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Marine Terminals

Capability and Experience

Capability Overview

INTECSEA has participated in a significant number of terminal projects worldwide where it has performed site surveys, system designs, prepared Invitation to Bid documents, inspected component fabrication, supervised terminal installations and provided total project management services. Projects have included import and export facilities in all regions of the world including Arctic and other hostile environments.

After focusing primarily on Single Point Mooring (SPM) terminals, INTECSEA has extended its expertise to Conventional Buoy Mooring (CBM) terminals, fixed tanker berths, and associated onshore facilities. This has created a capability for unbiased evaluation of alternate marine terminal options and subsequent implementation of total project services from concept through commissioning for the selected marine terminal type.

Services

- Feasibility and Conceptual Studies
- Terminal Simulation Studies
- Site and Pipeline Route Selection
- Mooring System Specifications
- Pipeline System Design
- Pipeline Material Specifications
- Invitation To Bid (ITB)
- SPM Detailed Design Review/Approval
- Project and Construction Management
- Fabrication and Installation Inspection
- Operation and Maintenance Manuals
- Floating LNG/LPG
- Start-up/Commissioning Assistance

60+

Terminals

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Engineering Services

Terminal Simulation Studies

INTECSEA performs terminal simulation and throughput studies to determine the optimal location of a marine terminal and to verify that the terminal has the required throughput capacity. Using proprietary software, analyses are performed to determine the effect on terminal efficiency of tanker transit time as influenced by sea conditions and operating procedures. The outcome of these types of analyses is the number of berths or mooring systems, volume of storage required, and size and number of tankers.

Mooring Systems Selection Evaluation

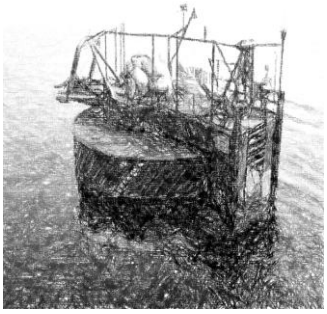
Conceptually, a choice must be made between a compliant mooring and a fixed berth. Moorings can be single point (SPM) or multi-point (CBM); whereas a fixed berth may be a jetty or a sea island connected to onshore facilities by marine pipelines or pipe trestles. The choice depends mainly on exposure to wind, wave and current conditions, navigational aspects, and water depth, and the range of tanker sizes and products to be handled. Evaluation and design are performed using commercial as well as INTECSEA proprietary software for analysis of the mooring system, underbuoy hoses, floating hoses, flexible pipe risers, and mooring hawsers.

Terminal Siting Studies

INTECSEA determines optimum marine terminal locations based on the results of hydrographic surveys and expected tanker size distribution to determine vessel draft, motions and maneuvering considerations to define the Mooring and Maneuvering Area (MMA), safety fairways, and anchorage areas. In addition, routing of the pipeline(s) and locating the Pipeline End Manifold (PLEM) are significant factors in siting offshore terminals. INTECSEA has established processes and procedures for these tasks to assure efficient and reliable results.

Engineering Design

INTECSEA design typically includes hydraulic analysis to determine pipeline and hose system diameters and other component sizing, surge analysis to simulate valve closure and resulting pressure surges, pipeline and PLEM designs, planning and supervision of model testing in ship model test basins of the selected mooring concept, design of fixed berth or other fixed structure, preparation of Invitation to Bid (ITB) documents, development of terminal operating and maintenance procedures including inspection and maintenance, design of support facilities such as hose handling facilities and small boat harbors, design of associated onshore facilities and tie-in to tank farm facilities, and preparation of emergency response procedures and procurement of emergency response equipment such as oil spill containment and fire fighting systems.



Special Studies

In addition to engineering design and construction management services, INTECSEA provides technical expertise in custody transfer, crude quality monitoring, leak detection, supervisory control, and the development of operating and maintenance procedures. INTECSEA has designed maintenance facilities which include hose handling facilities and small boat harbors.

Other specialized engineering support INTECSEA can offer includes assistance in permitting and compliance with regulatory requirements, risk and environmental impact studies, and HAZOP assessments. In addition to crude oil and petroleum products, INTECSEA has expertise in terminals for handling Liquid Propane Gas (LPG) and various types of slurries.

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Project Experience

Project: **Unocal Erawan SPM Terminal**
Client: **Unocal**
Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Erawan Field, Thailand

SPM and Pipeline Design Basis, SPM Location Evaluation, Conceptual PLEM Design, and SPM Performance Specification

The Unocal Erawan Field Floating Storage and Offloading (FSO) system operated by Unocal Thailand since 1981 was removed from service, towed to a shipyard, and refurbished in 1996 as part of a life extension project. A newbuilt Single Point Mooring (SPM No. 2) and Pipeline End Manifold (PLEM) was installed to moor a temporary FSO. Upon completion of the life extension work, the Erawan FSO was towed back to the Erawan Field and permanently moored to SPM No. 2. The existing SPM was refurbished and is being maintained as a back-up mooring system.

Project: **Mobil Zafiro SPM Project**
Client: **Mobil Equatorial**
Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Bioko Island, Equatorial Guinea

Engineering and construction management of the SPM terminal project

The Mobil Zafiro SPM serves as the export terminal for the Zafiro Producer Floating Production, Storage and Offloading (FPSO) system located offshore Bioko Island, Equatorial Guinea, West Africa. The terminal consists of an SPM for 300,000 dwt tankers, a 3.4 km long 40-inch diameter crude oil loading pipeline from the FPSO, PLEMs and 20-inch diameter flexible hose risers at the SPM and FPSO, and a 1.8 km long 10-inch diameter crude oil transfer pipeline from the nearby Jade Platform. The SPM terminal, which is located in 136 meters water depth, replaces the use of tandem mooring export procedures previously utilized at the spread moored FPSO.

