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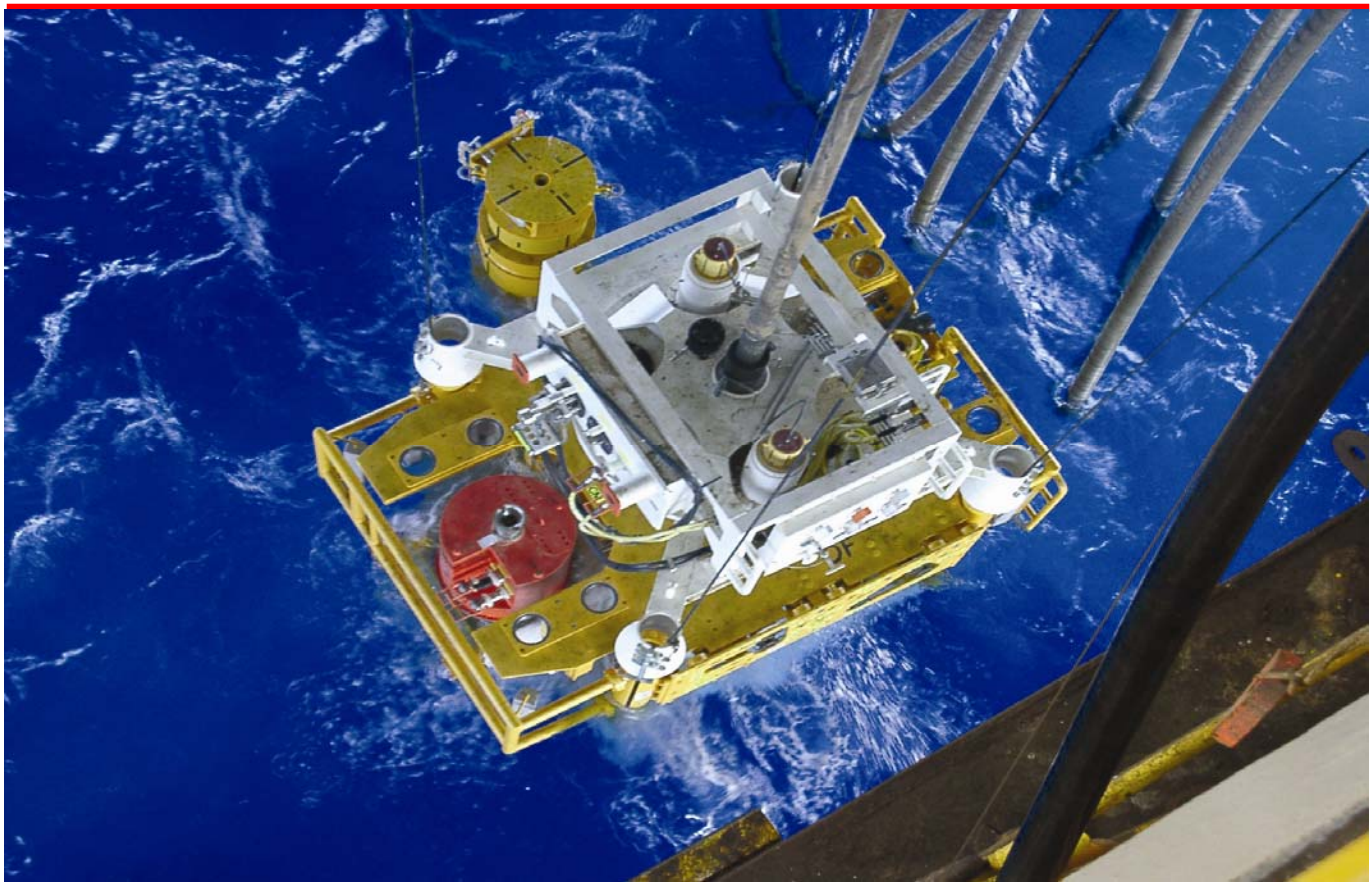
Subsea Production Systems

Capability and Experience



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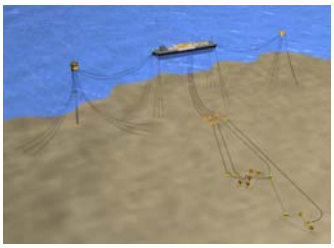
Overview



General

INTECSEA, headquartered in Houston, Texas was formed in 2008 by the joining of heritage Intec with heritage Sea Engineering to provide a consolidated floating systems, risers, pipelines and subsea engineering and construction management services within the global WorleyParsons Group. INTECSEA has established operating offices in Houston, Texas; Kuala Lumpur, Malaysia; Singapore; Delft, The Netherlands; Rio de Janeiro, Brazil; Perth and Melbourne in Australia; and London, UK.

INTECSEA's major areas of expertise include 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. This document describes INTECSEA's capabilities and experience specific to Subsea pipelines and Structures.

INTECSEA provides engineering and project management services through eight worldwide offices to the international oil and gas industry. INTECSEA's expertise includes Arctic and deepwater pipelines, marine production risers, subsea systems, flow assurance and operability and floating production systems for offshore field developments. With over 800 professional staff, it is the largest assembly in the industry of dedicated deepwater specialists in an independent consulting engineer. The company's services range from technical and economic feasibility studies, through FEED and detail engineering, procurement and construction management to commissioning and operations support. It is the only company that has engineered and executed spars, TLPs and semisubmersible facilities. INTECSEA has a specialty in pioneering achievements; including the world's deepest subsea production, longest subsea tieback, deepest and longest offshore pipelines and risers and largest FPSO. INTECSEA is a WorleyParsons Group company. The Group uniquely offers complete project expertise from subsea wellhead through onshore processing and distribution.

Engineering design and construction management of subsea production systems has been one of the INTECSEA core business areas since the early days of the company. Although many other engineering disciplines and other business areas such as systems engineering, flow assurance and operability, offshore terminals, floating production systems and LNG have been added to the INTECSEA range of project services. Subsea production systems, along with marine pipeline and riser systems remain a major INTECSEA business area.

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INTECSEA's primary emphasis has been on subsea applications in frontier areas, notably deepwater field developments; and for unusual service conditions such as high pressure and high temperature, aggressive fluids and subsea processing. These specialized technologies are firmly established within INTECSEA's extensive project experience including practical design and installation technology required for cost effective completion and operation of offshore field development facilities worldwide.

INTECSEA's capability in subsea production systems has become industry leading as functional requirements for deepwater concepts have evolved. In 1985 INTECSEA initiated several joint industry studies to develop solutions for deepwater production in the Gulf of Mexico and the North Atlantic, in which as many as 15 oil and gas companies participated. In 1992 INTECSEA was selected to manage the first phase of the DeepStar Program sponsored by Texaco. In this role INTECSEA has actively participated in the efforts of a multi-discipline industry group to extend the technological production limits and develop solutions for subsea operations in water depths to 10,000 feet and greater.

As a result of these initiatives, the offshore industry has moved to subsea system configurations that are now more modular and allow greater flexibility with reduced risk. These concepts have been implemented worldwide. INTECSEA has been able to validate these concepts via many subsea deepwater project applications. This includes the Gyrfalcon Field single well subsea tie-back utilizing the first 15,000 psi subsea production tree, the Canyon Express project which used a common gas flowline system to develop Total's Aconcagua, BP's King's Peak and Marathon's Camden Hills fields in water depths of 7,250 feet, BG's Scarab/Saffron and Simian/Sienna gas developments offshore Egypt that are the longest tiebacks at 74 miles.

For these projects INTECSEA's scope of work included:

- Development of field layout and operating philosophies
- Assess operability and conduct flow assurance analyses
- Develop technical definition for procurement and fabrication of subsea components
- Manage factory acceptance and system integration tests
- Supervise offshore installation, start up and commissioning
- Manage Deepwater Contractor (Scarab/Saffron)

Through a partnering agreement with Shell Offshore, INTECSEA has been directly involved with Shell's deepwater subsea developments in the Gulf of Mexico and West Africa. The most visible of these has been the Mensa Field Development consisting of three gas wells in 5,400 feet of water and tied back 68 miles to a shallow water platform. INTECSEA has provided deepwater expertise for Exxon's developments in the Gulf of Mexico and West Africa, including Diana, Diana South, Zafiro, Kizomba A/B/C and Erha.

These projects have provided an opportunity to learn first hand what works, what does not, and where the technical and construction risks are and how to mitigate them. Many lessons have been learned that are of ultimate benefit to all of INTECSEA's subsequent deepwater subsea field development projects.

INTECSEA has emerged as an industry leader in deepwater subsea technology services and has been instrumental in a number of world class field development projects including:

- Anadarko, Dominion and Kerr McGee MC920 Independence Hub – Gulf of Mexico
- Exxon Angola Block 15
- Chevron Agbami – Offshore Nigeria
- Burullus Gas West Delta Deep – Offshore Egypt
- Total Aconcagua – Gulf of Mexico
- BP Mardi Gras – Gulf of Mexico
- ONGC G1 and GS15 – Offshore India
- Chevron Gorgon – Offshore Western Australia
- Chevron Blind Faith – Gulf of Mexico
- BHP Billiton Shenzi – Gulf of Mexico

INTECSEA can offer installation solutions through an affiliated company, Heerema Marine Contractors, HMC. The company has two dedicated deepwater construction vessels, Balder and Thialf, each with DP capability. These vessels can carry out mooring line installation, installation of subsea structures, e.g. manifolds or integrated production systems, and perform J-lay pipeline installation inclusive of in-line structures, valves and other appurtenances, without interruption to the laying process.

INTECSEA can perform subsea projects in all of its offices. Knowledge, experience, lessons learned, and staff are shared among the offices so that the most current technology and project execution techniques are available for solving deepwater challenges.

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Subsea Production System Project List
Capabilities and Resources

INTECSEA Subsea Production System project list is summarized below.

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Ichthys	INPEX	Large gas field subsea development to a floating process unit and export pipeline	Ongoing
Kipper	ESSO Australia	FEED for subsea development and tie-back to an existing platform	Ongoing
Kikeh	Murphy Sabah Oil Co Ltd	Engineering service support to Murphy during execution of the Kikeh oil and gas field at deepwater of offshore Sabah; The project will require in excess of 30 wells to develop the reservoirs.	Ongoing
G1 and GS15 India	Clough / ONGC	Technical advisor, representing ONGC, for execution of G1 and GS15 subsea fields to shore	Ongoing
Shenzi Gulf of Mexico	BHP Billiton	Pre-feasibility and feasibility engineering for multi-well development in 4,300 ft of water; Detail design oversight and construction management during execution.	Ongoing
Frade Brazil	Chevron	FEED for subsea development tied back to an FPSO; Engineering support during execution.	Ongoing
Tubular Bells and Puma Gulf of Mexico	BP	Concept study of alternate concepts for fields with high pressure / high temperature wells and challenging seabed topography.	Ongoing
Blind Faith Gulf of Mexico	Chevron	Concept and FEED for development of a multi-well field in 7,000 ft of water.	Ongoing
Simian/Sienna Offshore Egypt	British Gas	Concept, FEED and execution of multi-well fields that are tied-in to the Scarab/Saffron flowline	Ongoing
Addax Projects	Addax	Engineering support for multiple subsea developments	Ongoing
Agbami Field Development Offshore Nigeria	Star Deepwater Petroleum (Chevron)	FEED for the development of EPIC bid packages for an FPSO and subsea systems including flowlines, risers and export loading systems for a major field development in 1,400 m of water.	Ongoing
Sequoia	Rashpetco/ Burullus	Joint venture to provide extra exploitation of a shared field with different partners and varying water depths. Procurement support provided.	0ngoing

