BB Offshore & Marine Consulting Ltd.

Workshops and Courses
The workshops and courses thoroughly explain design and technology of floating production, storage, offloading and LNG systems.

The programmes are composed in such a way that they can be adapted to focus on the participants’ interests and needs, yet still covering the full spectrum of FPSO and/or FLNG design and technology.

The workshops and courses will provide the participants with an in-depth knowledge through detailed information, real-life case studies, photos and video animation. The course material is reviewed by interactive exercises which will encourage discussions between both delegates and course director.

The workshops and courses explore (but are not limited to) the following:

**FPSO Design and Technology**

The course provides a comprehensive overview of Floating Production Storage and Offloading and includes key strategic, commercial, and technical considerations of an FPSO project.

The programme covers:

- The key components of an FPSO development ranging from hull, topside, turrets, mooring, storage and SURF to offshore loading.
- An explanation of the FPSO process and an outline of systems involved and their particulars.
- An overview of applicable rules and regulations, industry standards and regulations and environmental considerations.
- Other design requirements and commissioning.

**FLNG Design and Technology**

The programme gives a valuable, detailed insight into Floating Liquid Natural Gas development encompassing the challenges in adapting LNG technologies for offshore, technical complexities, key design issues, critical drivers and risks related to LNG FPSOs and FRSUs.

The course covers:

- The design drivers for the overall vessel, topside, hull and mooring systems.
- The key considerations for the LNG containment system.
- Liquefaction technologies and regasification and offshore LNG transfer systems.
- Safety, risk assessment and integration aspects of LNG production on a floating facility.
- Class, legislative requirements and environmental issues.
- Commissioning challenges and other operations involved in the LNG supply chain.

In addition we have specialized training programmes for FLNG Project Teams and FLNG Operation and Maintenance Teams.
FLNG Project Team Training Programme

The challenge of an LNG FPSO, is adapting the known onshore technologies to an offshore environment, with motion impacts affecting the process and offloading, as well as space limitations. The course will guide the participant through all the phases of the project from concept design, construction and interfaces to commissioning, handover and start-up.

The course encompasses:

- Project phases and effective project management
- Selection of equipment and materials
- Preventing interfaces resulting into problems
- Safety, risk assessment and integration aspects of LNG production on a floating facility

FLNG Operation and Maintenance Training Programme

For the successful operation of the LNG FPSO (FLNG) it is of vital importance to understand the process from well operation and subsea control, to separation, dehydration, liquefaction, storage and offload. The course focuses on in maintaining the high level of safety and security during whole process.

The course includes:

- Understanding operational procedures for dead ship start-up, emergency system start-up, utilities and power generation start-up, process plant start-up sequences
- Filling up the system with liquids where required (refrigerants, coolers, pipelines etc.)
- Tank cooling procedures and controlling the boil-off during tank filling
- Offloading operations shutdown initiating disconnection and retrieval of offloading arms.
- Shutdown period - operations awareness of process plant behaviour, monitoring and recording conditions of cryogenic system, refrigerants, boil-off gas in tanks, and roll over possibility, diesel oil availability etc.
- Maintenance of equipment and systems

Topside Construction, Fabrication and Installation

The course presents the major issues involved in Floating Production topside projects, including design considerations, configuration of the topsides supports and technical challenges.

The programme covers:

- All project phases from concept design, load-out, commissioning to handover and start-up including project management, execution and contracting strategies and identifying interface and schedule issues.
- Codes and standards for Floating Production topsides and HSE requirements
- Material selection, storage, procurement, subcontracting, project management and construction management
Floating Productions Design, Technology and Operations

The programme gives a comprehensive overview of design, construction and operational issues encompassing the influence of weather conditions on design, station keeping and offshore loading operations for FPSO and FLNG.

The course covers:
- Environmental aspects influencing design and operations with examples of deep water, shallow water, harsh and benign conditions including artic conditions.
- Considerations for selection of mooring and risers systems
- Shuttle tanker mooring arrangements and operations
- Storage tanks, cargo system and offshore loading arrangements and operations including custody transfer

Water Injection System

The course provides a complete and detailed overview of the water injection system.

The course includes:
- Well design and construction.
- Water quality and water quality monitoring
- Water injection system data requirements
- System start-up and shutdown procedures and trouble shooting

E & I Design, Installation and Operation

The training course provides a complete and comprehensive technical overview of electrical systems, instrumentation, process control and safety systems on FPSOs and FLNGs. The training course encompasses all aspects from design, construction and installation to commissioning and operation.

