OCEAN Technologies Group

# Advanced Oil Tanker
## Workbook

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# 1. Information

Please read the following notes carefully before carrying out the assignments.
The assignments have been written on the assumption that you have experience on this type of tanker and/or working on this type of tanker with the appropriate Safety Management System (SMS) in place.
You may find that some questions do not apply directly to the ship type or size that you are familiar with, however you must attempt to answer these. Use the learning from all course modules, recommended industry publications, the Company SMS and advice from fellow officers onboard to present your answers. All questions must be attempted as incomplete portfolios will be returned unassessed.

## Health, Safety and Protocol

Much of the work will require you to research information from your current or most recent ship. Always comply in full with all Health and Safety protocols and seek permission from the Master and/or relevant officers where your work takes you away from your ordinary routine. Take care not to interfere with shipboard operations and time your work to fit in with the work of others.

# 2. Assessment Guidelines

**Learning Outcomes of the Course**
On successful completion of the course you will:

1. understand the physical and chemical properties of oil and the hazards and control measures associated with carrying oil on board tankers
2. know what is involved in the safe operation and monitoring of cargo on board an oil tanker
3. be able to apply health, safety and environmental precautions in working on an oil tanker
4. be able to perform and monitor safe oil tanker cargo operations in compliance with legislative requirements

There are ten modules in this course mapped to the learning objectives, as follows:

| MODULE | LEARNING OUTCOMES ADDRESSED |
|---|---|
| **Module 1**<br>INTRODUCTION | 1 |
| **Module 2**<br>PHYSICS AND CHEMISTRY OF PETROLEUM | 1 |
| **Module 3**<br>HAZARDS AND THEIR MANAGEMENT | 1 & 3 |
| **Module 4**<br>LEGISLATION | 4 |
| **Module 5**<br>SHIP DESIGN AND EQUIPMENT | 2 & 4 |
| **Module 6**<br>OIL TANKER OPERATIONS | 2 & 3 |
| **Module 7**<br>INERT GAS SYSTEMS | 2 |
| **Module 8**<br>CRUDE OIL WASHING (COW) | 2 |
| **Module 9**<br>SAFETY AND POLLUTION PREVENTION | 2, 3 & 4 |
| **Module 10**<br>EMERGENCY PROCEDURES | 3 |

**Assessment**

On this course, you are assessed in two ways:

| Assessment | Delivery | Learning Outcomes Assessed | Minimum Pass mark |
|---|---|---|---|
| 1. Final Test | Closed questions - onscreen | 1-4 | 75% |
| 2. Module Assignments | Open questions – offline | 1-4 | Grade A |

- You must achieve at least 75% in the final test and Grade A or higher in all module assignments. If you do not achieve this result in any one element, you will be required to review the course material and re-attempt that element. Note that a re-assessment fee may be payable.
- All onscreen tests are automatically marked and the result displayed onscreen. You will be required to print your final test result immediately after you complete it. The course documentation checklist refers.
- Criteria marking is used to mark all module assignments. The marking scheme used is provided in **Annex A**.
- A grading sheet will be completed by the course assessor when your module assignments are marked. This will be sent to you. Where necessary the course assessor will provide feedback or notes for your attention.

**Completing Module Assignments**

The following word count is suggested for each of the module assignments of the course.

| Module | Question(s) | Suggested Word Count |
|---|---|---|
| 1 | 1 | 60-70 |
| 2 | 1<br>2 | 30-40<br>40-50 |
| 3 | 1<br>2<br>3 | 5-10<br>60-70<br>80-100 |
| 4 | 1 | 230-250 |
| 5 | 1<br>2<br>3<br>4<br>5 | Sketch<br>80-90<br>120-150<br>120-150<br>50-60 |
| 6 | 1<br>2<br>3<br>4<br>5<br>6 | 100-120<br>Sketches<br>20-30 + calculation<br>20-30 + sketches<br>70-80<br>230-250 |
| 7 | 1 | 230-250 + sketch |
| 8 | 1 | 230-250 |

| | | |
|---|---|---|
| 9 | 1<br>2 | 230-250<br>80-100 |
| 10 | 1<br>2 | 130-150<br>List of 17 |

Module assignments should be completed electronically (font size 12) or by hand in clear handwriting. Where required or as appropriate, you may provide diagrams or sketches to illustrate your answers. SMS procedures and documents are accepted as scans/attachments. The course assessor reserves the right to reject work that is not presented clearly and legibly.

