

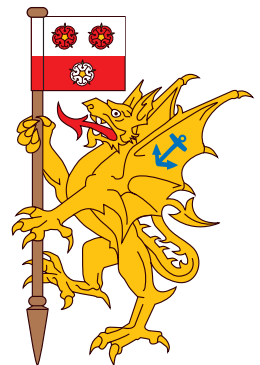
INTERTANKO

Tanker Officer Training Standards (TOTS)

4E Crude Oil Tanker Simulator Training Course



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INTERTANKO

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4E Crude Oil Tanker Simulator Training Course

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Tanker Officer Training Standards (TOTS)

4E Crude Oil Tanker Simulator Training Course

Prerequisites

It is intended that by the time candidates are given this tanker simulator training, they have experienced sea time on similar tankers and have taken part in the similar exercises simulated here. This encounter with simulated exercises should not be their first experience of such operations.

It is intended that the simulator used for this training will enable demonstration of the following competencies:

TOTS Reference

TOTS 4E

Competence

Training in crude oil tanker operations

STCW 95 Reference

Table A-II/1.9

Competence

Monitor the loading, stowage, securing, care during the voyage and unloading of cargoes.

Table A-II/3.6

Table A-II/3.8

Table A-III/1.11

Maintain seaworthiness of the ship.

Table A-II/2.11

Plan and ensure safe loading, stowage, securing, care during voyage and unloading of cargoes.

Table A-II/12.2

Table A-II/2.13

Table A-III/12.12

Carriage of dangerous cargoes.

Control trim, stability and stress

Table A-II/2.14

Table A-III/2.13

Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the marine environment.

Section A-V/1.19

Section A-V/1.21

Ship operations (oil tanker)

Emergency operations (oil tanker)

For instructor, supervisor and assessor qualifications see STCW 95 Regulation I/6, Section A-I/6 paragraph 3 and A-I/12 paragraphs 6 to 9.

Physical Realism

The simulator used should fulfil the following minimum requirements:

- It will simulate a typical cargo handling system found on a chemical tanker based on real operational vessels.
- The equipment is arranged in a ship like manner.

The simulator includes the following components and subsystems:

- Cargo control system
- Ballast control system
- Tank cleaning system
- Crude Oil Washing system
- Overboard discharge and monitoring systems
- Tank content monitoring systems
- Inert / venting control system including, gas freeing, purging and aerating
- Tank atmosphere control system
- Alarm system
- Communication system
- Cargo pumping system
- A system for communicating with 'the outside world'
- A stability and stress calculator.

Additional resources: Ship/shore check list
Crude Oil Washing checklist
Cargo Oil Record Book extracts
Log sheets

Behavioural Realism

IMO Model Course 1.04 Part D Appendix 9

The simulator model replicates the dynamic behaviour of the cargo handling system and its parameters. Furthermore, the simulator model simulates the components, their processes and control systems. It will be possible to introduce failures, breakdowns and wear to all equipment simulated.

Operating Environment

IMO Model Course 1.04 Part D Appendix 9

The simulator will simulate restrictions and failures in the cargo transfer, for instance, introduced by the simulated shore terminal. Alarms will be announced by flashing alarm lamps and sound in the 'cargo control room'.

Simulator Facility

These exercises have been written taking into account the variety of simulators which may be used to facilitate them. As few specific features as possible have been featured, so as to increase the adaptability of the exercises to the various simulators available.

The tanker in this package is double hulled, has 6 pairs of wing tanks and a pair of slop tanks. There are 3 manifolds, 4 cargo pumps and 2 ballast pumps. The ballast tank arrangement has not been specified and neither has the venting system. It is assumed the tanker has a cargo pump room and associated network of lines.

It is suggested that the individual training facilities select two grades of crude oil to illustrate how specific physical or chemical properties may influence the handling and carriage of crude oil.

However, the simulator should have its own Cargo Operations Manual which will be used during the training.

Simulator Exercises

- Exercise 1.** Ship and simulator familiarisation
- Exercise 2.** Start inert gas plant and commence primary inerting
- Exercise 3.** Completion of primary inerting by dilution
- Exercise 4.** Completion of primary inerting by displacement
- Exercise 5.** Cargo planning prior to loading a two grade cargo of crude oil
- Exercise 6.** Commence loading
- Exercise 7.** Complete loading
- Exercise 8.** Loaded passage
- Exercise 9.** Commence discharge
- Exercise 10.** Crude Oil Wash 4 P & S heavy weather ballast tanks
- Exercise 11.** Start taking heavy weather ballast
- Exercise 12.** Complete discharge
- Exercise 13.** Water wash 1 S cargo tank
- Exercise 14.** Purge and gas free 1 S cargo tank for entry
- Exercise 15.** Decanting slops after water washing and ballasting

Appendix I Cargo Stowage Plan

Exercise Descriptions

What follows by way of exercise descriptions has been written in the form of students' objectives. In order to prevent multiple duplication, the notes may also form guidance for instructors.