- Identifying the safety risks involved in power systems
- Obtain a better knowledge of selecting and integrating power distribution systems
- Understand the principles of protecting electrical equipment
- Gain a better understanding of power demand and power users.
- Comprehension of the classification of hazardous areas
- Defining the key requirements for instrument specifications
- Learn about installation and commissioning requirements
Key learning points

The workshops and courses are designed for professionals in the floating production and LNG industry, enabling them to obtain a better understanding of FPSOs’ and FLNGs’ technical complexities, critical drivers and key design issues.

- Understand the general role of an (LNG) FPSO
- Examine the key design and technology considerations
- Ability to evaluate the boundaries of design in interface management
- Achieve a deeper understanding of ship building and offshore approach
- Influence of ship’s hull motions on the vessel design affecting structural interfaces and equipment integrity
- Understand the development and history of the LNG industry and the role of FLNGs
- Comprehension of the challenges in offloading and transfer of LNG
- Understand the FLNG process plant encompassing liquefaction and regasification.

Who Should Attend

The course is recommended for personnel involved in floating production projects who require more in-depth knowledge about design, technology, layouts, interfaces, integration, construction, fabrication, load-out and installation.

The courses and workshops will benefit designers, managers and operators, establishing a cost-effective and timely execution of the project:

- Project Directors, Project Managers, Project Engineers, Construction Managers, Integration Managers, Commissioning Managers, Commissioning Lead Engineers, Marine Engineers, Offshore Installation Managers, and Project Engineers, discipline Engineers, Contractors involved in FPSO technology, Technical Authors, Field Engineers etc.

The Course Director

Contributor to the (OMEE) Offshore, Marine, Energy and Environment involving studies, concepts and practical execution.

Bruno Ban is an MSc electrical engineer and BSc maritime transport engineer, who has over 35 years’ experience in the maritime, offshore oil and gas industry. During his career he did additional studies in oil and gas process technology including N₂/LPG/LNG liquefaction and obtained a diploma in advanced LNG System Analysis and Oil and Gas Process Fundamentals. His wealth of knowledge, ranging from conceptual design, feasibility studies and front end engineering through to detailed engineering, procurement, construction, commissioning, decommissioning and training has contributed to many successful projects worldwide. Past projects include a wide range of installations (mobile fixed and subsea), such as FPSOs, LNG and FLNG vessels, petrochemical plants, pipe layers and subsea interfaces.

Bruno worked for major offshore oil and gas companies. In 2000, set up his own company BB Offshore & Marine consulting Ltd., to provide technical and management support, consultancy and training to the industry. He has proven ability in managing, coordinating and overseeing the entire project from conception through completion on a timely and cost effective basis.

In recent years Bruno has committed himself to the floating productions industry, studying and analysing the industry’s behaviour, technical requirements, developments and progress. He is the author of the book “FPSO Design and Technology”, which is the product of his vast experience and knowledge and an invaluable resource for understanding the technical value and complexity of FPSOs and such installation. His next book on FLNGs will be forthcoming.
FPSO Design and Technology
Highlights of a 5 day Programme

For a detailed agenda please contact us at info@bbomc.com

Introduce to FPSO Design and Technology
- Topside Design and Layout
  - Layout principles
  - Material selection
  - Structural design (global analysis)
  - Evolution of topsides support and topsides
  - Modular design and standardization
- Mooring Design and Arrangements
  - Mooring system selection
  - Anchor systems
  - Turret installation challenges
  - Turret swivel system
- SURF and Subsea Interfaces
  - Storage and Offloading
    - Cargo system
    - Cargo blanketing and venting
    - Cargo metering and custody transfer
    - Ballast system
    - Offloading and tanker mooring arrangements
    - Offloading risks
    - Emergency shutdown and release

Power, Heating and Utility Systems
- Gas and liquid separation
- Crude processing
- Gas handling system
- Produced water treatment system and water injection

Other Design Requirements
- Piping design
- Electrical design
- Instrumentation design
- Telecommunication
- Mechanical design
- Insulation and trace heating
- Corrosion monitoring and prevention
- Accommodation
- Material handling

Control and Safety System
- Commissioning
- Decommissioning

Introduction to FPSO Design and Technology
- Design Basis
  - General design criteria
  - Functional specification
  - Engineering process and design phases
- Environmental Design Influences
  - Metocean data
  - Characteristics of the geographical regions
  - Arctic conditions
  - ULS
  - Still water loads, weight control and stability
  - Motion and deformation
  - Hull loads and topside interface loads
  - Stress buckling and fatigue
  - Corrosion
- Safety in Design and Operation
- Hull Design
- Interfaces