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
SOI Gulf of Mexico Subsea Partnering Agreement	Shell Offshore, Inc.	Engineering assistance in the development of deepwater Gulf of Mexico oil and gas prospects using subsea production technology	Ongoing
Antan Nigeria	Fred Olsen Production a.s	Detailed Design, Flow Assurance, Procurement, installation and commissioning support of an offloading system from a new FPSO to a calm buoy located in 40 m water depth offshore Nigeria. The Design included: 3 flexibles risers from FPSO to subsea PLEM 2 flexibles risers from subsea PLEM to Calm buoy 2 subsea PLEMs 28" oil pipeline. On completion of the design, work continued with Procurement support, installation contractor selection and verification work, onsite installation support for all designed components followed by onsite commissioning support for the entire FPSO export system.	Ongoing
Cavendish Area Development Southern North Sea	R.W.E.	FEED design for a high temperature (100°C), high pressure (385 bar) 6” Corrosion Resistant Alloy clad 45km flowline and 45km 10” gas export pipeline with associated 3” piggyback to BS:EN 14161. The pipeline was in 30m water depth and was located in the southern north sea in an environmentally sensitive area. In addition to the design of the pipelines, flow assurance was also performed.	Ongoing
Gaza Marine Eastern Mediterranean	B.G.	Concept selection, Pre-FEED and FEED for The Gaza Marine gas field development which is located in the eastern Mediterranean Sea, some 36 km offshore from the nearest coastline in 800m of water. Gas from the field could be exported to either Egypt or Israel both routes contained many geophysical and geological features making for some complicated routing. In addition to the design of the pipelines, flow assurance and survey support was performed.	Ongoing

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Algeria to Spain pipeline	MEDGAZ	FEED and post FEED of two 24” 200 km (124 miles) high-pressure, Ultra-deepwater (2000m) gas pipelines, designed to deliver up to 16 billion m3/year of Algerian natural gas under the Mediterranean Sea to Spain and other European markets. Design included a large geophysical and geological survey and routing operations as well as lateral buckling from both external and internal pressure effects, two landfalls and multiple long deep water spans requiring VIV fatigue analysis.	Ongoing
COOTS pre-FEED / UK North Sea (or UKCS)	Progressive Energy / Centrica joint venture	Pre-FEED engineering services for a 500 km long 28” carbon steel pipeline system transporting liquid Carbon Dioxide from a new build power station in the Tees Bay area to an existing platform in the Northern North Sea where is will be used for EOR activities. Workscope included conceptual engineering and construction feasibility for the 28” mainline and 18” spurline to a mid-line aquifer including routing assessment, landfall conceptual design, materials selection, definition of controls requirements, flow assurance and hydraulic analysis, and conceptual design of the associated subsea facilities, in-line tee assemblies, subsea structures, tie-in manifold and aquifer injection manifold, the preparation of Level 2 cost estimate and schedule, Environmental Statement and documentation in support of the Pipeline Works Authorization.	Ongoing

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Nile West Delta Sector		The Scarab Saffron development consisted of 8 gas producing wells in water depths of between 480 and 630 m tied back via 10" flowlines (between 2 an 10 km in length) to a pair of subsea manifolds. The manifolds gathered the gas for export via two 20" trunk lines (approx 20km long) to a subsea PLEM in 95m WD. The Gas was then transported back to shore via a 36" and a 24" export pipeline (approx 60 km). The system required glycol to be injected into the wells to mitigate hydrate formation; this was done via a 4 inch pipeline connecting an onshore glycol plant to a subsea distribution assembly (SDA). The SDA then feeds the glycol, along with electrical and hydraulic fluids to the wells via umbilical lines. The deep water connections to wells, manifolds and SDA were all driverless and used Cameron vertical connector system. The next phase of work (2002-2004) was the development of the Simian, Sienna and sapphire fields. The simian\ Sienna fields were approximately 100 km offshore in water depths. Between 600 and 1300 m WD, Sapphire was in the range of 300 to 440 m WD. These developments consisted of a further 16 Wells tied back to 4 manifolds, and 2 SDAs; it required the installation of two 20-inch and one 24 trunk line to bring the gas back to the PLEM (via 2 new TIMs) before export to shore via the existing 36" line. An unmanned platform was built approximately 40 Km offshore for methanol / hydraulic storage and pumping and to distribute the electrical supply. The system also had two 4" Glycol lines running from shore to the SDAs and a further two 4" Vent lines running back from the SDAs to the TIMs. The WDDM Phase 4 project was a further expansion of the infrastructure to bring on a further 8 wells in the Scarab/Saffron vicinity. These new wells were tied back (using similar 10inch flowlines and umbilicals) to existing export trunk lines via two new manifolds, and a new SDA in the Scarab Saffron Hub area.	Ongoing

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
		During each of these phases INTECSEA performed flow assurance, conceptual and FEED design, system specification, and technical assurance for the EPIC stage.	
Husdrubal	BG Tunisia	Detailed design of an 18" multiphase pipeline system. The pipeline runs from a new build offshore platform in 68 m water depth to the new onshore Hasdrubal Terminal, in Tunisia. The original scope included the detailed design of the 18" riser, 106 km of offshore pipeline including the shore approach and landfall, and 3km of onshore pipeline. The multiphase fluid was at high temperature, sour service and highly corrosive, so the riser and first 10 km of offshore pipeline were lined with Alloy 625. An expansion spool was included in the first 10 km section to help mitigate the risk of lateral buckling, and a Z spool used to connect the CRA lined section with the carbon steel section, which runs into the terminal. Post detailed design work has included procurement, quality surveillance activities, follow-on engineering, engineering support and vessel/site rep services during the construction phase. As a further addition to the original contract, INTECSEA performed the FEED and detailed design for a 16 km 18" Gas Export pipeline, transporting sales quality gas from the Hasdrubal terminal to a metering station and connection to the Tunisian national grid.	Ongoing
WDDM Phase VI and VII	Burullus	Further development of West Delta Deep Marine, FEED through Detail Design including offshore support	Ongoing
WDDM Phase IV	Burullus	Infill wells for Simian/ Sienna/ Sapphire, brought on stream ahead of schedule.	2008
Vega B	Edison	Preparation of a study for various development options, based on a varied number of wells, over a number of step-out distances. Performed FEED for the selected option for a multi-well floating production facility in the Mediterranean	2007
Okoro	Afren Energy	Flowline and riser analysis for the field. Technical Assurance support.	2007
Bouri	Eni	Performed Basis of Design for FSO and Moorings, FEED through to Functional specifications for new build FSO and Moorings	2007

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Gimboa	Norsk Hydro	FEED studies for Flowlines, Umbilicals, Risers and Marine Installation (FURMI)	2007
Gaza Marine	Gaza Development	Conceptual design and FEED for a 55 km tieback from a 5 well development	2007
Independence Hub Gulf of Mexico	Anadarko, Dominion, Kerr McGee	Concept, FEED and Execution support for multi-operator, multi-field development in 9200 ft of water	2007
Ultra Deepwater Study India	ONGC	Conceptual and FEED for future deepwater developments in over 4500 ft of water	2007
Rosetta	Rashpetco	FEED through development and execution of gas field in Egypt	2007
Unocal Venture 76 Alliance Houston, TX	Unocal 76	Engineering assistance in the development of Gulf of Mexico oil and gas prospects using subsea production technology	2006
Kizomba Satellites	ExxonMobil	Engineering support during concept, FEED, and execution phase	2006
Kizomba C Angola	ExxonMobil	Engineering support during concept, FEED, and execution phase	2006
Erha Nigeria	ExxonMobil	Engineering assistance in the deepwater development in 1200 m of water; Two drill centers, 24 wells producing to a new build FPSO linked to a single point mooring offloading mooring - offloading buoy	2006
Erha North Nigeria	ExxonMobil	Engineering support during concept, FEED, and execution phase	2006
Bosi Nigeria	Exxon	Engineering support during concept and FEED	2006
Kizomba B Angola	ExxonMobil	Engineering assistance in the deepwater development in water depths to 1350 m; The development will feature a TLP linked to an FPSO from which 23 subsea water injection and gas injection wells will be operated	2005
K2 Gulf of Mexico	Eni	FEED and execution support for a multi-well tieback	2005
K2 North Gulf of Mexico	Anadarko	FEED for a multi-well tieback	2005
Scarborough Australia	BHP Billiton	Pre-feasibility engineering	2005
Woodside Frame Agreement Australia	Woodside Energy Ltd.	Various study work	2005
Stybarrow Australia	BHP Billiton	Pre-feasibility, FEED and execution	2005

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PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Gorgon Western Australia	Chevron	Pre-feasibility engineering for field development and pipeline to shore to feed an LNG plant	2004
Kizomba A Angola	ExxonMobil	Engineering assistance in the deepwater development in 1350 m of water; The development will feature a TLP linked to an FPSO and multiple subsea wells	2004
Scarab/Saffron Field Development Offshore Egypt	Burullus Gas Company	Concept, FEED and execution; Deepwater Managing Contractor (DMC) for an 8 well subsea field development in 700 m of water with dual 52 mile long pipelines to an onshore gas processing plant	2004
Canyon Express Gulf of Mexico	TotalFinaElf, BP, Marathon	FEED and procurement support for subsea equipment and flowlines for 3 gas fields: Aconcagua (TFE), King's Peak (BP), and Camden Hills (Marathon); Dual 12-inch flowlines transport gas approximately 48 miles	2004
Pohokura Australia	Shell Todd Oil Services Ltd.	Screening peer assistance	2003
Zafiro SEA West Africa	ExxonMobil	Provide technical assistance for the specification, design, fabrication, and installation of the 20 subsea trees and 5 production manifolds to be installed in the Zafiro South Expansion field by June 2003	2003
Marshall, Mica, Madison Gulf of Mexico	ExxonMobil	Development and construction/installation management of the subsea control system for the Marshall, Mica, Madison tiebacks	2003
Gorgon Field Western Australia	Texaco	Texaco/Mobil partnership to develop subsea concept for 4 large gas fields; Subsea tie-back to a shallow water platform, 1,600 ft to 4,000 ft of water	2003
Subsea Equipment Standardization Study Gulf of Mexico	Chevron	Study of subsea development tied back to 3 deepwater facilities in order to identify and standardize equipment	2003
Development Study Eastern Gulf of Mexico	Anadarko	Conceptual development study of a long distance deepwater gas tieback of 4 fields to a deepwater facility	2003
Lobito Tomboco	Chevron	Subsea Development in +/- 1300 ft of water tied back to the Benguela Belize Compliant Tower	2002
M4 and F23SW Subsea Development	Sarawak Shell Bhd	Conceptual and detail engineering design	2001
Europa Field Gulf of Mexico	Shell Deepwater (SDDSI)	GOM oil development in 4,000 ft of water; Multi-well subsea manifold with dual 20 mile PIP insulated flowlines tied back to MARS TLP	2001

PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Macaroni Field Gulf of Mexico	Shell Deepwater (SDDSI)	Three subsea oil wells with a cluster manifold in GB 602 tied back 12 miles to the Auger TLP	2001
Zafiro Development Phases 1 to 4 West Africa	Mobil Equatorial Guinea	Phase 1 to 4 consisted of 22 subsea wells tied back to a FPSO System; Initial production was achieved within a record 18 months after discovery; A gas lift system, an SPM and a floating flare were also installed.	2000
Gyrfalcon Gulf of Mexico	Total Offshore Production Systems (TOPS)	The Gyrfalcon Project consists of a 2.7 mile, single well tie-back from an existing high pressure, deep gas well located in Green Canyon 20 in 885 ft of water. The Gyrfalcon Project includes the following industry firsts: • First 15K subsea tree • First 15K chemical injection system • First 15K Super Duplex umbilical and first flexible flying leads rated 12,500 psi • First 12.2K flexible riser (5-inch ID)	2000
Kuito West Africa	Chevron Cabinda Gulf Oil	Preliminary Engineering of phases 1B and 1C options for 16 well tie-backs to an existing FPSO in 1,300 ft of water	1999
State of the Art Subsea Configurations	Chevron	Engineering study to review the state of the art in subsea configurations	1999
MODU SIMOPS Installation Safety	Chevron	Engineering study to evaluate impact on cost and schedule using simultaneous operation installation methods	1999
Pluto Subsea Development Gulf of Mexico	Mariner Energy, Inc.	Concept and FEED engineering for a 29-mile subsea tie-back	1999
Angus Field Gulf of Mexico	Shell Deepwater (SDDSI)	Four subsea oil wells with an 8-slot cluster manifold tied back 12 miles with two 8-inch multi-phase flowlines to the Bullwinkle Platform	1999
Angola Block 15 Phases I, II and III West Africa	Exxon Upstream Development Company	Development and costing of concepts for the deepwater development, including subsea configuration, flowlines, umbilicals and risers to an FPSO and DDCV	1999
Dulcimer Field Development Gulf of Mexico	Mariner Energy, Inc.	Fast track development of gas condensate field requiring project management, flow assurance, detailed design, inspection, construction planning and installation supervision for GB 236 Platform using dual 4.5-inch steel flowlines; The 14-mile dual 4-inch steel flowline tied back to a Chevron platform in Garden Banks Block 236	1999
West Delta Deep Marine Field Development Egypt	British Gas	Risk assessment and forward planning for field developments; This work was subsequently followed by the FEED for the subsea development	1999