Project: **Cabot Port Dickson CBM Terminal Project**
Client: **Cabot**
Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Port Dickson, Malaysia

Onshore and Offshore Survey Support, Preliminary and Detailed Engineering Design, System Operation Manual, Specification and Drawing Preparation

A Conventional Buoy Mooring (CBM) for 100,000 dwt tankers and an associated pipeline system were installed in the Port Dickson area, west coast of Peninsular Malaysia in a water depth of 32 m. The terminal was designed to offload hydrocarbon feedstock to the CABOT carbon black facility. The mooring system consisted of six spread mooring buoys with chain anchor legs attached to piled anchors. The CBM and PLEM were connected to the onshore plant by 20-inch and 10-inch 8 km long offshore pipelines and 1.3 km long onshore pipelines. The 10-inch pipeline serves the system by delivering water to the PLEM subsea pig launchers to initiate pipeline flushing operations. Onshore pipelines incorporated two 17 m risers and major road, railroad, and swamp crossings. Onshore facilities included a booster pump station, pig launcher and receiving facilities, pigging water storage tank, and water pump station.

Project: **CPC Shalung SPM No. 2 Terminal**
Client: **Chinese Petroleum Corporation**
Phases: IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Taoyuan, Taiwan

Detailed engineering design of a new 42-inch pipeline to replace an existing 42-inch pipeline and PLEM

The Shalung SPM No. 2 crude oil import marine terminal is located on the northwest coast of Taiwan. The terminal consists of an existing 42-inch pipeline and an SPM for offloading 250,000 dwt tankers. The SPM is located approximately 5 km offshore in a water depth of 35 m. INTECSEA was responsible for the detailed engineering design of a new 42-inch pipeline to replace an existing 42-inch pipeline and PLEM.

Project: **DSI Manavgat SPM Terminal Project**
Client: **Ministry of Public Works of the Republic of Turkey**
Phases: IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Manavgat River Mouth, Turkey

Technical support, engineering, and construction supervision for the marine terminals covered by an EPC contract which was awarded to a Turkish construction consortium.

DSI has completed construction of a fresh water intake, treatment and a pair of SPM terminals near the mouth of the Manavgat River on the Mediterranean coast of Turkey. The SPM terminals include four 48-inch export pipelines (two pipelines to each SPM terminal), approximately 3 km each, and two SPMs located in a water depth of 80 meters for tankers 250,000 dwt tankers. Fresh water will be exported to other countries.

Project: **Lasmo Cohasset/Panuke SPM**
Client: **Lasmo Nova Scotia, Ltd. And Pan Canadian Nova Scotia, Ltd**
Phases: IDENTIFY EVALUATE DEFINE EXECUTE OPERATE

Cohasset/Panuke Field, Nova Scotia

Project engineering, fabrication, and installation inspection services

As part of the Lasmo Nova Scotia Ltd. Cohasset/Panuke Field Development located in 70 m water depth off the eastern coast of Canada, INTECSEA was responsible for the conversion and installation of an existing CALM SPM for use with a permanently moored FSO in very severe offshore weather conditions.

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About INTECSEA

(click here to learn more about INTECSEA)

For more than 25 years, INTECSEA has provided frontier technology leadership for the energy industry's most challenging offshore field development and pipeline projects.

INTECSEA was formed in 1984 and provides design for floating systems, risers, pipelines, and subsea engineering and construction management services within the global WorleyParsons Group. INTECSEA has established operating offices in Houston, Kuala Lumpur, Singapore, Delft, Rio de Janeiro, Jakarta, Angola, Cairo, St. John's, Perth, Melbourne, and London. (see all WorleyParsons' locations)

INTECSEA's major areas of expertise include deepwater subsea and floating production systems, marine pipeline and riser systems, Arctic pipelines, marine terminal systems, and Arctic structures. Additional areas of expertise include flow assurance and operability, marine surveys, marine operations, and offshore equipment design.

A History of Innovation and Benchmark Achievements…

SUBSEA

- Deepest Subsea Production
- Longest Oil Tieback
- Longest Gas Tieback
- First Subsea Allocation Flow Meters
- First 15,000 psi Subsea Trees
- First Electrically Heated Pipe-in-Pipe Flowlines
- Deepest Multiphase Subsea Pumps
- First Super Duplex Umbilical
- First Diaphragm Chemical Injection System

RISERS

- First Pipe-in-Pipe Steel Catenary Riser
- First Reeled Steel Catenary Riser
- The Deepest Steel Catenary Risers
- Most Shallow Catenary Riser
- Largest Diameter Flexible SCR Joint
- First SCRs on an FPSO
- Most Direct Vertical Access Risers
- First GOM Free-Standing Riser

FLOATING SYSTEMS

- Largest FPSO
- Deepest TLP at Time of Installation
- Deepest SPAR at Time of Installation
- Most Installed TLPs
- First Deepwater FPU Operated with a Drilling Tender
- Most Types of Floating Systems

MARINE PIPELINES

- Deepest S-lay Pipeline
- Deepest J-lay Pipeline
- Longest Offshore Pipeline
- First Offshore Arctic Pipeline
- First Arctic Pipeline Leak Detection System
- First Piggable Wyes
- First Arctic Pipeline Bundle

(for more capabilities information click here)

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Global Reach,
Local Knowledge,
Global Solutions

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