FLNG Design and Technology
Course Outline
Highlights of a 5 day Programme

For a detailed agenda please contact us at info@bbomc.com

Introduction to FLNG
- FLNGs versus FPSOs
- Class, Regulatory Requirements and Environmental Considerations

FLNG Vessel Design
- Design basis
- Design considerations and challenges
- Shipbuilding and Offshore Approach

LNG FPSO Process System
- LNG FPSO process introduction
- LNG properties and specifications
- Gas treatment
- Liquefaction processes and technologies
- Selection of liquefaction equipment
- Cooling water system
- Dynamic process simulation

Power Generation, Heating and Utilities
- Determining power requirements and generation
- Heating requirements
- LNG dual fuel

Environmental Influences on FLNG Design
- Environmental design parameters
- Arctic conditions
- Motion and deformation
- Stress buckling and fatigue
- Corrosion

Hull Design
- FLNG Topside Design and Layout
- Interfaces
- FLNG Mooring, Turret and Swivel
- SURF and Subsea Interfaces
- LNG Cargo Containment System
  - LNG storage tank design
  - LNG sloshing, Boll-off effects on LNG tankers and FLNG vessels
  - Tank loading preparation
- LNG Carriers

LNG Transfer
- Challenges of offshore LNG transfer
- Offloading risks
- Emergency shutdown and release
- Tanker mooring
- Custody transfer

Safety in Design and Operation
- LNG Regasification
  - Regasification technologies
  - FRSUs
- Control and Safety Systems
- Other Design Requirements
  - Piping design
  - Electrical design
  - Instrumentation design
  - Telecommunication
  - Mechanical design philosophy
  - Insulation and trace heating
  - Accommodation

Completion, Pre-commissioning and Commissioning
The Future of FLNG

All course outlines can be adapted to the participants interest and requirements
Introduction to FLNG
FLNGs versus FPSOs
Class and Regulatory Requirements and Environmental Considerations
FLNG Vessel Design
Vessel Selection
• New build or conversion?
• Tanker sizes
Design Basis
Engineering
• Engineering phases
• Topsides modular engineering
• Global analysis
Effective Project Management
• Project process
• Project Execution & Division
Environmental Influences on FLNG Design
Hull Design
FLNG Topsides Design and Layout
LNG FPSO Process System
• Production system challenges
• Gas treatment
• Liquefaction processes and technologies
• Selection of liquefaction major equipment
• Dynamic process simulation
Procurement and Subcontracting
Construction Management
Guiding Principles
Fabrication
_interfaces
FLNG Mooring, Turret and Swivel
SURF and Subsea Interfaces
LNG Cargo Containment System
• LNG storage tank design
• LNG sloshing and boil-off effects
• Storing of other products (Condensate, LPG, Fuel gas, Refrigerants)
• Tank loading preparation
LNG Carriers
LNG Transfer
• Challenges of offshore LNG transfer
• Offloading risks
Safety in Design and Operation
LNG Regasification
• Regasification technologies
• FRUs
Power Generation, Heating and Utilities
Control and Safety Systems
Other Design Requirements
• Piping design
• Electrical design
• Instrumentation design
• Telecommunication
• Mechanical design philosophy
• Insulation and trace heating
• Accommodation
Mechanical Completion, Pre-commissioning, Commissioning and Post commissioning
Installation, Hook-up and Handover
The Future of FLNG

Maintenance — Guidance and General Requirements
Plans and Procedures and Records
Class and Regulatory Requirements
FLNG Vessel
LNG FPSO Process System
• Water-hydrocarbon system behaviour
• Hydrates formation
• Separation equipment
• Stabilization
• Condensate to tank
• Liquefaction major equipment
• Pumps
• Compressors and drives
• Cooling water system
• Relief and Flare Systems
• Process plant corrosion protection
Environmental Influences affecting FLNG Hull
• Hull structural assessment
• Surveys

FLNG Operation and Maintenance Training Programme
Highlights
For a detailed agenda please contact us at info@bbomc.com

FLNG Topside
• Structural integrity monitoring
• Piping integrity and protection
• Electrical installation integrity and protection
• Separators, process vessels and towers
FLNG Mooring, Turret and Swivel
• Mooring lines inspection
• Swivel periodical inspection
• Turret main bearing maintenance
SURF and Subsea Interfaces
• Well control system
Cargo Containment System
• Storing of the products
• Tank loading preparation
• Tank inspection procedures
• Cargo handling
LNG Transfer
• Cargo transfer operations and risks
• Transfer system valves
• Tanker mooring Procedures

Safety in Operation and Maintenance
• Hazards associated with process fluids
• Leakage and dispersion of LNG release
• Assessment of hazards (HAZID, HAZOP, Audits)
• Fire prevention and control
• Emergency plan (equipment and procedures)
Power Generation, Heating and Utilities
• Power generation and distribution
• Heating sources and generators
Control and Safety Systems
Other Systems Operation and Maintenance
• Piping
• Electrical
• Instrumentation
• Telecom
• Mechanical
• Insulation
• Structural

Future of FLNG

Floating Production Topsides Construction, Fabrication and Installation
Highlights of a 3 day Programme
For a detailed agenda please contact us at info@bbomc.com

Introduction to Floating Productions
Design Basis
Effective Project Management
Engineering
Topsides Process System
• Preparing the basic design of the separation system
• Gas and liquid separation
• Crude processing
• Gas handling system
• Produced water treatment system and water injection
Topsides Design
Utility Systems and Other Requirements
Procurement and Subcontracting
Construction Management
Guiding Principles
_interfaces
Construction Considerations
• Challenges of modular engineering
• Structural orientation
• Multi-support girder design arrangement for modules support

Fabrication
• Materials
• Handling and storage
• Traceability, certification, marking
• Fabrication tolerances and dimensional control
• Mechanical installation
• Surface preparation and coating
• Load-out and sea-fastingening
• Inspection and testing
Commissioning
• Installation and Hook-up and Hand-over

All course outlines can be adapted to the participants interest and requirements
Floating Productions Design, Technology and Operations
Highlights of a 4 day Programme)

Introduction of FPSO design and technology
Class and Regulatory Issues and Environmental Considerations
Environmental Aspects Influencing Design and Operations
- Characteristics of the geographical regions
- Wind, waves, and current
- Artic conditions
- ULS
- Still water loads
- Minimum freeboard
- Weight control
- Stability
- Corrosion

Mooring Systems, Arrangements, Installation and Operation
- Types of mooring systems and their features
- Anchor systems
- Turret installation

Subsea layout and installation

Material Selection Water Injection System
Chemicals used in water injection
Water quality monitoring

Water Injection Plant
- WI systems data requirements
- Water Injection process
- Water Injection modules
- Seawater intake
- Sulphate removal unit
- De-aeration
- Process monitoring and control

Storage
- Crude Oil Storage
- Ballast tanks
- Methanol tanks
- Inert gas system
- Procedures for safe tank entry
- LNG containment system
- Sloshing
- LNG Boil off effects
- LNG tank loading preparation

System Start-up and shut-down
Sub Sea Interface
- Control system components
- System components overview
- Surface equipment
- Offshore control system

Operational Issues
Troubleshooting

Introduction
Reservoir Recovery Mechanism
- Containment and confinement
- Primary recovery
- Secondary recovery
- Enhanced recovery
- Sources of injected water
- Oil extraction and recovery

Quality and Source of Raw Water
Properties of Sea Water

UPS and Batteries
- Variable Speed Drives
- Motors
- Testing theories and recommendation for motors

Safety and Protection
Earthling
Harmonics
Electrical equipment in hazardous areas
- Ex/ATEX

Instrumentation
- Measurement
- Control
- HART Protocol (highway addressable remote transducer)

Basis of design
Instrumentation (field instruments)

E & I Design, Installation and Operation
Highlights of a 5 day Programme

Safety Instrumentation
Communication Networking Systems
Automation
Installation requirements
Valves
Subsea Instrumentation and Control Systems
Cathodic Protection

Documentation
- Instrument loop diagrams, Cable schedule,
  Termination Details
- Instrument layouts, Logic drawings
- Construction installation details
- Wiring diagrams
- P&IDs

All course outlines can be adapted to the participants interest and requirements
The FPSO and FLNG workshops and courses, focus on the key technical challenges and risks associated with the execution of the project.

Using practical and interactive sessions, it will provide a complete technical overview of Floating Production and Storage Facilities from design and construction to commissioning and start-up. It will arm the participant with the necessary information to help them advance their FPSO and FLNG projects and ensure its success.

We can conduct individual in-house workshops and training courses on-site, designed to meet the participants' needs.

To learn more about our courses or if you would like a detailed agenda contact us:

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Our workshops and courses were attended by participants from:
Offshore & Marine Consulting Ltd.

The Power of Knowledge