



# **M0029: Offshore Structure Design, Construction, Inspection, Maintenance & Repair**



## Training Description:

The aim of this intensive training course is to provide the participants with a complete and up-to-date overview of offshore structure engineering in general and steel jackets (platforms) in particular. It will give a picture of the work of ocean and structural design engineers using case studies to highlight the topics discussed.

The course will cover the design, construction, inspection, maintenance and repair of offshore structures/platforms in accordance with API and ISO standards; discuss the various types of offshore structures including their advantages, disadvantages and design requirements; analysis of the ocean environment affecting offshore structures which includes wind, waves & environmental forces, currents, tides and storm surge; design criteria for steel jackets including simplified procedures suitable for the first stages of design of a small liftable jacket; the layout of jacket frame and other structural topics for jacket design; and the correct diameter, thickness and bending in member design, strength, approaches to fatigue in joint design and pile capacity of foundation piles.

During the course, participants will be able to apply proper load-out, transportation, installation and commissioning methods related to offshore structures; execute proper launch of a steel tower; recognize and employ the standards and specification of risk assessment for offshore structure; practice the software available for use in jacket analysis and design; and employ sub-sea inspection, cathodic protection, corrosion allowance, flooded member detection and other surveys in protecting and maintaining the structure.

Proper methodology for estimating response based conditions for design against extremes, typical results and consequences; describing the factors that control the ultimate strength of the steel structures; emphasizing the principles of structural reliability analysis as well as the principles of cost/benefit analysis and considerations of risk; explaining vortex-induced-vibration, wave slamming and diffraction forces related to waves and environmental forces affecting the offshore structures as well as the importance of deck elevation, role of model testing and wave-structure interaction; and identifying the things that go wrong especially the opportunities and present problems arising in project management and engineering will also be covered during the course.

Upon the successful completion of this course, the participant will have a satisfactory understanding of the planning, concept development, design, construction, installation, operation, inspection and maintenance of Offshore Structures.

## Training Objectives:

**By the end of the training, participants will be able to:**

- ✓ Apply an in-depth knowledge on the design, construction, inspection, maintenance and repair of offshore structures/platforms in accordance with API and ISO standards
- ✓ Discuss the various types of offshore structures including their advantages and disadvantages & design requirements
- ✓ Analyze the ocean environment affecting offshore structures which includes wind, waves & environmental forces, currents, tides and storm surges
- ✓ Employ design criteria for steel jackets including simplified procedures suitable for the first stages of design of a small, liftable jacket as well as give emphasis on the layout of jacket frame & other structural topics for jacket design





- ✓ Determine the correct diameter, thickness & bending in member design, strength & approaches to fatigue in joint design and pile capacity of foundation piles
- ✓ Apply proper load-out, transportation, installation and commissioning methods related to offshore structures and execute the proper launch of a steel tower
- ✓ Recognize and employ the standards and specification of risk assessment for offshore structure
- ✓ Practice the software available for use in jacket analysis & design and employ sub-sea inspection, cathodic protection, corrosion allowance & flooded member detection and other surveys in protecting and maintaining the structure
- ✓ Employ proper methodology for estimating response based conditions for design against extremes, typical results and consequences
- ✓ Describe factors that control the ultimate strength of the steel structures and give emphasis on the principles of structural reliability analysis as well as the principles of cost/benefit analysis and considerations of risk
- ✓ Explain vortex-induced-vibration, wave slamming and diffraction forces related to waves and environmental forces affecting the offshore structures as well as the importance of deck elevation, role of model testing and wave-structure interaction
- ✓ Identify the things that go wrong especially the opportunities and present problems arising in project management and engineering

### Training Designed for:

This course is intended for those who are involved in the design, construction, inspection, maintenance and repair of offshore structures. This includes engineers who are newly qualified, who have recently moved into offshore structural engineering or hold broad responsibilities that include offshore structures in oil and gas, construction, design and installation companies and regulatory authorities.