You are reminded that the final test and module assignments **must** be completed under 'exam conditions'. This means under the direct supervision of an authenticating person who will attest that your assessments have been completed unaided and solely by you. You are strongly advised to keep a back-up of all your work before sending it to us for Assessment. Anything you quote or paraphrase from a publication or other source must be referenced in your work, by giving the following information:

- Author's name
- Title of Publication
- Year (and day/month if a newspaper article or magazine) published
- Page reference
- Name of Publisher
- Place of Publication

## Method of acknowledging other's work

a) Use "quotation marks" round the actual words you have copied and insert a brief reference in brackets () at the end. The brief reference should contain author's name and publication year only.
b) Supply the full reference in a list at the end of your answer.
   i. Example
   "Crude Oil is any oil occurring naturally in the earth whether or not treated to render it suitable for transportation and includes:…" (SOLAS 1997 p148)

   *and then, at the end of the answer, supply the full reference thus*:

   SOLAS, Consolidated Edition 1997, Ch II-2 Para 28, International Maritime Organization, London.

## ANNEX A - GRADE CRITERIA FOR MODULE ASSIGNMENTS

Notes

- Percentage marks shown under each grade are for guidance only. The assessor will only issue a grade for each module assignment.
- All module assignments must achieve a pass grade for a course certificate to be issued.

| MARKING CRITERIA: | GRADE CRITERIA | | | | |
|---|---|---|---|---|---|
| | **Grade D Refer (0-24%)** | **Grade C Refer (25-49%)** | **Grade B Refer (50-74%)** | **Grade A Pass (75-85%)** | **Grade A+ Pass (86-100%)** |
| **Submitted answer fully addresses the assignment question** | Poor, significant missing or inaccurate information | Unsatisfactory, mostly inaccurate or missing information | Satisfactory, planning and structure but key elements missing or inaccurate | Good, any errors or omissions are within acceptable limits | Excellent, all key criteria included with no factual errors |
| **Comprehensive knowledge of relevant taught material has been demonstrated** | Poor, core modules information missing or superficial coverage | Unsatisfactory, superficial, inaccurate or weak description of taught content | Mainly satisfactory, but some elements of relevant content missing | Good description of relevant content appropriate to question. Some use of additional information sources used | Excellent description of relevant content appropriate to question. Additional information sources used to good effect |
| **Knowledge of industry best practice, Codes and/or Regulations has been demonstrated where applicable** | Token attempt. Poor, missing or inaccurate information | Incorrect or limited application of Codes or regulations used. Little use of best practice applied to question | Answer is satisfactory with some limited use of Codes, regulations or best practice in answering the question | Good knowledge of relevant industry best practice, Codes and/or Regulations demonstrated | Thorough knowledge of relevant industry best practice, Codes and/or Regulations fully demonstrated |
| **Work shows evidence of further reading beyond the taught content** | Poor, little or none is evident | Some evidence shown | Satisfactory in some respects, but limited in scope | Good use of further reading shown in answer | Excellent, consistent evidence of further reading has been used |
| **Word count for each question has been complied with** | Little attempt made to meet word count limits | Word count limits not met for majority of modules | Word count limits have been met for majority of modules | Word count limits met | Word count limits met |

# 3. Advanced Oil Tanker Assignments

## Module 1: Introduction

1. The following abbreviations and names refer to different types of oil-tankers:
   I. ULCC
   II. AFRAMAX
   III. PANAMAX
   IV. LR1
   V. Product carriers.

   For each type of tanker:
   a) Define each abbreviation.
   b) Indicate the normally accepted minimum and maximum deadweight tonnage or size to which they refer.
   c) State the type or types of cargo likely to be carried in each.

## Module 2: Physics and Chemistry of Petroleum

1. Briefly explain the characteristics (the make-up) of crude oil.

2. Consider a crude oil cargo of your choice and complete the following tasks:
   a) State the type of oil and the grade (if applicable).
   b) On board ship, where would you find the actual Reid Vapour Pressure (RVP) for the grade of oil?
   c) What is the normal range of RVP for the crude oil cargo you have chosen?
   d) Explain the reason(s) why the Cargo Officers should know the RVP.

## Module 3: Hazards and Their Management

1. State where you would find out how many portable gas-detecting devices must be carried on board.

2. Select one type or make of portable gas detection equipment and describe the procedure for testing on board. State the frequency of testing and the frequency required for testing the equipment ashore.

3. Explain the risks inherent in lowering equipment into cargo tanks containing flammable gas, cargo or a mixture of both. Describe the precautions you would take when manual ullaging.

## Module 4: Legislation

1. Explain briefly (approximately 250 words) the role of the International Maritime Organization (IMO) in oil tanker operations. Your answer should:
    a) Highlight the main Conventions and explain the scope of each.
    b) Explain how the Conventions are implemented by the member States.

## Module 5: Ship Design and Equipment

1. Use a cross-sectional drawing to indicate the double hull construction of an oil tanker. Indicate:
    a) The cargo tank(s).
    b) The ballast tank(s).
    c) The location of continuous longitudinal bulkheads.

2. Describe the arrangements required by MARPOL for discharging to the shore the final contents of pipelines and cargo pumps.

3. Give two examples of the different types of cargo pump commonly used on board oil tankers and briefly explain the principal differences in their design.
    a) Explain how discharge rates are influenced by distance and height of the receiving tanks, and reference your answer to the pump performance curve.
    b) List any other significant factors that influence the discharge rate.

4. Describe one method for venting cargo tanks during loading. Explain the hazards involved in venting and the measures that are taken to minimise them.

5. Describe the operating functions of the Oil Discharge Monitoring Equipment (ODME) fitted on board oil tankers.

## Module 6: Oil Tanker Operations

1. State the dangers associated with flammable gas and accommodation spaces. Describe the measures taken to prevent the ingress of gas to the accommodation during cargo operations.

2. Using sketches or diagrams, illustrate the best method of supporting the weight of cargo hoses during cargo operations. Show the areas which are particularly vulnerable to wear and tear and damage.

3. State the three pieces of information required to calculate the weight of oil in a cargo tank.
    a) Show the calculation for working out the weight of the oil in a single cargo tank.
    b) Discuss the factors which determine the maximum amount of cargo a ship may load.

4. Using diagrams, explain the terms ‘hog’ and ‘sag’ and explain how these conditions arise.
    a) State how the extent of any hog or sag may be measured.

5. Describe the initial stages of a loading operation, stating the checks you would make to ensure the operation is proceeding as planned.

    a) Describe the emergency shut down procedure when loading.

6. Briefly describe a tank-cleaning (not COW) operation. State the potential dangers involved in tank cleaning and also the MARPOL discharge criteria that must be taken into account.

## Module 7: Inert Gas Systems

1. Describe an inert gas system, including the following in your answer:
    a) A schematic diagram of the Inert Gas System.
    b) The method of producing the Inert Gas and the chemical composition of the gas when it is pumped to the cargo tanks.
    c) The IG Start Up and Shut Down procedures.

## Module 8: Crude Oil Washing (COW)

1. Describe a Crude Oil Washing operation, including the following information in your answer:
    a) Describe the type of washing machines and how they are powered.
    b) State the sizes of the washing machines with their throughput and working pressures.
    c) Present a discharge and COW Plan, the plan should show:
        I. Responsibilities of ship and shore staff.
        II. The discharge, COW and ballasting sequences.
        III. Pumps to be used.
        IV. Communication methods to be used with the shore.
        V. Expected drafts and trim of the vessel throughout the operation.

## Module 9: Safety and Pollution Prevention

1. Define the term ‘enclosed space’.
    a) Explain the safety procedures to be followed prior to, and during, an entry into an enclosed space.

2. Following an oil spill at sea, a report must be made to the nearest Port State coastal contact.
    a) List the information that is required in the initial report.
    b) How should the report be sent?
    c) When should a follow-up report be sent?

## Module 10: Emergency Procedures

1. Describe a fire drill in which you have personally been involved. Include:
    a) The part of ship in which the drill took place.
    b) The nature of the simulated incident.
    c) The size and number of the firefighting parties involved.
    d) The methods used to contain and extinguish the fire.
    e) Comment on the effectiveness of the drill and suggest ways in which it might be improved.

2. List the drill scenarios that are required by SOLAS to be carried out on board.

If you need assistance or clarification on the contents of this workbook, do not hesitate to contact us at courses@oceantg.com

# 4. Document status

| Issue no. | Date | Author |
|---|---|---|
| V1 | 17 Nov 2020 | IG |
| V2 | 9 June 2021 | SG |
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# 5. Changes in the document

| Issue no. | Paragraph no. | Description |
|---|---|---|
| V2 | 1 | Minor amends to wording |
| | 2 | New Assessment Guidelines with Annex A inserted incorporating some existing information on referencing. Subsequent paragraphs renumbered. |
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