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PROJECT NAME/ LOCATION	CLIENT	PROJECT HIGHLIGHTS	FINISH DATE
Valve Leak Testing Procedures	Shell Offshore, Inc.	Developed testing procedure and a MS Excel/97/Visual basic program for leak testing of Underwater Safety Valves (USV) and Surface Controlled Subsurface Safety Valves (SCSSV)	1999
Gemini MC292 Gulf of Mexico	Texaco	Texaco/Chevron partnership to develop a 3-well cluster tie-back to VK 900; Dual 12-inch gas flowlines, 28 miles long in 3,400 ft of water	1999
Fuji Development Phase I and II Gulf of Mexico	Texaco	Subsea tie-back to EPS in 4300 ft of water	1999
Mensa Field Gulf of Mexico	Shell Offshore, Inc.	GOM high rate gas well development in 5,300 ft of water with a 60-mile tie-back to shallow water platform	1999
Matterhorn Gulf of Mexico	Elf Exploration, Inc.	Conceptual engineering of field development options for 4 subsea oil and gas wells and manifolds in 3,300 ft of water, tied back to a host platform 12 miles away in 1,000 ft of water	1998
Malampaya Philippines	Cooper Cameron	System design engineering support for Cameron's subsea system	1998
MC 764 (King) Gulf of Mexico	Shell Offshore, Inc.	Conceptual engineering for 1 to 3 wells in 3,285 ft of water tied back 3 miles to Mars TLP	1998
Standardized Deepwater Subsea System	Unocal	Prepared functional specifications for standardized subsea tree, wellheads and completions	1998
Boomvang Gulf of Mexico	Total Offshore Production System (TOPS)	Feasibility and preliminary engineering for 3 to 8 subsea wells and cluster manifolds in 3,800 ft of water tied back 40 miles to the Snapper Platform	1998
Ursa Field Gulf of Mexico	Shell Offshore, Inc.	System engineering and cost estimating for concept selection for field development, including up to 2 satellite subsea wells in 4,030 ft of water	1998

HPHT Experience

INTECSEA's primary emphasis has been on pipeline applications in frontier areas, notably deepwater and Arctic environments; and for unusual service conditions such as high pressure and high temperature, aggressive fluids and complex fluid rheology. These specialized technologies are firmly established within INTECSEA's extensive project experience including practical design and installation technology required for cost effective completion and operation of marine pipeline facilities in all environments. In addition to deepwater pipeline applications, INTECSEA has also been responsible for many long distance, large diameter transmission pipeline projects and conventional offshore platform-to-platform pipeline projects.

INTECSEA past and present projects include conventional pipelines, long distance and deepwater pipelines, high pressure/high temperature production flowlines, insulated production flowlines and offshore arctic pipelines.

PROJECT NAME/LOCATION	CLIENT	PROJECT DESCRIPTION	FINISH DATE
Blind Faith Gulf of Mexico	Chevron	Concept screening and cost estimate, Pre-FEED and FEED of subsea tie-backs to various host options via PIP SCRs. Local host is in 7000 feet of water depth. FEED study evaluates SCR and hybrid riser options. The SCRs are very challenging with features such as high temperature, high pressure, Pipe-In-Pipe and sour service. SCRs with Lazy-wave tails were assessed to establish SCR feasibility. Based on the results of feasibility study, the appropriate riser concept will be selected and preliminary riser design performed. T=300°F, P=1000bar	Ongoing
Tubular Bells Conceptual Engineering Study	BP	Conceptual design study for flowlines associated with the Tubular Bells subsea system. The Tubular Bells field is located in Mississippi Canyon, Blocks 725 and 726 in approximately 4,500 ft water depth in the Gulf of Mexico. Some of the reservoirs in this conceptual study have pressures and temperatures above 21,000 psi and up to 340°F. These are termed Extra High Pressure High Temperature (XHPHT).	Ongoing

PROJECT NAME/LOCATION	CLIENT	PROJECT DESCRIPTION	FINISH DATE
Cavendish Area Development Southern North Sea	R.W.E.	FEED design for a high temperature (100°C), high pressure (385 bar) 6" Corrosion Resistant Alloy clad 45km flowline and 45km 10" gas export pipeline with associated 3" piggyback to BS:EN 14161. The pipeline was in 30m water depth and was located in the southern north sea in an environmentally sensitive area. In addition to the design of the pipelines, flow assurance was also performed.	2007
Cili Padi Lateral Buckling Design	Shell	Technip Malaysia which was contracted by Shell SSB to perform the conceptual and detailed engineering for the required facilities for the Cili Padi Gas Field Development. Technip engaged INTECSEA to assist them to perform the conceptual and detailed engineering for the lateral buckling mitigation for the high pressure and high temperature 30km, 16" Cili Padi pipeline to F23R-A platform. INTECSEA scope was divided into two phases, i.e., Conceptual and Detailed Engineering Phase. The conceptual phase scope covered the assessment of the potential risk associated with lateral buckling and preliminary assessment of the mitigation method to mitigate the risk. The detailed engineering phase the scope covered a detailed 3D Finite Element Analysis to verify the acceptability of the proposed mitigation method. To mitigate the risk associated with "unplanned" lateral buckles, measures involving the introduction of controlled buckle formation along the pipeline route using the "Bend on Trigger" concept developed by Shell. To meet the stringent acceptance criteria, performance of numerous finite element analyses to assess the formation of intended and unintended buckles were carried out. The FEA work involves the detailed modeling of the soil–pipe interaction, planned and unplanned buckle behavior, trawl gear interaction and full route simulations including possible pipeline walking. Fatigue analysis was performed for the trigger sections. The results of the sensitivity analyses will then be used for the probabilistic assessment to demonstrate that the robustness of the	2007

PROJECT NAME/LOCATION	CLIENT	PROJECT DESCRIPTION	FINISH DATE
		developed buckling strategy for the Cili Padi pipeline system. The temperatures and pressures are as follows: Cili Padi: T=120 DegC P= 212 barg	
Pluto Deepwater Flowline Study	Woodside	Conceptual design and flowline routing study for dual insulated gas flowlines connecting a series of subsea manifolds to a shallow water platform located approximately 18 km east of the development in approximately 140 m minimum water depth and 1050 m maximum water depth. The flowline diameters being considered during this phase ranged from 12-inch to 20-inch. The objective of the study was to identify all the technical challenges that the project would need to manage for the flowline design that traversed a steep slope (local gradients as high as 45 deg) and transported high temperature, high pressure production to the shallow water platform. P= 6650 psi (458 barg)	2006
Rhum Field Development Offshore Aberdeen	Iranian Oil Company	The Rhum field is a high temperature, high pressure reservoir (705 bar and 130°C), corrosive (6.5% CO2 and 10ppm H2S) gas field development requiring exotic materials, long distance PIP systems and subsea High Integrity Pressure Protection System (HIPPS).	2005
Gyrfalcon Gulf of Mexico	Total Offshore Production Systems (TOPS)	The Gyrfalcon Project consists of a 2.7 mile, single well tie-back from an existing high pressure, deep gas well located in Green Canyon 20 in 885 ft of water. The Gyrfalcon Project includes the following industry firsts: • First 15K subsea tree • First 15K chemical injection system • First 15K Super Duplex umbilical and first flexible flying leads rated 12,500 psi • First 12.2K flexible riser (5-inch ID)	2000

PROJECT NAME/LOCATION	CLIENT	PROJECT DESCRIPTION	FINISH DATE
Mobile Bay Flowlines Gulf of Mexico	Exxon USA	Flowline systems for high pressure, high temperature sour gas using special corrosion resistant alloy materials and pipe-in-pipe insulated flowlines and risers. T=300°F, P=750bar	1999
Mensa	Shell Offshore	This technically challenging Subsea project includes continuous choking at the wellheads and transporting gas at high pressure through a 12-inch flowline. The project is located in the GoM Mississippi Canyon area in 5400 ft of water depth. P=690bar	1999
Fairway Field Flowlines Mobile Bay Offshore Alabama	Shell Oil Company	Four 6-inch inconel lined flowlines for transport of high pressure, high temperature, and sour gas from satellite wellhead platforms to central production platform.	1991
South Pars Phases 17 and 18	IOEC (via the National Iranian Oil company)	Two 32inch wet sour gas pipelines, each with a 4inch piggy back service pipeline, are running from the platforms South Pars Deck (SPD) 23 and SPD 24 to the shore at Assaluyeh. The platforms are located approximately 100km away from the Iranian Southern Coast. Onshore, the pipelines are routed to the facilities located approximately 4.5km inside Iran. The average length of the onshore and offshore pipelines equals 111km. Each 32inch pipeline is designed for a flow rate of 1000 MMSCFD and a maximum temperature of 90 degrees Celsius. The basic and detail design is partly performed by INTECSEA and partly by IOEC.	2006 - 2008

Work performed by personnel now employed by INTECSEA:

PROJECT NAME/LOCATION	CLIENT	PROJECT DESCRIPTION	FINISH DATE
Jade Field Development North Sea	Phillips	Dr A. Walker and Mr P. Cooper were engineers responsible for Phillips UK supervising and assessing the 16/20” x 18km pipe-in-pipe design work by JPK and EMC, and the spool design work by APA. In addition, they undertook the review and verification of complete Jade pipeline design, the detailed verification of lateral buckling analysis performed by JPK and EMC. Pressure was 160 barg and temperature 160 C.	2005
Erskine Replacement Pipeline North Sea	Texaco	Dr A. Walker and Mr P. Cooper performed the verification of the 16/24” x 30km PIP and provided specialist engineering including strain based analysis and design. Pressure was 118 barg and temperature 150 C.	2000

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Subsea Production System Project Experience

INTECSEA has provided subsea systems engineering and project management services for numerous clients and many deepwater field developments. These projects include flow assurance analyses, system concept designs, cost analyses, concept evaluations, systems selection and other systems engineering and project execution activities. Project responsibility ranges from conceptual design studies through field installation, commissioning, start-up and operating manuals. INTECSEA has experience with all aspects of a subsea production system, including:

- Subsea System Architecture
- Manifolds and Templates
- Trees, Chokes and Wellheads
- Control Systems and Umbilicals
- Subsea Distribution Systems and Flying Leads
- Intrafield Flowlines and Jumper/Connector Systems
- Production Riser Systems
- Completion and Workover Riser Systems
- Intervention, Maintenance and Repair Systems

Subsea projects typically include all these aspects, requiring knowledge and experience in each of these areas to develop the best possible development strategy and production system architecture for any given set of production parameters. INTECSEA's knowledge in all aspects of subsea production and of the various interfaces and interdependencies allow INTECSEA to design the production system from an overall system level. INTECSEA designs the overall system during concept and front-end engineering; and develops functional specifications for the components within the framework of the system design. For most projects, equipment suppliers perform the detailed design of the components and INTECSEA reviews the detailed design as part of construction and project management.

Subsea System Architecture

INTECSEA will consider many options for the subsea system architecture for a development during the concept engineering phase. The reservoir, fluid composition, seafloor environment and client preferences constrain the type of concepts that are reasonable. Preliminary decisions are made concerning the number of wells and drill centers, and their phased timing. Existing infrastructure and possible host facilities are identified. Operability, flow assurance, integration with the planned drilling and completion program, and suitability of installation methods are considered. To satisfy these requirements, the subsea system architecture may include or omit various equipment, such as manifolds, and use various concepts such as templates, cluster wells, daisy chaining, and flowlines with in-line sleds to tie-in wells. INTECSEA will evaluate the concepts for operability, and technical and economic feasibility. New technology and methods for enhanced recovery are considered.

The viable concepts are then developed to produce field development and drill center layouts to show the position of the equipment on the seabed. This integrates the tasks of routing the flowlines and umbilicals, and considers the installability of all items.

This development of subsea system architecture is fundamental for early evaluation of developments where there is significant uncertainty about the reservoirs, fluids, or viability of new technology. INTECSEA has provided these services on numerous projects such as Chevron Gorgon, BP Tubular Bells and Puma, Anadarko/Dominion/Kerr McGee MC 920 Independence Hub, and Burullus Scarab/Saffron.

Manifolds and Structures

INTECSEA has developed, prepared and overseen engineering designs for various subsea manifolds, templates, umbilical termination assemblies (UTA) and pipeline end termination assemblies (PLET). These items can be very simple or extremely complex. The efficient packaging of the various valves, connectors/hubs, production fluid piping, instrumentation, structural supports and foundations is important because of the limitations of installation methods and vessels.

INTECSEA has performed preliminary and detailed design on numerous projects. Several projects include:

- BHP Billiton Shenzi: INTECSEA developed and detailed for fabrication multiple duel header manifolds and gas lift distribution units.
- Shell Malampaya: INTECSEA provided assistance in the detail design and analysis to the manufacturer of this large manifold.

Trees, Chokes and Wellheads

INTECSEA is very familiar with the multiple tree and wellhead designs that are manufactured by industry, and provides guidance in selecting the configuration that is best for project specific conditions. Parameters that are considered include:

- Pressure and temperature rating
- Tree type and purpose: Vertical bore (conventional) or Horizontal (spool) -- standard and enhanced versions; production from reservoirs or injection of water and/or gas
- Guideline or guideline less
- Materials of construction, corrosion protection and insulation
- Size and type of choke valves, chemical injection control and possible metering, annulus access
- Interface coordination of profiles and funnels between the wellhead, tree, and BOP stack
- Interface coordination of the production control system, including instrumentation
- Interface coordination of the subsurface completion
- Installation and work over tool systems and their associated control systems
- Development of procedures for life of field operations: valve testing and override, inspection, maintenance and retrieval

Control Systems and Umbilicals

During concept definition, INTECSEA, in coordination with the client, develops the control system philosophy and requirements, which results in the number of control and instrumentation functions, the composition of umbilicals and sizes of the umbilical conduits. INTECSEA then prepares functional specifications and monitors detailed designs performed by equipment suppliers. During manufacturing, INTECSEA provides quality assurance and inspection services during all phases of manufacturing and installation.

As with the trees, many parameters are considered for each project. For deepwater developments the control system is usually electro-hydraulic multiplexed (EH-Mux) to efficiently handle the multiple trees and to enable a suitable valve closure time. Certain applications may use either direct or pilot hydraulic systems.

The topside components must be integrated into the host platform control system to ensure safe and reliable operations. The umbilicals have both a dynamic section in the water between the topside of the host and the mudline, and a static section on the mudline. The dynamic section requires particular attention for the proper design to prevent fatigue and clashing with the risers. The umbilical has additional variables to be chosen: Are the conduits to be steel tubes or hoses? What is the number and size of the wires for

power and signal? Will fiber optics be used? How many tubes are common / dedicated / redundant / spare? The interfaces between the umbilical and other equipment, such as trees and manifolds, needs to be carefully determined to establish the requirements for the umbilical termination assemblies (UTA), subsea distribution units (SDU), and the flying leads that connect everything.

INTECSEA has provided these services on numerous projects both at a preliminary and detailed level. Several projects include Shell Mensa, Exxon Mica, Total Canyon Express, Chevron Gorgon, Burullus Scarab/Saffron, Chevron Blind Faith, Atwater Valley Producers MC 920 Independence Hub, and Chevron Frade.

Intrafield Flowlines and Jumper Systems

INTECSEA is recognized as a world leader in the engineering and construction management of deepwater flowlines and risers. INTECSEA also is an expert in other technically challenging flowline applications, such as in the arctic environment. This expertise is applied in the offshore field developments. Jumpers are used to connect the flowlines to the manifolds and trees.

INTECSEA provides preliminary and detail design and analysis of jumpers. INTECSEA is experienced with both horizontal and vertical connector/jumper systems, including inverted “U”, stab and hinge over, and pull-in methods for both rigid and flexible pipe. INTECSEA is familiar with the various connector systems produced by the industry, both collet and split flange types, and the tooling systems associated with them.

Some of the projects on which INTECSEA has provided jumper design and analysis includes Total Canyon Express, which included flow meters, integrated into the jumpers, and Burullus Scarab/Saffron which had up to 20-inch jumpers.

Completion and Workover Riser and Control Systems

INTECSEA has experience with a variety of completion and workover and control riser systems. These systems are used to land the tree and its completion string, as well as provide access during workover operations.

INTECSEA also has expertise in handling and developing horizontal tree systems, their installation and work over equipment acquired from Total Canyon Express and from Burullus Scarab/Saffron.

Intervention, Maintenance and Repair Systems

INTECSEA can produce ROV operating manuals including requisite tooling packages with vendor specifics, technical specifications for ROV torque tool operations, and hot stab operating criteria including pressure and fluid volume requirements.

If required, INTECSEA subsea engineers are available to assist or represent clients during offshore work coordination including troubleshooting and supervising offshore subsea system repairs, well workovers, remote control system failures, umbilical problems, subsea tree valve failures, manifold replacement, flowline connections and well jumper handling.

Subsea Production Systems Engineering Services

INTECSEA offers subsea development project services that encompass the full cycle of project development and execution from concept through commissioning.

Overall Field Development Planning

INTECSEA provides total system reviews, cost estimates, screening studies, trade-off evaluations and economic impact analyses for an entire field development or single well subsea tie-backs. INTECSEA's extensive subsea knowledge and experience base enables INTECSEA to evaluate and optimize developments from subsystem elements (trees, manifolds, flowlines, umbilicals, risers, controls and surveys) to a complete system overview.

System Engineering

To “get it right,” INTECSEA endeavors to execute its engineering services with appropriate attention to inter-disciplinary system aspects that affect our work and that our work affects. System engineering can be broadly described as the collection of tasks and work areas that assure that the total system has been defined, conceived, and executed with appropriate attention to system requirements and constraints. System Engineering personnel work closely with client personnel, functional leaders (reservoir, drilling and completions, operations, flow assurance, project engineering, etc.), other contractors and with the entire project team throughout the life of the project to coordinate, assist, and/or execute system-wide work activities.

System engineering work areas may include:

- Project-wide Design Basis development and maintenance
- System-level P&ID and PFD oversight and approval
- System-level functional specification development
- Functional interface issues (client, contractors, project) management
- System cost and economics assessment
- Risk and reliability assessments and oversight
- Design Review leadership and/or participation
- HAZOP and HAZID leadership and/or participation

Conceptual, Preliminary and Detailed Engineering Design and Analysis

During conceptual design, INTECSEA generates initial field design scenarios sufficient to develop cost estimates and to evaluate system performance. The concepts facilitate project management strategies for cost, schedule and execution. This is accomplished by utilizing high-level technical reviews of the project and identifying key components for development.

The next step is preliminary design. INTECSEA defines system configurations and field layouts, generates design specifications, develops project work scopes, vendor and bid packages, and provides vendor/client liaison and component recommendations.

The final stage is detailed engineering. In this phase, INTECSEA supports and performs engineering tasks to finalize the design, reviews the design for functionality, and continues client and vendor liaison to facilitate project execution.
INTECSEA tracks the project and oversees factory acceptance tests and site integration testing, and identifies and develops tooling, lifting equipment and operating procedures necessary for field installation and operation.

Typically, INTECSEA assumes responsibility for detailed project engineering and construction management including the following tasks:

- Operability and Flow Assurance Evaluation
- Material and Equipment Specifications
- Control System and Umbilical Configuration, Specifications and Procurement
- Subsea Tree Specifications, Bid Evaluation and Procurement
- Subsea Manifold Specifications, Bid Evaluation and Procurement
- Subsea Flowline and Pipeline Design, Specifications, Bid Evaluations and Procurement
- Installation Procedures and Supervision
- Start-Up and Commissioning Procedures and Assistance
- Operating and Maintenance Manuals

Specifications, Work Scopes and Bid Packages

INTECSEA is frequently responsible for subsea engineering coordination, flowline system design, installation bid package preparation, project schedule coordination, technical interfacing of various contractors/vendors, construction management, system operating procedures and operations manuals. INTECSEA has provided these services in numerous projects including Total Canyon Express, Burullus Scarab/Saffron, Mobil Zafiro, Chevron Agbami, ExxonMobil ERHA and Kizomba B.

Fabrication Liaison and Factory Acceptance Testing

INTECSEA provides factory inspection and monitoring during the manufacturing of subsea equipment including flexible pipe, umbilicals, trees, manifolds and control systems. INTECSEA also monitors line pipe coating, stalking and spooling of steel flowlines.

Similarly, INTECSEA witnesses factory acceptance testing on behalf of its clients. Following these services, INTECSEA coordinates the logistics for packing and transport of equipment to the installation site.

System Integration Test (SIT) and Offshore Services

INTECSEA offshore services consist of hardware integration and field installation, which includes developing system integration test procedures. INTECSEA plans and implements the SIT including trees, manifold and umbilical termination structures in cooperation with drilling and completion activities. Field assistance is also provided during offshore installation of subsea trees and associated equipment.

INTECSEA is capable and qualified to follow the field development or subsea tie-back through offshore installation. INTECSEA provides procedures to facilitate installation, develop installation scenarios and contingency plans, liaison between vendors and client during installation planning, and provide skilled personnel to witness and oversee equipment load out and installation.

Project Management, Cost and Schedule Tracking and Project Execution

Depending on client requirements, INTECSEA can provide personnel resources to an integrated client team, or provide a complete project management team to execute a project. For instance, INTECSEA was part of the Mobil Zafiro Project Team and had specific responsibility for the subsea systems and infield flowlines, as well as overall project interface coordination.

INTECSEA provided complete project teams with project management responsibilities to projects such as Mariner Pluto, Mariner Dulcimer, Shell Rocky, Oryx Mississippi Canyon 401/445, TOPS Gyrfalcon and others. For each project, INTECSEA was responsible for:

- System Design
- Functional Specifications Preparation
- Bid Document Preparation
- Tender Review
- Contract Negotiation
- Detailed Design Review
- Interface Coordination and Control

- Quality Assurance and Inspection
- Cost and Schedule Control
- Document Control
- Installation Supervision
- Commissioning Assistance
- Operating Manuals

Manuals, Illustrations and Animated Videos

INTECSEA has enhanced capabilities to develop and publish system operating manuals and illustrate field developments utilizing 3-dimensional graphical programs resulting in studio quality color illustrations. Additionally, INTECSEA creates animated videos that simulate offshore installation and operational sequences.

Operating Manuals

- Field, Reservoir and Location Data
- Subsea Equipment and Performance Data
- Control System Performance
- Start-Up Procedures
- Normal Production Operations
- Shut Down Procedures
- Testing Procedures

Illustrations

- Field Layouts
- Host Facilities (Platform, FPSO, Semi, TLP, Tower, SPAR, etc.)
- Subsea Hardware (Trees, PLEMs, ROVs, Jumpers, and ROV Panels)

Animated Videos

- Subsea System from ROV Perspective
- Installation Sequences
- ROV Intervention/Maintenance Operations
- Retrieval/Replacement Operations

Previous Projects

INTECSEA has prepared three-dimensional color field development animated videos including installation sequences for the following projects:

- Shell Offshore, Inc. Mensa Subsea Field Development Project
- Texaco Fuji Subsea Field Development
- Reading and Bates DEVCO Boomvang Subsea Field Development
- British Petroleum Northstar Project
- Texaco/Mobil Gorgon Subsea Field Development

INTECSEA has published Operations Manuals for:

- Total Canyon Express
- Burullus Scarab/Saffron
- Shell Macaroni Subsea Field Development
- Shell Angus Subsea Field Development
- Shell Europa Subsea Field Development
- Mobil Zafiro Subsea Field Development
- LL&E Garden Banks Subsea Field Development
- LL&E Eugene Island Subsea Field Development

Project Resumes

- BG Scarab/Saffron Subsea Development
- Agbami Field Development
- Canyon Express Project
- ExxonMobil ERHA Subsea Project
- ExxonMobil Kizomba B Subsea Project
- Independence HUB (MC920) Subsea Field
- K2 Field Development Production Fac
- ChevronTexaco Blind Faith Field
- BHP Billiton Shenzi Field Development
- Burullus Gas Simian Sienna
- Casino Field Development
- Jabiru 7ST, 11ST and 13ST

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Project Profile

Project: Independence HUB (MC920) Subsea Field Development

Client: Anadarko, BHP Billiton, Dominion E&P, and Kerr McGee

Location: Atwater Valley, Lloyd Ridge, and De Soto Canyon, Gulf of Mexico

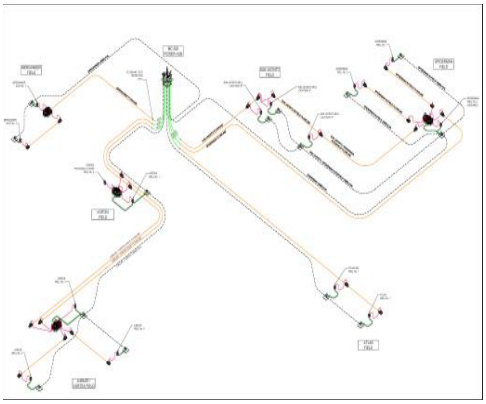
Scope: Flowlines, trees, manifolds, jumpers, control system, umbilicals, flow assurance and operability at Concept and FEED level

Timeframe: January 2004 - August 2005

Project Value: USD 1.9 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



Anadarko Petroleum Corporation, BHP Billiton Petroleum, Dominion E&P, and Kerr-McGee Oil and Gas Corporation are developing a number of deepwater gas discoveries in the eastern Atwater Valley, western Lloyd Ridge and southwestern De Soto Canyon Areas of the Gulf of Mexico, approximately 120 nautical miles southeast of Venice, LA.

The fields included in the development are the Spiderman, Atlas, Jubilee, Vortex, San Jacinto and Merganser fields, and comprise up to 15 subsea wells producing dry gas situated in water depths between 7900 ft and 9200 ft.

Production from all fields will be routed back to a centrally located floating host facility via a subsea production, flowline, and riser system. The facility will process the production and provide compression as required for export.

The subsea flowlines are planned to be uninsulated and will consist of five individual flowline and riser systems radiating from the central host.

SCOPE OF SERVICES:

INTECSEA's scope included:

Flowlines, trees, manifolds, jumpers, control system, umbilicals, flow assurance and operability.

- Subsea system architecture & engineering
- Design or pipe system
- Design of PLETs, in-line sleds, manifolds
- Preparation of technical documents for major services & components not yet procured
- Review & pre-qualification of vendor equipment for record depth developments
- Offshore planning of installation
- Preparation of bid packages for equipment and services

Concept Engineering began in January 2004 and FEED was completed in October 2004. Project support continued through August 2005.

INTECSEA
WorleyParsons Group

Project Profile

Project: K2 Field Development Production Facilities

Client: ENI Petroleum

Location: Green Canyon Block 562, Gulf of Mexico

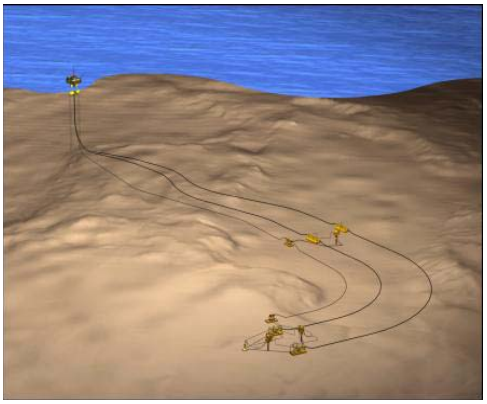
Scope: INTECSEA's scope was to support the design and implementation of the K2 Flowlines, Risers, PLETs and Structures, Umbilical(s), and Remote Controls at FEED and Detail Design level.

Timeframe: January 2004 - August 2005

Project Value: USD 1.9 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The K2 Project is to tie-back 3 – 5 subsea oil wells in approximately 3,900 to 4,500 of water depth of Green Canyon Block 562 of the Gulf of Mexico back to Marco Polo TLP the host facility The subsea system consists of two well centers tied back to the TLP via dual pipe-in-pipe insulated flowlines in a piggable loop configuration and steel catenary risers (SCRs). One umbilical will be suspended from the host facility in a dynamic catenary configuration.

SCOPE OF SERVICES:

INTECSEA's scope was to support the design and implementation of the K2 Flowlines, Risers, PLETs and Structures, Umbilical(s), and Remote Controls, as well as:

- Route and hazard survey
- Subsea system architecture and engineering
- Design of pipe-in-pipe system
- Preparation of technical documents for major services and components not yet procured
- Review and acceptance of vendor equipment designs
- Analysis of risers and riser hang-off structures and necessary documentation
- Interface control
- Flow assurance design
- Operability review
- Risk assessment and peer review
- Offshore planning, installation and commissioning
- Permit document preparation and support
- Generating of operating manuals

INTECSEA
WorleyParsons Group

Project Profile

Project: ExxonMobil Kizomba B Subsea Project

Client: ExxonMobil Development Company

Location: Kizomba Field, Angola

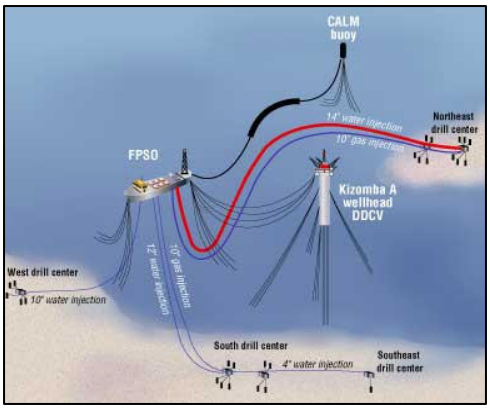
Scope: INTECSEA has provided technical assistance with all aspects of the development including concept definition, field layouts, equipment definition, etc.

Timeframe: January 2002 - July 2004

Project Value: USD 2.2 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The Kizomba field is located offshore Angola in Block 15 in water depths of 3,300 ft to 4,300 ft. The field is a large multiple well developments and may involve a TLP with surface wellheads and subsea trees tied back to an FPSO.

SCOPE OF SERVICES:

INTECSEA has provided technical assistance with all aspects of the development including concept definition, field layouts, equipment definition, bid reviews, controls engineering and systems philosophies.

INTECSEA
WorleyParsons Group

Project Profile

Project: ExxonMobil — ERHA Subsea Project

Client: ExxonMobil Development Company

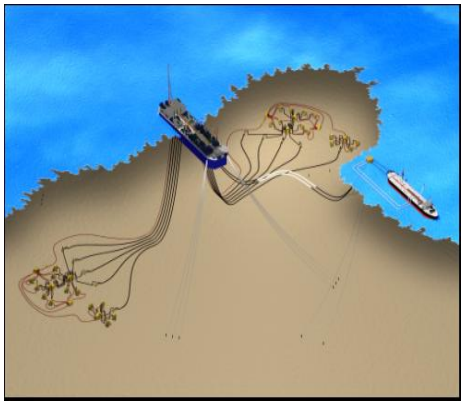
Location: ERHA Field, Nigeria

Scope: INTECSEA has provided technical assistance with all aspects of the development including concept definition, field layouts, and equipment definition.

Timeframe: June 2001 - December 2006

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The ERHA field is located offshore Nigeria in Block OPL 209 in water depths from 1000m to 1200m. The development consists of two drill centers with a planned total of 24 wells (15 producers, 5 gas injectors and 4 water injection). The produced fluids will routed to a new build FPSO using 10-inch and 6-inch (test) flowlines with Steel Catenary Risers (SCRs) and then onwards to a single point offloading buoy via 2 x 22-inch offloading lines. First Oil is planned for 2005.

SCOPE OF SERVICES:

INTECSEA has provided technical assistance with all aspects of the development including concept definition, field layouts, and equipment definition. INTECSEA personnel have been Responsible for bid reviews, technical clarifications, bidder recommendation, and contract negotiations. Contract management will be ongoing through First Oil.

INTECSEA personnel will be part of the client Project Management Team managing an Engineering, Procurement, and Construction (EPC) contract for subsea equipment. INTECSEA will be directly responsible for Subsea Systems Engineering, Subsea Control System Engineering, and Interface Management.

INTECSEA
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Project Profile

Project: Burullus Gas Simian/Sienna

Client: Burullus Gas

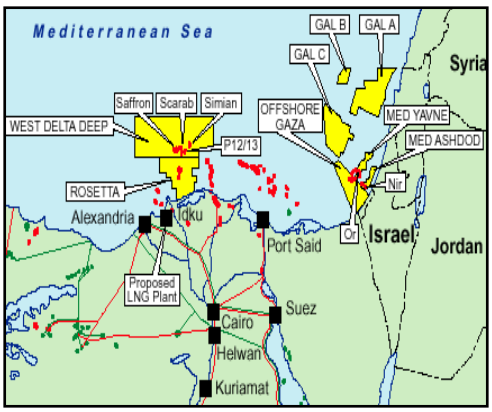
Location: Simian and Sienna Fields, Egypt

Scope: INTECSEA performed the Concept Definition Studies and the subsequent FEED phase including the detailed flow assurance work for the project.

Timeframe: August 2002

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



INTECSEA provided technical support to Burullus Gas Company for the development of the Simian and Sienna gas fields.

Simian and Sienna gas fields are located in the West Delta Deep Marine Concession offshore Egypt to the northeast of the Scarab/Saffron fields. The water depths are between 500 m and 1,100 m. The center of Simian/Sienna is approximately 104 kms from shore.

The initial development consists of four subsea wells in Simian and two subsea wells in Sienna. A 5-slot manifold in the north will commingle the flow from the two Sienna wells and two Simian wells and will connect via an 8 km, 20-inch pipeline to a 4-slot manifold in the south which will commingle the flow from two further Simian wells. The gas will flow from the southern manifold via a 26-inch pipeline 40 km to a shallow water PLEM which is part of the Scarab/Saffron development. The gas then flows into the Scarab Saffron export pipelines with Scarab/Saffron gas to shore via a 36-inch and 24-inch pipeline.

SCOPE OF SERVICES:

INTECSEA performed the Concept Definition Studies and the subsequent FEED phase including the detailed flow assurance work for the project. Burullus Gas created a team of subsea specialists consisting of Burullus Gas personnel and INTECSEA engineers to oversee the technical aspects of the EPIC contract from ITT until first gas. The anticipated duration was 36 months.

INTECSEA
WorleyParsons Group

Project Profile

Project: Canyon Express Project

Client: TotalFina Elf in partnership with BP and Marathon Oil

Location: Aconcagua, King's Peak, and Camden Hills Fields, Gulf of Mexico

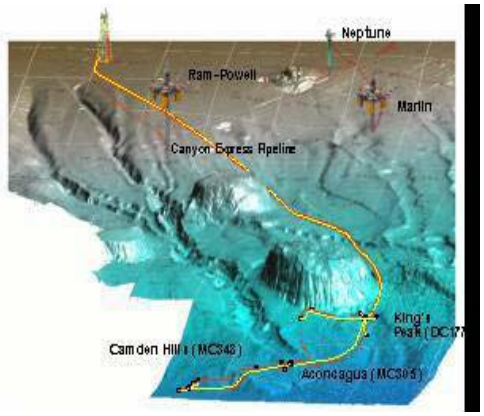
Scope: FEED and Project Execution for the complete subsea development. Preparation and evaluation of ITB packages for all subsea equipment and installation, etc.

Timeframe: December 1999 - December 2001

Project Value: USD 9 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The Canyon Express Project is a first-of-a-kind industry initiative to jointly develop three area gas fields in the Gulf of Mexico, operated by different companies through a common production gathering system. The three separate fields include Aconcagua in Mississippi Canyon 305 operated by TotalFina Elf, King's Peak in Desoto Canyon 177 and 133, and Mississippi Canyon 173 and 217 operated by BP, and Camden Hills in Mississippi Canyon 348 operated by Marathon Oil. Peak gas production from the three fields will be approximately 500 MMSCFD. A gathering system consisting of dual 12-inch pipelines will transport the gas from the three fields approximately 55 miles to Williams Canyon Station Platform located in Main Pass 261. The deepest portion of the Canyon Express pipeline system is in the Camden Hills area where the water depth is approximately 7,250 ft. Water depth at the Canyon Station Platform is 299 ft.

The Canyon Express Pipeline System must be able to produce the three fields under different operating regimes and varying production rates from multiple zone completions without any field taking on the performance risk of another field. Accurate flow allocation is therefore essential, which resulted in the use of subsea multiphase flow meters on each of the subsea wells. Multiple well manifolds and infield flowlines have been eliminated through the use of inline well tie-in sleds installed as part of the flowlines. These inline tie-in sleds have been designed to accommodate individual subsea wells. As a result, flowline routing is dictated in large part by the location of the subsea wells. Wells are connected to the flowline tie-in sleds using conventional inverted 'U' shaped jumpers.

SCOPE OF SERVICES:

- FEED for the complete subsea development including:
  - Flow Assurance and Systems Engineering and Subsea Equipment Specifications
  - Flowline Design and Routing
  - Steel Catenary Risers at the Virgo Platform
  - Subsea Well Tie-in Jumpers
  - Subsea Control System, Umbilicals, and Multiphase Flow Meters
  - Intervention/Workover Control System
- Project execution support through installation of start-up
- Preparation and evaluation of ITB packages for all subsea equipment and installation
- Review of design and installation engineering
- QC services and management of offshore surveys
- Equipment qualification
- Procurement, expediting, SIT/EFAT, construction management, operator training and rig modification support
- O&M, IMR and intervention manuals
- Post installation start-up and operations support
- O&M, IMR and Intervention Manuals

INTECSEA
WorleyParsons Group

Project Profile

Project: Casino Gas Project
Client: Santos
Location: Otway Basin, Australia
Scope: Conceptual Engineering / pre-FEED, FEED, and Detailed Design

Timeframe: November 2003 - Ongoing
Project Value: Total installed cost - AU$ 250M; Contract value - AU$ 1M
Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate

The Casino field is located in permit VIC/P44 in the Otway Basin offshore from western Victoria. The water depth is approximately 70 m.

INTECSEA provided support for evaluation of hull structure studies and flow assurance and evaluated some key technologies being considered for the Blind Faith Field Development. Studies were performed for:

The development is expected to comprise the following:

- Two development wells, drilled with a semi-submersible MODU and completed subsea
- Approximately 38 km of offshore pipeline and electrohydraulic umbilical. The pipeline size is expected to be in the range of 10-inch to 12-inch Nominal OD. The umbilical may be bundled with the pipeline or laid separately and buried
- HDD shore crossing
- Approximately 12 km of onshore pipeline and umbilical from the HDD shore crossing to the existing Iona plant
- Casino gas contains approximately 94% methane, less than 1% CO_2 and minimal associated hydrocarbon liquids

SCOPE OF SERVICES:

- Concept development of subsea tree, controls, umbilical and pipeline
- Contracting strategy and project execution plan
- Operations review
- HAZOP
- Project risk assessment
- Early preparation of the installation tender packages and specifications
- Tender evaluation
- Offshore route survey supervision
- Offshore pipeline route selection
- Project budget proposals for financial investment decision
- Full commercial, quality and technical support

INTECSEA
WorleyParsons Group

Project Profile

Project: Chevron Blind Faith Field Development

Client: Chevron

Location: Blind Faith Field, Gulf of Mexico

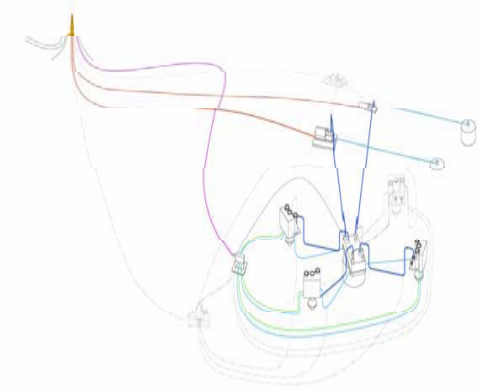
Scope: INTECSEA assisted Chevron in evaluating field development options and supported their steps through the concept selection process, FEED and detailed design.

Timeframe: March 2004 - Ongoing

Project Value: USD 1.9 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



Chevron's Blind Faith field is located in Mississippi Canyon Block 696 at a water depth of approximately 7,000 ft. Blind Faith is an oil system with a high pressure reservoir (approximately 12,500 psi WHSITP) and the potential of high temperatures at the wellhead in excess of 250° F. The high pressure and high temperature production in 7,000 ft water depth make Blind Faith a technically challenging project. In fact, these parameters put design requirements at the leading edge of industry supplier capability.

SCOPE OF SERVICES:

INTECSEA assisted Chevron in evaluating field development options and supported their steps through the concept selection process. Following concept selection, INTECSEA worked as part of Chevron's FEED Team to develop the technical requirements for the Blind Faith subsea system. INTECSEA provided support as part of the Client Team managing detailed design and construction. INTECSEA provided:

- In pre-concept, a detailed cost estimate
- In concept selection, identification of viable field development options, development of these options for evaluation, detailed cost estimates for each option, evaluation of the options and selection support to be carried into FEED
- During FEED, INTECSEA developed functional and technical requirements for the subsea systems and provided bid support during bid evaluations
- In the execution phase, INTECSEA is providing technical support, procurement management, and construction oversight

INTECSEA's scope of work includes all subsea systems: trees, manifolds, controls, umbilicals, jumpers, PLETs, flowlines and risers.

INTECSEA provided support for evaluation of hull structure studies and flow assurance and evaluated some key technologies being considered for the Blind Faith Field Development. Studies were performed for:

- Artificial lift
- Subsea multiphase pumps
- Subsea multiphase flowmeters
- High Integrety Pipeline Protection Systems (HIPPS)
- Electrical flowline heating
- Subsea distribution for chemical injection

INTECSEA
WorleyParsons Group

Project Profile

Project: BHP Billiton Shenzi Field Development

Client: BHP Billiton

Location: Shenzi Field, Gulf of Mexico

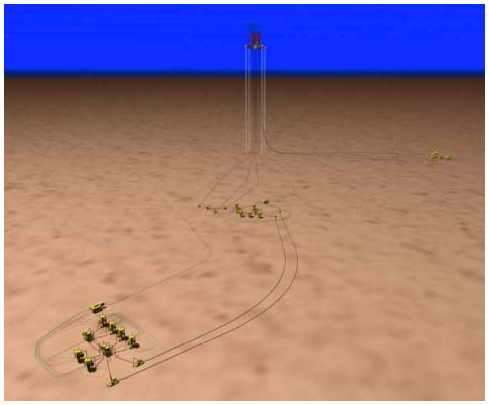
Scope: INTECSEA assisted BHPB in evaluating field development options and supported their steps through the concept selection process

Timeframe:

Project Value:

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



BHP Billiton (BHPB) Shenzi field is located in Green Mississippi Canyon Blocks at a water depth of approximately 4,000 ft. Shenzi is an oil system with delivery capacity of 100M BOPD and 50 MMCFPD of associated gas production. The overall development consists of three remote drill centers flowing back to a Tension Leg Platform (TLP) where the production steam will be processed to sales quality product.

SCOPE OF SERVICES:

INTECSEA assisted BHPB in evaluating field development options and supported their steps through the concept selection process. Following concept selection, INTECSEA worked as part of BHPB's FEED team to develop the technical requirements for the Shenzi subsea system. INTECSEA is now providing support as part of the Client Team, managing detailed design and construction. INTECSEA provided:

Throughout pre-FEED, the team narrowed the flowline, riser and subsea systems options and operational requirements.

During FEED selection, INTECSEA identified viable field development options and developed these options for detailed cost estimates and development schedule. Also, during FEED the team supported the BHPB Production Operations Group through HAZOP.

During final design engineering, INTECSEA developed functional and technical requirements for the subsea systems, flowlines and risers and provided bid support during bid evaluations.

In the execution phase, INTECSEA is providing technical support, package management, and construction oversight.

INTECSEA's scope of work includes all subsea systems: trees, manifolds, controls, umbilicals, jumpers, PLETs, flowlines and risers.

INTECSEA
WorleyParsons Group

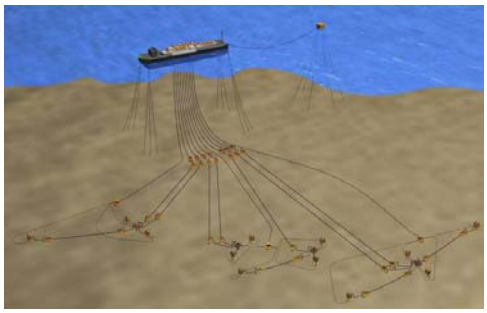
Project Profile

Project: Agbami Field Development
Client: Chevron
Location: Agbami Field, Nigeria
Scope: FEED for the complete subsea development

Timeframe: October 1999 - Ongoing
Project Value: USD 11.8 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The Agbami Field Development is located approximately 70 miles offshore Nigeria, approximately 220 miles southeast of Lagos. The discovery is located in OPL Block 216 with water depths ranging from 4,200 ft to 5,400 ft. Like many other West African discoveries, it is primarily an oil field with associated gas. ChevronTexaco partners include Nigerian National Petroleum Company, Famfa Oil and Petrobras.

The Agbami Field Development concept is based on a new build Floating Production Storage and Offloading (FPSO) system, a nearby Dry Tree Unit (DTU) and subsea wells. The FPSO will be a spread moored monohull vessel with a storage capacity of 2 mm bbls, and will have a process facility designed for 200,000 bopd, 260,000 MMSCFD of gas and 120,000 bwpd. The export system will consist of a single point mooring system with multiple flexible pipe offloading lines extending from the FPSO to the SPM.

The Agbami Development will use flexible pipe risers to bring production from the subsea wells. The subsea system is configured as a four-well cluster with a central manifold to commingle production from each well. The manifold will be tied back to the SCRs by dual 10-inch flowlines, which are insulated with cast syntactic foam insulation. The flowlines are connected to the manifold using conventional rigid “U” type jumpers.

SCOPE OF SERVICES:

FEED for the complete subsea development including:

- Concept development
- Field layout
- Preliminary subsea equipment design
- Front end engineering FPSO vessel design
- Mooring analysis and preliminary design
- Riser selection, analysis and preliminary design
- Flowline analysis and preliminary design
- Subsea equipment selection
- Preliminary installation analysis and planning
- Preparation of functional specifications
- Preparation of bid packages
- Bid technical evaluation

INTECSEA
WorleyParsons Group

Project Profile

Project: Scarab/Saffron Subsea Development

Client: Burullus Gas (British Gas, Edison International, and Egyptian General)

Location: Scarab and Saffron Fields, Egypt

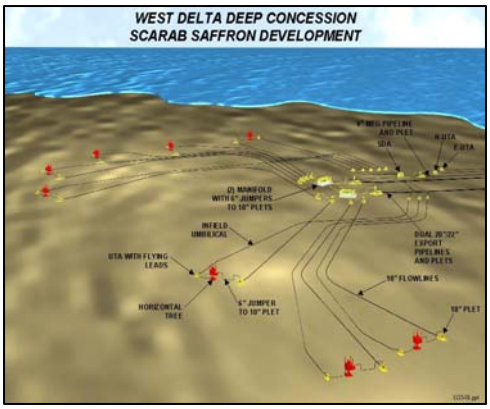
Scope: FEED engineering and the preparation and evaluation of ITT packages, and management of the contracted suppliers of services and equipment.

Timeframe: November 1999 - March 2003

Project Value: USD 31.8 million

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate



The Bechtel INTEC Consortium, designated as the Deepwater Managing Contractor (DMC), is managing the Scarab/Saffron Field Development Project on behalf of Burullus Gas Company. The Scarab and Saffron Fields are located in the West Delta Deep Marine Concession offshore Egypt approximately 90 km north of the Nile River Delta.

The water depth in the Scarab/Saffron Development area ranges from 250 m to 850 m. The development will consist of eight wells that will produce 600 MMSCFD of gas via a dual export pipeline system to a new onshore gas processing plant. Following treatment, the gas will be exported via a new pipeline to a tie-in to the Egyptian National Transmission System.

Burullus Gas Company executed the management contract with the DMC November 30, 1999. The management center of the contract was initially in Houston, transferred to London and moved to Cairo, Egypt during the procurement and installation phases.

SCOPE OF SERVICES:

INTECSEA was responsible for performing FEED engineering and the preparation and evaluation of ITT packages, and management of the contracted suppliers of the following services and equipment:

- Marine survey
- Pipeline material purchase
- Pipeline installation and shore crossing
- Subsea deepwater equipment supply
- Deepwater equipment installation
- Manifolds, infield flowlines and infield umbilicals
- Purchase of electrical and hydraulic umbilicals
- Purchase of infield umbilicals
- Installation of electrical and hydraulic umbilicals

The project began in November 1999. An SIT program was completed in August 2002 and installation/hook-up was completed in early 2003. First gas was March 2003.

INTECSEA
WorleyParsons Group

Project Profile

Project: Jabiru 7ST, 11ST and 13ST
Client: BHP Billiton
Location: Timor Sea, East Timor
Scope: Detailed Design & Engineering and Program Management Consultant

Timeframe: February 1995 - 1996

Phases:

1	2	3	4	5
Identify	Select	Define	Execute	Operate

In order to extend the life of the Jabiru Field in the Timor Sea, in 1996 BHPP tied-in one new well to the production facilities and reconnected an existing well which had been disconnected in 1989. At the same time, all existing subsea hydraulic control umbilicals were replaced.

The Jabiru riser turret mooring (RTM), in 120 metres water depth, has only four slots for tie-in of subsea wells, all of which were being utilized at the time of the project. In order to tie-in a fifth well, the flowlines and umbilical to the existing J11 well were disconnected and tied-in to a new subsea manifold. New flowlines and umbilicals were laid and tied-in from the manifold to J11 and the new well J13 allowing production from J11 and J13 to be recovered through the existing J11 production slot on the RTM. The existing Jabiru well J6 was disconnected and the existing flowlines extended and connected to the well J7. The J11/J13 manifold incorporated hydraulic control tubing, valves and ROV operated chokes for the control of gas lift to the two manifolded wells.

All subsea control umbilicals in the Jabiru field were replaced with new umbilicals and the existing umbilicals removed.

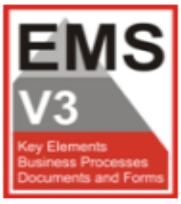
SCOPE OF SERVICES:

- Project management and engineering for the installation of the umbilicals, flowlines and manifold.
- Preparation of contract documents including specifications, scope of work, etc. and review of tenders for the installation contract.
- Detailed design of the subsea manifold and supervision of the manifold manufacture.
- Re-analysis of flexible riser catenaries (lazy-S configuration).
- Preparation of documents including specifications, scope of work, etc. and review of tenders for the manifold manufacture purchase order.
- Preparation of the operations manual for the subsea manifold.
- Review of the installation contractor's engineering and installation manual.
- Offshore supervision of the installation contractor.

Project Management

WorleyParsons maintains a comprehensive suite of tools to manage projects at the highest level around the world. WorleyParsons employs a consistent, proven suite of group-wide processes, systems and tools supported by functional managers (Business Process Owners, or BPOs) and Business Systems Groups (developers, trainers, start-up support, help desk, commercial agreements, etc) scalable for any size project.

Enterprise Management System (EMS) web enabled repository of policies, directives, standard workflows, procedures, guidelines, forms, and checklists content controlled by BPOs EMS is easily accessible in any of our offices and is company standard enabling the more than 30,000 staff in 110 offices to share work on a common platform. The supporting systems are tailored to apply in each of the following stages of a project: Identify, Select, Define, Execute, and Operate.

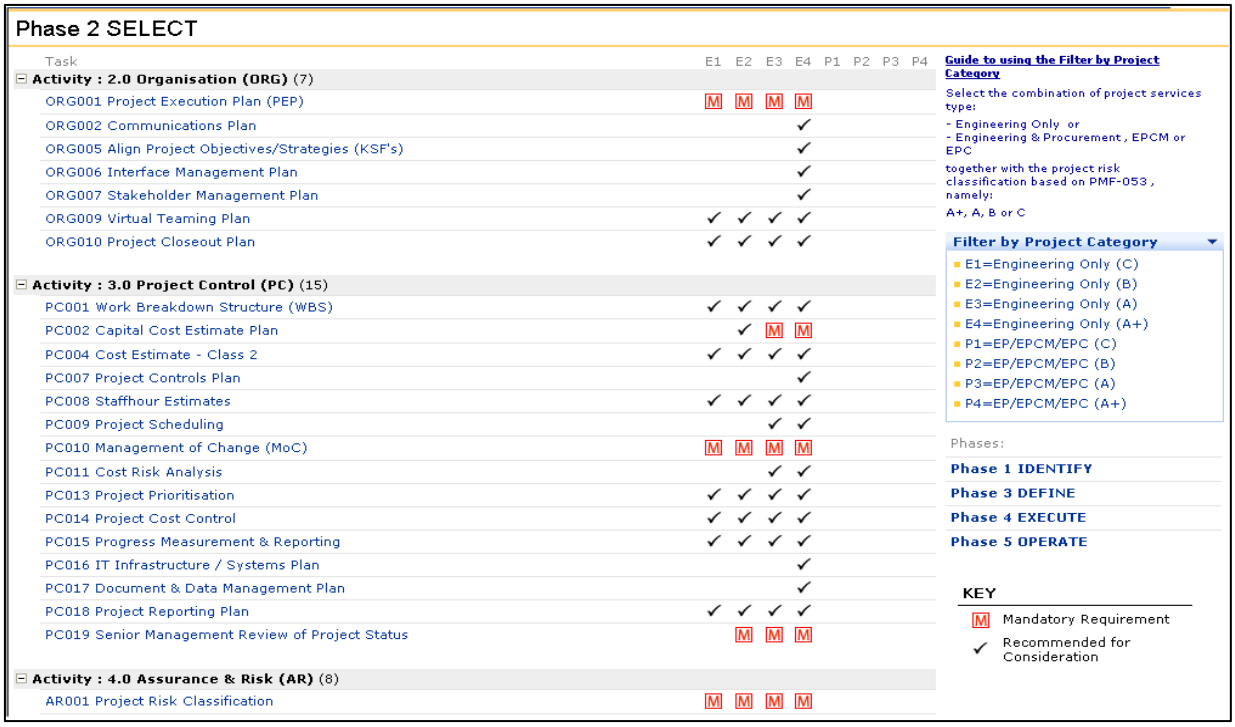


WorleyParsons Project Management Process (WPMP) is our scalable, risk based framework for project execution – some content mandatory, most is advisory.

The main principles of WorleyParsons Management Processes are:

- It is s a matrix of mandatory or potential tasks applicable for each project phase. Mandatory tasks kept to a minimum
- Project Value Objectives are clearly documented, and Maximum Value identified and realized
- Decision support package requirements are fundamental to what is planned for and delivered in each phase
- Value Improving Practices (VIPs) are used as appropriate
- Each of the tasks is summarized in an overview task sheet, supported as required by:
  - Procedures
  - Corporate Guidelines
  - Template Project Plans
  - Go-Bys

The system includes prompts and go-bys easily available for each phase of the work, illustrated by the following examples for Select Phase projects:



Phase 2 SELECT

Task	E1	E2	E3	E4	P1	P2	P3	P4
Activity : 2.0 Organisation (ORG) (7)								
ORG001 Project Execution Plan (PEP)	M	M	M	M				
ORG002 Communications Plan				✓				
ORG005 Align Project Objectives/Strategies (KSF's)				✓				
ORG006 Interface Management Plan				✓				
ORG007 Stakeholder Management Plan				✓				
ORG009 Virtual Teaming Plan	✓	✓	✓	✓				
ORG010 Project Closeout Plan	✓	✓	✓	✓				
Activity : 3.0 Project Control (PC) (15)								
PC001 Work Breakdown Structure (WBS)	✓	✓	✓	✓				
PC002 Capital Cost Estimate Plan		✓	M	M				
PC004 Cost Estimate - Class 2	✓	✓	✓	✓				
PC007 Project Controls Plan				✓				
PC008 Staffhour Estimates	✓	✓	✓	✓				
PC009 Project Scheduling			✓	✓				
PC010 Management of Change (MoC)	M	M	M	M				
PC011 Cost Risk Analysis			✓	✓				
PC013 Project Prioritisation	✓	✓	✓	✓				
PC014 Project Cost Control	✓	✓	✓	✓				
PC015 Progress Measurement & Reporting	✓	✓	✓	✓				
PC016 IT Infrastructure / Systems Plan				✓				
PC017 Document & Data Management Plan				✓				
PC018 Project Reporting Plan	✓	✓	✓	✓				
PC019 Senior Management Review of Project Status		M	M	M				
Activity : 4.0 Assurance & Risk (AR) (8)								
AR001 Project Risk Classification	M	M	M	M				

Guide to using the Filter by Project Category

Select the combination of project services type:

- Engineering Only or
- Engineering & Procurement, EPCM or EPC

together with the project risk classification based on PMF-053, namely:

A+, A, B or C

Filter by Project Category

- E1=Engineering Only (C)
- E2=Engineering Only (B)
- E3=Engineering Only (A)
- E4=Engineering Only (A+)
- P1=EP/EPCM/EPC (C)
- P2=EP/EPCM/EPC (B)
- P3=EP/EPCM/EPC (A)
- P4=EP/EPCM/EPC (A+)

Phases:

Phase 1 IDENTIFY

Phase 3 DEFINE

Phase 4 EXECUTE

Phase 5 OPERATE

KEY

M Mandatory Requirement

✓ Recommended for Consideration

InControl is our CTR based project cost and resources control tool - for small or large projects. It is WorleyParsons proprietary, but interfaces with third party applications plus selected third party applications under global agreements – Intergraph (PDS, Marian and SmartPlant Foundation), Primavera, Oracle, Quest, etc.

Other supporting systems include:

- Primavera Project P3
  - Project planning and control
- Cost Management System (CMS)
  - Estimating cost and schedule impact due to project changes
- Scorecard
  - Engineering progress measurement and productivity
- Project Portal (EDMS)
  - Secure, web-based, integrates closely with Microsoft Office 2003
  - Data, schedules, and documents can be accessed from a central location by project teams, clients and vendors worldwide
- Encompass®
  - Total project management information tool
  - Up-to-date and accurate information not only in the home office, but at the job site and at select partner or customers sites as well
  - Information can be shared worldwide by project teams

Interface Management is one of the most critical management practices that must be performed to an excellence-in-execution result. Interface Management is core-defined as eliminating "the gaps and the overlaps." In principle, Interface Management is clearly recognized by INTECSEA as a key active component of our Project Execution Plan.

The key is to recognize what information is required at what time by whom and where and to handle the constant flow of information, decisions, and requirements between all the stakeholders in the project. To this effect a common interface management process needs to be established among all parties; this requires that the interface management process is clearly identified as a contractual obligation between all parties.

There are multiple levels of information exchange:

Internal:

- Between individual disciplines within Client team
- Between Client team and contractors,

External:

- Between the internal groups within the contractor
- Between vendors, subcontractors, and 3rd parties and the main Contractor

Based on the experiences gained by INTECSEA, a methodology has been developed that suits most projects and applies to both internal and external interface management. The purpose of the IMS will be to maintain lines of communication between different stakeholders and Contractor(s) and, ensuring that technical details are consistent, schedule delivery dates are achieved and costs are kept within an agreed budget, as well as providing early warning to interfacing conflicts and tracking the effects of change.

The objectives of our Interface Management process are to:

- Define the Information Exchange Requirements throughout all Phases of a Project
  - General Project Information
  - Equipment Interfaces
- Information Required by Who and When
  - Project Schedule and Milestones
  - Deliverables
  - Contractor Workscopes
- Monitor the Exchange of Information
  - Take Corrective Action through an Early Warning System

Excellent communication is of course an essential ingredient, but it needs to be accomplished in a systematic way to ensure interfaces are handled most effectively. Typically managing, coordinating and resolving interfaces are the role of an Interface Manager who reports directly to the Project Manager. His role is to systematically track the information exchange and its impact on progress.

INTECSEA's Interface Management Process is a proven system tool to support the tracking, management, and effectiveness of the exchange of important project information.

Our IM system provides the following reports:

- General Interface Information Reporting (general interface physical properties)
- Interface Schedule Information Reporting (inter-related activities associated with search)
- Interface Clarification Register (listing issues, date raised, due date, resolution)
- Change Report (documenting the changes and the responsible parties)
- Document and Drawing Register (listing project and 'shadow' document status)

INTECSEA personnel have been responsible for interfaces on a number of recent projects, such as the ChevronTexaco Agbami project. This major undertaking requires the management of over 85,000 interfaces between disciplines and contracts. The system was established during the FEED phase to coordinate the design effort and will continue throughout project execution phase to support management of the vendors and contractors.

The INTECSEA Interface Management System (IMS)

General interface information is organized on three working levels with increasing detail. It reports general interface physical properties for attributes, components and tasks. The system links with the project scheduling tools to identify impacts and monitor status. The Interface Clarification Register lists issues, dates raised and due, resolution, responsible party and resolution team. The change report documents changes to interfaces, tasks and milestones. The Document and Drawing Register lists current document and "shadow" document status.

A graphical interface, an example of which is shown in Figure 1 below, enables ease in finding related interfaces and facilitates coordination among the project participants.

INTECSEA IMS Concept Presentation

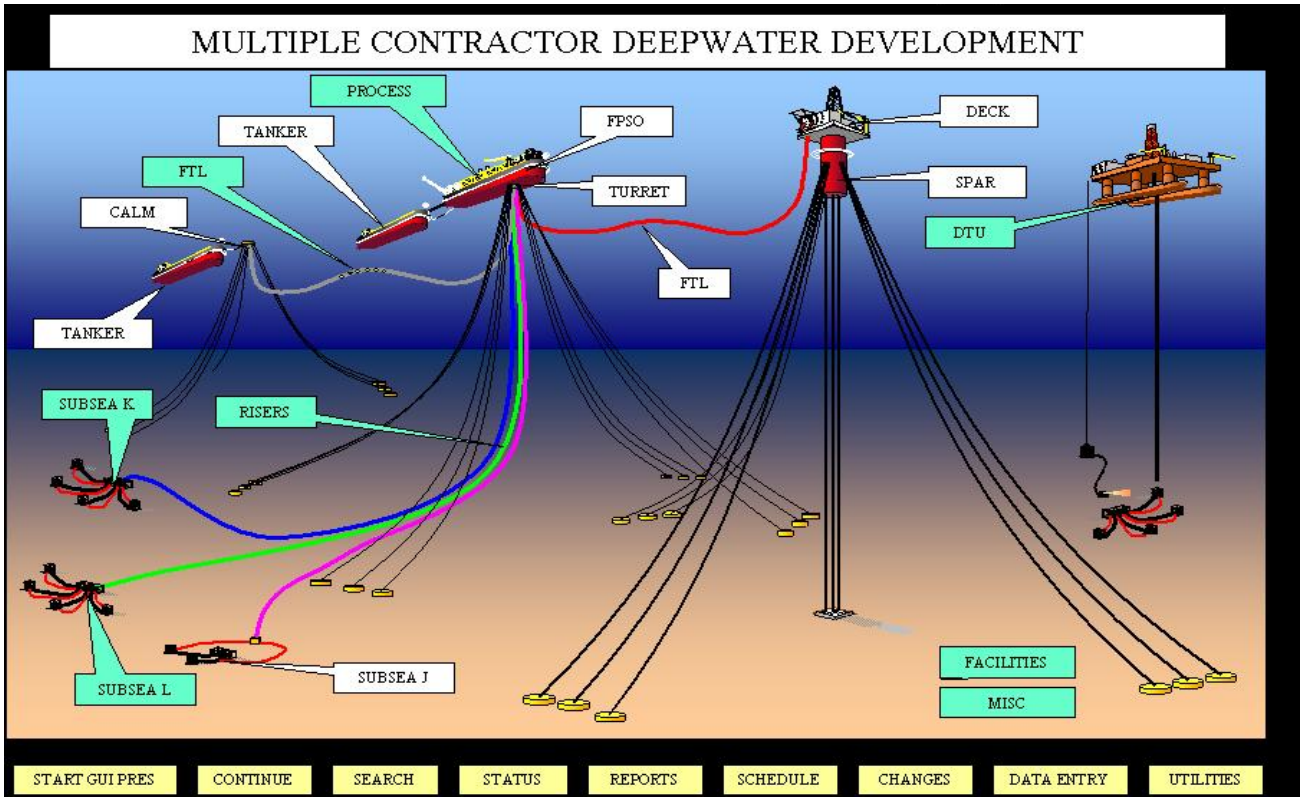


Figure 1: Graphical Interface on Typical Multi-Faceted Development

Effective interface management is key to the successful delivery of FEED and Detailed design. An Interface Management System (IMS) will be established during the FEED phase to identify and define design and disciplines interfaces and then continue through project execution to coordinate multiple contracts and suppliers.

The purpose of the IMS will be to maintain lines of communication between different disciplines, groups, companies, and contractors to ensure that technical details are consistent, schedule delivery dates are achieved, and costs are kept within an agreed budget, as well as providing early warning to interface issues and a mechanism for resolving.

Interfaces are either internal (within a defined component, assembly, or work scope) or external (between components, assemblies, work scopes, or organizations). As the project advances into the FEED, detail design, and execution phases, the management of external interfaces becomes more important and complex.

INTECSEA has developed an Interface Management System (IMS) methodology consisting of procedures, work processes and computer tools. The model is applicable to both internal and external project interfaces and can be adapted to suit any size or type of single or multi-faceted project. The Interface Management System (IMS) was developed by INTECSEA and incorporates the necessary procedures, work processes and computer tools to aid in the management of project interfaces. INTECSEA is currently providing complete interface management of ChevronTexaco's Agbami project, a major project including an FPSO, subsea, flowlines and offloading. Initially, the system was applied to the substantial engineering tasks and will continue into management of the multiple EPC contract elements of the project.

The Interface Management Tool (IM Tool) is a robust database application accessible worldwide though the intranet. It stores and manages project interface information as well as interface links and key dates. Parties receive notifications of interface queries and actions by email, and can use the web interface to respond.

INTECSEA will offer Client the Interface Management System (IMS) modified to suit the particular needs of the project, including both internal and external interface management, and with suitably experienced engineers. The full IMS package will ensure that interface issues are identified and discussed between all affected parties.

The IMS will control the following aspect of the project:

- Contractual responsibilities and requirements
- Engineering tasks and activities
- Design reports issue and revision dates
- Interface physical properties
- Project milestones

- Procurement
- Construction
- Installation and commissioning
- Operation and Maintenance

Interface Management Process

The Interface Management Process ensures effective management of functional, physical, schedule and cost interfaces within the project. The Interface Management System will be the basis for all parties to communicate on interface issues to ensure that interface issues are identified and discussed between all affected parties and to develop agreed mechanisms, responsibilities, and completion dates for resolution of issues.

The Interface Management Process for the project will be periodically updated to account for revisions to the working process accounting for CLIENT requirements. Figure 2 below, shows the key elements in the IMS Work Process.

INTECSEA IMS Work Process

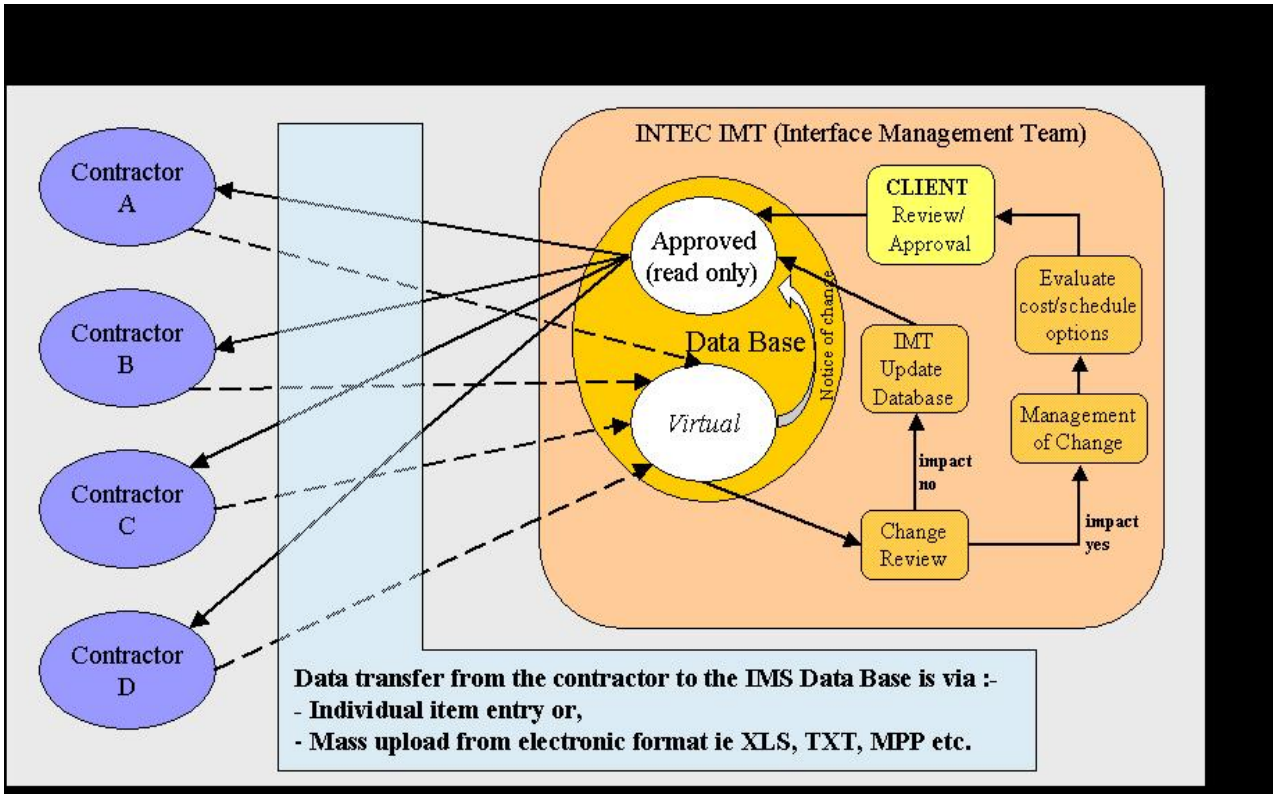


Figure 2: IMS Work Process Flow

Integration management will be a key element in ensuring the successful outcome of the project and will avoid costly delays during fabrication, hook-up, installation and commissioning activities.

The Interface Manager will be responsible for the following:

- Chair regularly scheduled project-wide Interface Meetings. Chair and/or attend other meetings as required and appropriate.
- Ensure that technical interfaces (both functional and physical) and contractual interfaces (cost and schedule) within its own scope of supply and between itself and other relevant parties are identified, recorded, understood, agreed upon by all parties, and reported to the IMS.
- Review Client and Contractor interface documentation to ensure that appropriate responsible parties have been informed of and have been provided input to interface issues and that issues have been properly identified, resolved, and documented.
- Review all Change Requests and significant non-conformance reports and dispositions to assure that interface issues are appropriately identified and resolved.
- Maintain an Interface Register and Interface Database.
- Identify and report progress, concerns and actions to resolve problems and any impact to other areas of the development.
- Manage the resolution and timely closeout of relevant interface issues.
- Provide relevant information or data to those groups within the Client, own organization and other contracting parties, which may have need of, or be impacted by, the subject information.
- Coordinate review and approval for all procedures, data, instructions, drawings, etc. at relevant work interfaces.
- Coordinate review and approval of Change Requests to ensure that interface issues are recognized and addressed.
- Coordinate review and approval of all significant non-conformance reports and dispositions to ensure that interface issues are recognized and addressed.
- Communicate (via appropriate documentation) issues and resolutions to all affected parties.
- Inform the Client and INTECSEA IMS Team of all inter-organization interface meetings at the time they are organized. Client and INTECSEA may attend these meetings as necessary or appropriate.

Each of the managed (EPC) contractors will be made responsible for implementing an interface management system within its own organization and shall participate in operation of the PMT Interface Management System. Each managed contractor will appoint an Interface Coordinator who will coordinate

issue resolution activities within their organization and will communicate these resolutions to the PMT Interface Manager. The Interface Coordinator shall be a single-point-of-contact on the managed contractor's interface issues. Each contractor shall establish within its own organization an interface management system to:

- Ensure that technical interfaces (both functional and physical) and contractual interfaces (cost and schedule) within its own scope of supply and between itself and other relevant parties are identified, recorded, understood, agreed upon by all parties, and reported to the IMS.
- Manage the resolution and timely closeout of relevant interface issues.
- