuel Bunkering process simulation

While the tanks in the "SYSTEM" provide smaller capacities in comparison to the real life situation, however the KYSDEP simulates and presents on the "workstations" a simulated (virtual) reality.

The fuel is substituted in the bunkering simulator with a different fluid, which is appropriately selected by the manufacturer of the "SYSTEM" to:

- Reduce the risk management of real fuel
- Simplify the handling devices (pumps, valves, tanks, vents, etc.)
- Maximize the mean time between failures and scheduled maintenance period of these devices

The "supervisor" is running the simulation "scenario" of bunkering process, signaling the start of each successive trainee. All the necessary handling and monitoring during the bunkering process is possible from the trainee workstations through KYSDEP.

Each student, following the "supervisor" start signal, performs a sequence of actions to successfully complete Bunkering of the ship which is being simulated. Most of the necessary actions and for handling the bunkering process are possible to be controlled remotely from the trainee workstation through the KYSDEP system. The exception is the standard process of

taking a representative sample of fuel through the Drip Sampler which is integrated by design in the "SYSTEM"

Oil Bunkering

Similarly to the previous section, the system is simulating the lube bunkering. For this purpose, it is provided a similar "scenario", which runs by the trainee.

Part II : Lube and Oil Laboratory

The Lube and Oil Laboratory is an integral part of the overall 'SYSTEM'. It is fully equipped in accordance with international standards of "quality" to analyze fuel and lubricants, in order to ascertain compliance with the established standards. Where discrepancies, the lab quantifies accurately the relative magnitudes, and especially in lube oils the lab has the ability of "diagnostic interpretation" of the primary causes.

Lube and Oil Constituents

The laboratory allows the complete and detailed analysis of the constituents and other elements of marine fuels (heavy fuel oil) and lubricants, while it is adapted to the appropriate educational environment.

For this purpose it is equipped with a fuel tank capacity of one (1) metric ton, with all necessary supporting equipment to allow for proper and quality educational process, to a group of trainees. Each trainee will perform a series of necessary procedures for analyzing fuels and lubricants.

The "supervisor" will be able to define and create the "initial conditions" of fuel quality or lubricant condition before each student starts the process of sampling and analysis.

Laboratory Analytical Capabilities

Fuel

- Viscosity
- Density
- Water content
- Insoluble
- CAll
- Flash Point

Other tests:

- Test for pump ability
- Test for blending Fuels in different temperatures
- Test for injection Temperature
- Calibration of Viscosity
- Calibration of calorific value

Lube

- Water in Oil
- Insolubles
- TBN
- TAN
- Viscosity
- Water content quality (fresh, brackish, salt)
- Iron Ions content lubrication results

Fuels Bunkering Simulator

Hands-On Training Automated Laboratory

Water (on-board)

- Potable
 - Chlorine Levels
 - Bacteria Testing
- Boiler and Cooling Water
- Sewage



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