EXERCISE 1

Simulator and Ship Familiarisation

Objective

The purpose of this exercise is to help you become familiar with the operation of the simulator and the cargo system. At the same time, you will undertake the necessary tests to ensure the Inert Gas Generator is fully operational, finish ballasting the forepeak and test the operation of a cargo pump.

Information

The vessel has just departed from drydock, so the cargo system is gas free and will need inerting. All bunkers, fresh water and ballast are as per the normal ballast condition, other than the forepeak ballast tank, which needs topping up.

Note: it is appreciated that not all liquid cargo simulators will have exactly the same functions incorporated. The following are suggestions of systems that need familiarisation:

1. Check the various display pages of the simulator and familiarise yourself with the information shown. Where is the EMERGENCY SHUTDOWN button?
2. Change pages and operate valves.
3. Find the pages dealing with the BALLAST SYSTEM.
4. It is suggested that a short ballasting operation takes place during this familiarisation exercise. Perhaps one ballast space could be topped up. This operation will provide a good opportunity for best practice of pump and line operation to be observed.
5. Familiarise yourself with the ALARM PANEL page.
6. Familiarise yourself with the GAS DETECTION facility.
7. While the vessel has been in drydock, many parts of the inert gas plant have been opened up for repair and maintenance. The boilers have already been flashed up and the next tasks are to restore the IG System to safety, start up the plant and test its interlocks and shutdowns prior to use. This operation also provides a good opportunity to test the communications systems with the engine room.
8. Depending on the simulator being used, the various parts of the INERT GAS SYSTEM can be checked; therefore the student will be expected to:
 - Monitor oxygen content and alarms
 - Initiate water supply to plant
 - Demonstrate gas line up
 - Demonstrate starting of the blower
 - Take appropriate action in the event of high oxygen content
 - Move and lubricate non return valve before starting IG plant
 - Ensure instrument / control air lines are drained before start
 - Ensure flue gas valves have been cleaned before operation
 - Start IG generator
 - Identify problems and take appropriate corrective action
9. As well as the fixed gas detecting system, do not forget the standard practice of utilising portable gas detectors, where required.
10. Start the Inert Gas System as per the operating manual and check the AUTOMATIC SHUTDOWN facility.
11. Do not forget to monitor the ballasting of the tank being worked.
12. In order to familiarise yourself with the cargo system, it is suggested to water flush the cargo line system. Sea water can be taken from a sea suction and deposited in a slop tank. When appropriate, the flush can continue by re-circulating sea water from the chosen slop tank. Test the eductors, whilst executing this operation.

13. Whilst sending sea water around the cargo system, take the opportunity to test the steam system by heating the water.

EXERCISE 2

Start inert gas plant and commence primary inerting

Objective

The purpose of this exercise is to produce and execute an operational procedure for starting the IG plant from a normal shut down condition, and then to commence primary inerting of the cargo tanks including residue and slop tanks using EITHER a dilution OR displacement method.

Information

1. On this vessel, primary inerting can be achieved by using either the dilution (mixing) method, or the displacement (layer) method.
2. Inert gas can be vented from the cargo tanks via either the IG inlets to the mast riser, the cargo lines, purge pipes, or the short stand pipes on deck, the latter two options being activated by inserting the appropriate spool pieces.
3. Note the P/V valve pressure and vacuum setting on your simulator model. Note also the IG blower capacities.
4. The vessel has just left drydock and is on passage to the loading port. Note the forward and aft draft of the vessel. The first loading port is five days steaming away.
5. The sea and air temperatures should be noted and any major contrast considered.
6. All portable instruments have been checked and calibrated.
7. The IG system is set for safety, i.e. the water pump serving the scrubber seal and deck seal is ON. In addition, the scrubber cooling water pump has been switched ON and the scrubber tower has been flushed for at least fifteen minutes. All other tests and checks on the plant have been completed.

Competence Requirements

1. Identify and describe an understanding of the two methods of primary inerting, dilution or displacement.
2. Identify the relative density of the gases involved in the inerting operation.
3. If dilution method is chosen, state how many tanks will initially be opened and the expected duration of the operation.
4. If displacement is chosen, state the minimum number of tanks to be inerted at any one time.
5. State whether the main Gas Regulating Valve should be used in AUTO or MANUAL for this operation.
6. Identify and apply appropriate monitoring requirements during the inerting procedure.
7. State what checks on the system will be made during this operation.
8. State the maximum permitted oxygen concentration in the inert gas being delivered to the cargo system.
9. State the maximum permitted oxygen concentration in the inert gas inside the individual cargo tanks in order for the tank to be considered inert.
10. State a typical chemical composition of inert gas from a boiler uptake.
11. Identify appropriate sampling positions in tanks for use with portable gas analysing equipment.
12. Identify appropriate pressures to which the gas main may be raised.
13. State the hazards of inerting after an inert gas plant breakdown.

EXERCISE 3

Completion of primary inerting by dilution

Objective

The purpose of this exercise is to complete the primary inerting of the cargo and slop tanks using the dilution method. A cargo tank oxygen level reading log should be maintained. Upon completion of the operation, the system should be pressurised and the IG system shut down in a safe manner.

Information

1. The IG system is in operation with one blower and the Gas Regulating Valve in 'manual' mode.
2. The last set of cargo tanks, 6P and 6S, are currently being inerted, in via the deck distribution system and out via the stand pipes. All other tanks except the slop tanks have been completed but not checked or pressurised and are currently isolated from the IG system.
3. Check your company's Inert Gas Operating Manual;
What is the maximum oxygen content permitted in the cargo tanks prior to loading cargo?
Ensure the oxygen readings taken are recorded.
Establish the minimum permitted pressure on the inerted system under all conditions of operation.
4. Assess the list of readings (appended) supplied by an experienced and reliable member of the deck watch. These readings were taken in the last hour.
5. All portable gas detecting instruments have been checked and calibrated.
6. The vessel is now within 72 hours of the load port.

Competence Requirements

1. State what conditions have to be satisfied before primary inerting has been completed successfully.
2. State what will be the final status of the inert gas plant and distribution system.
3. State what checks will be made on the system after final shut down.
4. Shut down the inert gas plant upon completion of the operation.
 - Describe a safely shut down plant
 - Shut down the plant
 - Water flush the flue gas scrubber
 - Flush the overboard valves and lines
 - Describe post shut down maintenance
 - Describe blower flushing and internal inspection
 - Set the plant for safety
 - Ensure the water supply is running and the alarms are in order

- Incorporate the routine testing of interlocks during shut down.

OXYGEN READING REPORT

Slop P	Top	20.81%	Slop S	Top	20.81%
	Middle	20.81%		Middle	20.81%
	Bottom	20.81%		Bottom	20.81%
6S	Top	6.51%	6P	Top	6.36%
	Middle	6.49%		Middle	6.38%
	Bottom	6.52%		Bottom	6.41%
5S	Top	4.61%	5P	Top	4.61%
	Middle	4.59%		Middle	4.66%
	Bottom	4.60%		Bottom	4.59%
4S	Top	4.83%	4P	Top	4.85%
	Middle	4.81%		Middle	4.83%
	Bottom	4.79%		Bottom	4.82%
3S	Top	4.63%	3P	Top	4.64%
	Middle	4.60%		Middle	4.63%
	Bottom	4.62%		Bottom	4.64%
2S	Top	4.66%	2P	Top	4.68%
	Middle	6.44%		Middle	4.66%
	Bottom	4.61%		Bottom	4.67%
1S	Top	4.12%	1P	Top	5.27%
	Middle	4.09%		Middle	5.24%
	Bottom	4.11%		Bottom	5.25%

EXERCISE 4

Completion of primary inerting by displacement

Objective

The purpose of this exercise is to complete the primary inerting of the cargo and slop tanks using the displacement method. A cargo tank oxygen level reading log should be maintained. Upon completion of the operation, the system should be pressurised and the IG system shut down in a safe manner.

Information

1. The IG system is in operation with one blower and the Gas Regulation Valve in 'manual' mode.
2. The last set of tanks 2P, 2S, 3P, 3S, 5P and 5S are currently being inerted, in via the bottom cargo lines and out via the deck stand pipes. All other tanks have been completed but not checked or pressurised and are currently isolated from the IG system.
3. Check your company's Inert Gas Operating Manual;
What is the maximum oxygen content permitted in the cargo tanks prior to loading cargo?
Ensure the oxygen readings taken are recorded.
Establish the minimum permitted pressure on the inerted system under all conditions of operation.
4. Assess the list of readings (appended) supplied by an experienced and reliable member of the deck watch. These readings were taken in the last hour.
5. All portable gas detecting instruments have been checked and calibrated.
6. The vessel is now within 72 hours of the load port.

Competence Requirements

1. State what conditions have to be satisfied before primary inerting has been completed successfully.
2. State what will be the final status of the inert gas plant and distribution system.
3. State what checks will be made on the system after final shut down.
4. Shut down the inert gas plant upon completion of the operation.
 - Describe a safely shut down plant
 - Shut down the plant
 - Water flush the flue gas scrubber
 - Flush the overboard valves and lines
 - Describe post shut down maintenance
 - Describe blower flushing and internal inspection
 - Set the plant for safety
 - Ensure the water supply is running and the alarms are in order

- Incorporate the routine testing of interlocks during shut down.

OXYGEN READING REPORT

Slop P	Top	2.95%	Slop S	Top	3.05%
	Middle	2.94%		Middle	3.06%
	Bottom	2.96%		Bottom	3.05%
6S	Top	2.91%	6P	Top	2.91%
	Middle	2.90%		Middle	2.91%
	Bottom	2.91%		Bottom	2.89%
5S	Top	20.78%	5P	Top	20.78%
	Middle	2.91%		Middle	2.92%
	Bottom	2.92%		Bottom	2.91%
4S	Top	20.81%	4P	Top	2.91%
	Middle	2.90%		Middle	2.90%
	Bottom	2.91%		Bottom	2.91%
3S	Top	20.78%	3P	Top	20.78%
	Middle	2.93%		Middle	2.94%
	Bottom	2.92%		Bottom	2.94%
2S	Top	20.79%	2P	Top	20.78%
	Middle	2.92%		Middle	2.92%
	Bottom	2.91%		Bottom	2.91%
1S	Top	2.91%	1P	Top	2.91%
	Middle	2.90%		Middle	2.92%

	Bottom	2.89%		Bottom	2.91%
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EXERCISE 5

Cargo planning prior to loading a cargo of crude oil

Objective

To prepare a cargo plan and operational procedure, including all safety and pollution prevention precautions, for the loading of two grades of crude oil.

Information

1. The following information has been received regarding the cargo to be loaded:

- Vessel is to load two grades of crude oil
- Grade 1: Note API
 Temperature
 Quantity

To be loaded into tanks 1 P & S, 3 P & S, 4 P & S, 6 P & S and the port slop tank. This is the first grade to be loaded through the aft manifold.

- Grade 2: Note API
 Temperature
 Quantity

To be loaded into tanks 2 P & S, 5 P & S and the starboard slop tank, through the forward two manifolds.

2. It is suggested a draft limitation is imposed in this exercise.
3. Both grades are to be loaded concurrently
4. Note the maximum loading rate provided by the shore in relation to the vessel's own loading capability. Check the individual tank venting capabilities.
5. The distribution and quantities of ballast, fresh water, fuel and stores on arrival at the outer anchorage are as in the 'Normal Load Condition'.
6. Before berthing, bunkers will be taken in the outer anchorage. Note how this will affect the arrival draft, stresses and stability.

Competence Requirements

1. Plan the status of the IG system and tank venting system during this operation.
2. Refer to the vessel cargo operations manual for details of tank grouping and suggested line up.
3. Ensure that vessel stability and hull stresses are within safe limits at all times during the operation.
4. Refer to the Cargo Operations Manual for specific cargo handling information and warning regarding the effects of free surface.
5. Read Exercises 6 and 7. Note which will be the completing grade.
6. In order to create a finish loading exercise specific to your loading plan, it is likely a unique exercise will be required to be programmed into your simulator. In order to create this, depending on the simulator in use, you may also supply the following information;
 - Final loaded condition of each tank as a percentage full.

- The condition of the last 4 pairs of wing tanks to be topped off before finishing loading. This should also be supplied as the tank percentage full. Note that you are required to top off all of the last 4 pairs of wing tanks in the “Complete Loading” exercise (6).
- 7.** State in the plan how the following loading issues may be monitored;
- Cargo loading rates
 - Starting procedure
 - Venting
 - Monitoring full and empty tanks
 - Location and readiness of safety equipment
 - Location and readiness of pollution equipment
 - Shut down procedures, both routine and emergency
 - Deballasting
 - Pumproom segregation
 - Line up
 - Topping off

8. The plan should also be flexible in case of a change in loading sequence.

EXERCISE 6

Commence Loading

Objective

To execute an operational procedure, including all safety and pollution prevention precautions, for the start loading of two grades of crude oil.

Information

1. The vessel is berthed port side alongside.
2. All manifolds have been connected.
3. All local and terminal regulations are being complied with, and the ship/shore safety checklist as per Appendix A of ISGOTT has been completed.
4. The oxygen content within all the tanks has been checked and found to be less than 8% as required by the terminal.
5. The inert gas system is shutdown and set for safety.

Competence Requirements

1. Start load procedure. Do not open manifold valves until the agreement of the jetty operator has been obtained.
2. Limit the number of tanks to be loaded to one line one tank.
3. Establish a low initial loading rate.
4. Check offshore and isolated manifolds.
5. Communicate with deck staff to ensure safety and pollution checks are being maintained.
6. State when the deballasting operation should start and check:
 - Cleanliness of the surface of the water being discharged
 - Cleanliness of harbour water overboard having started deballasting
 - Deballast through appropriate sea valve
7. Prepare and uses an action plan to deal with the possibility of:
 - Stuck valves
 - Leaking valves
 - Communication failure
 - Gauge failure
8. Describe how the following stability issues may be monitored:
 - Longitudinal
 - Transverse
 - Free Surface
 - Hull stresses
 - Bending moments and sheer forces
9. During bulk loading monitor: loading rate stresses
10. Adjust cargo flow for trim and list purposes.

11. Monitor moorings and maintain security.

EXERCISE 7

Complete Loading

Objective

To execute an operational procedure, including all safety and pollution prevention precautions, for the completion of loading two grades of crude oil.

Information

1. The vessel is berthed port side alongside.
2. All manifolds have been connected.
3. Deballasting is almost completed, ballast tanks 5 and 6 remain to be finished.
4. The vessel is currently loading crude oil Grade 2 through both of the two forward manifolds, the first grade having been topped off and the aft manifold closed on completion.
5. The vessel is currently loading at the maximum bulk loading rate. Consider the loading rate appropriate or topping off tanks and the notice the terminal requires to reduce the rate.
6. Ship's manifold valves should remain in the open position until shore has agreed that they may be closed.
7. The emergency stop procedure has been agreed as follows:
 - The jetty should be contacted by radio.
 - Jetty operator will then take appropriate action to stop the cargo as quickly as possible.
 - The vessel will be informed when it is safe to close the manifold valves.

Competence Requirements

1. Careful checks on the operation should be maintained at all times including manifold pressures, flow rates and tank ullages.
2. State which topping off procedure is to be used.
3. Shut the tanks in a predetermined sequence.
4. Adjust flow rates to avoid creating an excessive manifold pressure.
5. Monitor completed tanks for a steady ullage.
6. Confirm the completion procedures with the terminal.
7. Carry out line draining to avoid the pressure of trapped cargo.
8. Drain the manifold in such a way as to avoid spills.

EXERCISE 8

Loaded passage

Objective

Minimise losses due to evaporation as far as practicable. Monitor cargo containment.

Information

1. Discuss tank pressure management and a reduction in VOC losses, especially the benefits in reducing these losses.
2. No vapour segregation is required, a common main may be used.
3. No cargo heating is required.

Competence Requirements

1. Cargo tank ullages still need monitoring during the loaded passage as well as ballast spaces for any hydrocarbon leakage.
2. State which vessel stress and stability is to be monitored during this exercise.
3. Prior to arrival at the discharge port, a checklist needs to be completed.
4. State how the pressure and vacuum settings on the venting systems will affect this issue.
5. Monitor the cargo tank pressure and top up with inert gas if necessary.
6. In the event of cargo leakage into a ballast space, activate appropriate action plan and reporting procedure.

Discharge Pattern

To discharge Grade 1 Crude Oil from 1 P & S, 3 P & S, 4 P & S, 6 P & S and the port slop tank and Grade 2 Crude Oil from 2 P & S, 5 P & S and the starboard slop tank,

Tanks to Crude Oil Wash this voyage are 2 p & s, 4 p & s, 6 p & s. Top washing to be started when the stated ullage is reached in these tanks, as per the Cargo Operations Manual.

Extreme weather conditions prevail outside the discharge port and one pair of cargo tanks will be ballasted for safety purposes.

1. All tanks to be debottomed by 1 metre. Both grades to be debottomed at the same time but kept segregated.
2. Both grades to be kept segregated to the extent possible, and discharged consecutively, the Grade 1 parcel first.
3. Grade 1 Crude to be discharged using two main cargo pumps.
4. To assist vapour management while taking heavy weather ballast, number 3 p & s cargo tanks will be held at approximately half full until 1 P & S, 3 P & S, 4 P & S, 6 P & S have been discharged and are ready for COW.
5. During discharge of Grade 1 crude, a pre-prepared ballasting plan should be followed. Decide which pair of wing ballast tanks will be required for trim and list adjustment.
6. When COW is completed, heavy weather water ballast is to be pumped into 4 p & s cargo tanks.
7. Grade 2 Crude Oil bulk to be discharged with one main cargo pump.
8. During discharge of Grade 2 Crude Oil, continue the ballast plan.
9. During discharge of Grade 2 Crude Oil, COW no. 2 p & s cargo tanks using the starboard slop tank as source of COW and eductor drive liquid.

10. On completion of discharge, all cargo is to be thoroughly drained from pipelines and pumps and sent ashore.

EXERCISE 9

Commence discharge

Objectives

To plan and execute an operational procedure, including all safety and pollution prevention precautions, for the start of discharge of a cargo of crude oil.

Information

1. The vessel's discharge plan has been discussed and agreed with the terminal:
 - All tanks except slop tanks to be de-bottomed by at least 1 metre
 - All Grade 1 Crude to be discharged first followed by Grade 2.
2. A ship/shore safety checklist has also been completed.
3. The vessel is port side alongside, and has all three manifolds connected.
4. The inert gas plant has been tested before arrival and no defects found. It is currently set for safety. All cargo tanks have been tested for oxygen content and found to be satisfactory.
5. The main cargo pumps have been warming through for the last hour.
6. De-bottoming of both grades to be done simultaneously, but the grades must be kept segregated.
7. Start discharge of each grade at a slow rate and obtain the agreement of the Jetty Operator before increasing to maximum rate. Do not start discharge of the second grade bottoms until the first grade is being discharged at maximum rate.
8. As soon as discharge is progressing smoothly, start ballasting and inform the Jetty Operator of the start time.

Competence Requirements

1. State and prepare the line set-up prior to commencing discharge.
2. State and prepare the operational status of the IG plant.
3. Refer to the Cargo Operations Manual for specific cargo pump and cargo discharge information.
4. Prepare the cargo pumps for operation.
5. Monitor the pump running conditions with reference to:
 - Suction and discharge pressures
 - Cargo tank level
 - Manifold flow
6. Balance pump speeds for common discharge when in parallel.
7. Monitor and control suction and discharge pressures.
8. Commence the discharge in line with best practice:
 - Fill the line and pump gradually
 - Ensure the pumproom is manned
 - Limit the number of tanks open at one time
 - Start the pump on slow speed and accepts hand over from the engineer
 - Open the manifold with terminal agreement
 - Direct the deck watch to carry out safety and counter pollution monitoring
 - Monitor active and closed cargo tank levels.
9. Continue to monitor longitudinal and transverse stability.

10. Continue to monitor draft, list and trim.

EXERCISE 10

Crude Oil Wash 4 P & S the heavy weather ballast tanks

Objective

To execute an operational procedure to bottom crude oil wash both of No. 4 port and starboard cargo tanks.

Information

1. The vessel is port side alongside, with all three manifolds connected.
2. All cargo tanks have been de-bottomed by a minimum of 1 metre and the port slop tank has been recharged with "dry" crude. The COW top wash was completed when the tank innage corresponded with the Operations Manual.
3. Bulk discharge of the Grade 1 Crude cargo in 1, 4 and 6 p & s has been completed and a few centimetres remain.
4. One main cargo pump is discharging Grade 2 Crude from 3 p & s cargo tanks.
5. The ballast plan is being followed.
6. The inert gas distribution system is common on deck and the plant is in operation, with the gas regulating valve set to automatic.

Competence Requirements

1. State the prerequisites for Crude Oil Washing as fixed washing machines and an inert atmosphere.
2. Describes machine types and wash patterns, such as:
 - Single nozzle programmable
 - Fitted with fixed drive unit
 - Using portable drive unit
 - Non-programmable (or pre-programmed) double nozzle
3. Describe and demonstrate settings of programmable machines for:
 - Wash angle
 - Pitch
 - RPM
4. Describe the preparations for COW and employs relevant checklist:
 - Pipeline test to operating pressure
 - Oxygen analyser calibration
 - Blank hydrants which may have been used for water washing
 - Ensure pollution control procedures in place
 - Discharge the bottom one metre of crude to be used as a source for COW to reduce static generation
 - Confirm isolation of the tank cleaning heater
5. Be familiar with the contents of the Operations & Equipment Manual.
6. Uses the appropriate wash programme.

7. Control the line pressure when starting COW and when changing tanks.
8. Take oxygen readings in the tank prior to washing to verify oxygen content of less than 8% by volume.
9. Provide drive for COW:
 - COW pump
 - Bleed off any discharge
 - Cargo pump taken out of discharge
10. Keep bottom of tank oil free towards the end of COW by controlling stripping with:
 - Eductor (state capacity and drive fluid requirements)
 - Stripping pump (state capacity and required strokes per minute)
 - Stern trim complying with minimum required
11. State that the capacity of the stripping arrangements is related to throughput of the COW machines (1.25)
12. Adjust washing machine nozzle angles as necessary.
13. Monitor tank pressure to prevent vapour emissions on start of washing and ensure that the pressure is always positive.
14. State the abort conditions for COW as:
 - Oxygen level in the inert gas being delivered exceeds 8% by volume.

- The pressure of the atmosphere in the tanks is no longer positive.

EXERCISE 11

Start taking heavy weather ballast

Objective

To drain the heavy weather ballast tanks and pipelines of oil and to start filling the tanks with seawater.

Information

1. Discharge of the Grade 1 parcel of crude is nearing completion and crude oil washing of the heavy weather ballast tanks has been completed.
2. The main cargo pumps are running as follows:
 - Port slop tank is being discharged one main cargo pump
 - No. 3 p & s cargo tanks being discharged with another main cargo pump
3. Port ballast pump is ballasting as per plan.
4. The inert gas system is common on deck and the gas regulating valve is set to automatic.

Competence Requirements

1. State the requirements for taking heavy weather ballast in the cargo tanks as:
 - Tank to have been Crude Oil Washed
 - Pipelines used to be drained of oil
 - Pipelines to be flushed into a slop tank
 - Ensure that hydrocarbon vapour is vented through the approved venting system
 - State that when starting to load cargo tank ballast, pumps should be operated in accordance with the ICS/OCIMF publication "Prevention of Oil Spillages Through Cargo Pumphouse Sea valves"
 - State that if a non-inerted tank containing hydrocarbon vapour is to be ballasted, valve operation and filling rate must be controlled to prevent spraying of water which may create an electrostatically charged mist
2. Control inert gas system with regard to:
 - Tank pressure
 - Vapour emissions
 - Vapour balancing - concurrent ballasting and cargo discharge
3. Exercise pollution prevention procedures by controlling:
 - Pump starting at very slow speed
 - Opening sea suction valve
 - Centrifugal pump speed control, avoid trip
 - Consider use of stripping pump to create vacuum
 - Carry out overside check
4. State that other allowable operational exceptions for taking cargo tank ballast in cargo tanks are:
 - passage under a low bridge
 - height of loading connections (and combination carrier hatch coamings) relative to shore systems

- local regulations requiring specific draft for safe navigation
- (exceptions for maintenance reasons are allowed)

EXERCISE 12

Complete discharge

Objectives

To execute an operational procedure to complete the discharge of a cargo of crude oil.

Information

1. The vessel is port side alongside with all three manifolds connected.
2. The discharge is nearing completion, all bulk Grade 1 Crude has been discharged, and a small amount of Grade 2 Crude remains to be discharged. Cargo pumps and lines must be drained (it has been agreed that at the end of bulk discharge, drainings of both grades will be accepted as a mixture).
3. One main cargo pump is discharging the starboard slop tank.
4. The port ballast pump is filling one ballast tank to correct the list.
5. Consider the following advice:

At the appropriate tank sounding the vacuum pump can be started and the auto stripping system activated, depending on the simulator model.

Upon completion of discharge, cargo pipelines must be drained to the shore tanks. This can be achieved in one of two ways:

- a) By dropping the lines to the slop tank and redraining the slop tank to shore via the 'MARPOL Line':
- b) By draining the lines directly to the stripping pump and pumping the drainings ashore via the "MARPOL" Line.

These procedures will depend on the facilities offered by the particular simulator in use.

Competence Requirements

1. Describe the equipment with centrifugal pumps for tank draining as:
 - Automatic self-priming stripping systems (Vac-Strip, Prima Vac)
 - Operates such systems in automatic and in manual modes
 - Describe the optimum tank draining sequence as from for'd to aft
 - State that suction valves are not throttled when using the system
2. Describe the auxiliary tank draining equipment and states the operating requirements for:
 - Eductors
 - Reciprocating pumps
3. Carry out cargo stripping with reference to:
 - Optimum trim and list (if appropriate)
 - Sequence for maximum efficiency (main pump, eductor, reciprocation stripping pump).
4. Monitor the level in tank being drained to ensure the liquid is actually moving. If not, ascertain why and/or move to another tank.
5. Complete cargo discharge:
 - Monitor completed tanks to ensure valves are not leaking
 - Drain cargo deck mains and risers to slop tank or pump
 - Drain residual liquid from centrifugal pump casing
 - Use MARPOL line to send final residues from slop tank and pump room ashore

- Drain manifold connection
 - Manage pressure of inert gas to ensure no venting occurs
6. Prepare and use an action plan to deal with typical problems:
- Tank overflow resulting from:
- Movement of cargo between tanks of differing level
 - Line up error
 - Slop tank overflow during educting
 - Valve leakage or failure
 - Failure of automatic stripping system
 - IG plant failure, either permanent or temporary
 - Bilge level alarm

EXERCISE 13

Water wash 1 S cargo tank

Objective

Plan and execute a routine tank washing and preparation operation, including all safety and pollution prevention precautions. All MARPOL concerns must be addressed and the operation recorded in the Oil Record Book.

Information

1. Having sailed from the discharge port, tank 1 S requires a routine wash and inspection. A routine water wash is all that will be required. At this stage, the slop tanks will not be washed since they will need to contain the residues of tank washings.
2. As per routine safety procedures, the inert gas system must be run during the tank washing programme.
3. Remember to monitor the inert gas quality being delivered to the deck as well as the IG main pressure, to ensure that safety requirements are fulfilled.

Competence Requirements

Tank Washing – With Water

1. State that washing tanks with water is carried out to enable entry and maintenance.
2. State that water washing is carried out with either cold water or hot water heated:
 - By in line heater
 - In a slop tank
3. State that a tanker fitted with an inert gas plant must wash tanks with the atmosphere in the inert condition and that crude tankers smaller than 20,000 dwt without an inert gas plant may wash tanks in the non-inert condition following the most stringent safety procedures.

For Washing in the Inert Condition:

4. Tank atmosphere is tested and controlled to be 8% or less by volume oxygen and positive pressure (as for COW)
 - Recirculated wash water may be used using one or more slop tanks
 - Chemical additives may be used, either injected into the water supply or added in bulk to the cargo or slop tank
5. Fixed washing machines and/or portable machines may be used
6. State that for portable machines:

Spot washing can be accomplished

An electrical continuity test of the hoses is required before use (not to exceed 6 ohm per metre length)

EXERCISE 14

Gas free 1 S cargo tank ready for entry

Objective

Plan and execute the gas freeing of 1 S cargo tank, taking all relevant safety and pollution prevention precautions.

Information

1. Having water washed 1 S cargo tank, company procedures require the tank to be gas freed in order for an entry and routine inspection to take place.
2. Consult the Company Manual so that approved procedures are followed.
3. Set up the inert gas plant to deliver inert gas to 1 S for gas freeing purposes and set up the venting system accordingly.
4. Plan also to gas free the tank in accordance with approved procedures.

Competence Requirements

1. State that for an inerted tank, gas freeing may only take place once purging has been completed
2. State that either the Inert Gas Plant (q.v.), fixed or portable ventilation equipment may be used
3. Describe fixed equipment such as a "Golar Vent" and describes the requirement for isolation from the cargo system when not in use
4. Describe portable equipment as:
 - Water/air/hydraulic/steam operated fans
 - State that when portable equipment is used the tank is to be isolated from the inert gas/vent main
 - State that portable trunking may be used but that flow characteristics of the portable equipment may indicate greater efficiency without
5. Describe with the aid of ISGOTT 11.4 the procedures and safety precautions to be taken when gas freeing with portable equipment

EXERCISE 15

Decanting slops after water washing and ballasting

Objective

Plan and execute the legitimate disposal of slops from the starboard slop tank, including all safety and pollution prevention precautions. All MARPOL concerns must be addressed and the operation recorded in the Oil Record Book.

Information

1. The vessel is now two days from the next load port. Weather conditions have improved considerably and the heavy weather ballast has been discharged, with the oil residues contained in the starboard slop tank.
2. In order to minimise slops on arrival, the remaining residues in the starboard slop tank have to be decanted.
3. Ensure the required components of the line system are in place to enable the starboard slop tank to be discharged, via the Oil Discharge Monitoring Equipment, into the sea.
4. Upon completion of this operation, such components (e.g., spool piece) should be removed as required prior to working the next cargo.

Competence Requirements

1. Describe the requirements for discharge, in compliance with Regulation 34 of Revised Annex I MARPOL 73/78, not in a special area:
 - more than 50 miles from land
 - en route
 - instantaneous rate of oil content discharge not to exceed 30 litres per mile
 - total quantity of oil discharged not to exceed 1/30,000 of the previous cargo
 - Oil Discharge Monitoring & Control system and slop tank in use
 - any residues which cannot be discharged into the sea to be retained on board
2. Describe the appropriate entries to be made in the Oil Record Book Part II - Cargo/ballast operations
3. Decanting of slops remaining from cargo tank water washing operations:
 - Describe and demonstrate the operation of the interface detector
 - Calculate the quantities of oil and water by reference to tank calibration tables
 - State that the heating of slops is a method of reducing the quantity of emulsion at the interface
 - Demonstrate discharge of the "clean" part of the slop tank contents, stop discharge before excess oil is discharged

CARGO STOWAGE PLAN

Slop	6	5	4	3	2	1

	Grade 1 Crude Oil	2 P & S	5 P & S	Slop P
	Grade 2 Crude Oil	1 P & S	3 P & S 6 P & S	4 P & S Slop P



INTERTANKO

INTERTANKO London

St Clare House
30-33 Minories
London EC3N 1DD
United Kingdom

Tel: +44 20 7977 7010
Fax: +44 20 7977 7011
london@intertanko.com

INTERTANKO Oslo

Nedre Vollgate 4
5th floor
PO Box 761 Sentrum
N-0106 Oslo
Norway

Tel: +47 22 12 26 40
Fax: +47 22 12 26 41
oslo@intertanko.com

INTERTANKO Asia

5 Temasek Boulevard,
#12-07 Suntec City Tower
Singapore 038985

Tel: +65 6333 4007
Fax: +65 6333 5004
singapore@intertanko.com

INTERTANKO North America

801 North Quincy Street
Suite 200
Arlington, VA 22203
USA

Tel: +1 703 373 2269
Fax: +1 703 841 0389
washington@intertanko.com