### Training Program:

#### DAY ONE:

- ❖ PRE-TEST
- ❖ **Introduction to Offshore Structures**
  - Purpose
  - Importance in Field Development
  - Economic Considerations
  - Aspects of Design
  - API and ISO Codes
  - Introduction to Design Sequence and its Interaction with the Different Topics Covered in the Course
- ❖ **Typical Offshore Platform Nomenclature; Interactions with Regulatory Bodies**
  - Offshore Engineering Lingo
  - Class Discussion
- ❖ **Types of Structures**
  - Description of Fixed
  - Floating
  - Mobile and Subsea
  - Advantages and Disadvantages





- Design Requirements
- ❖ **Ocean Environment**
  - Winds, Waves, Currents, Tides and Surges
  - Probability and Estimation of Extreme Environments
  - Steel Jacket Design Criteria
  - Factors Determining Different Parts of Structure
  - LRFD Versus WSD Codes

- ❖ **Video Presentation**
  - VHE-15 "The Piper Alpha Disaster"

#### DAY TWO:

- ❖ **Introduction to the Design of a Small & Lifiable Jacket**
  - Background
  - Outline of a Simplified Procedure Suitable for the First Stages of Design
- ❖ **Lay out of Jacket Frame**
  - Deck Elevation, Batter, Brace Patterns, Transfer of Forces Through the Structure Break
- ❖ **Software for Jacket Design—SACS®, ANSYS, StruCad, USFOS, etc.**
  - Review of Software Available for Use in Jacket Analysis and Design, Introduction to SACS® Software
- ❖ **Member and Joint Design**
  - Calculation of Member Strength. Determination of Diameter, Thickness, Bending, Joint can Strength
- ❖ **Foundation Piles**
  - Pile Design, Soil Data, Pile Capacity-Axial and Shear
- ❖ **Response Based Design**
  - Overview of Methodology for Estimating Response Based Conditions for Design Against Extremes, Typical Results and Consequences

#### DAY THREE:

- ❖ **Class Exercise on Jacket Design by Hand**
  - Preliminary Basic Design of a Jacket by Hand Using API RP-2A Recommendations
- ❖ **Exercise on Jacket Design Using Software**
  - Building a Simple Model Using SACS®
- ❖ **Exercise on Jacket Design: Presentation and Discussion**
  - Discussion of Project for Hand Designing a Simple Jacket
- ❖ **Load-out, Transportation, Installation and Commissioning**
  - Aspects Affecting Jacket Design, Practical Considerations and Limitations, Choice of Approach

#### DAY FOUR:

- ❖ **Fatigue Analysis Methods**
  - The Palmgren-Miner Hypothesis; Spectral vs. Deterministic Fatigue Approaches
- ❖ **Risk Management**
  - ISO 18001, Risk Assessments, Leadership
- ❖ **Above Water and Sub-Sea Inspection**
  - Methods (Particularly MPI)





- Targets
- Results
- Repair or Not? Risk-Based Underwater Inspection and Structural Integrity Management Plan
- Cathodic Protection
- Corrosion Allowance
- Ship Impact, Inspection and Maintenance, Repair
- ❖ **Structural Reliability**
  - The Historical Performance of Offshore Structures
  - Principles of Structural Reliability Analysis
  - Aspects Determining Reliability
  - Load Statistics and the Probability of Failure
- ❖ **Ultimate Strength of Steel Structures**
  - Factors that Control the Ultimate Strength of the Structural System
  - Reserve Strength Ratio
  - Estimation of Ultimate Strength by Pushover Analysis
- ❖ **Video Presentation**
  - VHE-39“RiskAssessment”
- ❖ **Practical Sessions**
  - This hands-on and includes simulator, real-life case studies and exercises

#### DAY FIVE:

- ❖ **Cost/Benefit Analysis**
  - Principles of Cost/Benefit Analysis and Consideration of Risk
  - Applications
- ❖ **Waves and Environmental-VIV**
  - Vortex-Induced-Vibration
  - Wave Slamming
  - Diffraction Forces
- ❖ **Platform Disasters**
  - Review of the Major Accidents Involving Offshore Structure and Loss of Life
  - Lessons Learnt
- ❖ **Platform Decommissioning**
- ❖ **Case Studies**
  - Underwater Inspections Scopes of Work and Report
- ❖ **Things that Go Wrong, Opportunities**
  - Reviews Problems Arising in Project Management and Engineering
  - Light weight Jacket or Sub-sea?
- ❖ Course Conclusion
- ❖ POST-TEST and EVALUATION

#### **Training Requirement:**

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.





Practical sessions will be organized during the course for participants to practice the theory learnt. Participants will be provided with an opportunity to carry out various exercises using the “Offshore Structural Analysis Computer System (SACS®)” simulator.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

### Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

### Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

### Training Fees:

**As per the course location** - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01<sup>st</sup> of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

### Training Timings:

#### Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

**For training registrations or in-house enquiries, please contact:**

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Training & Career Development Department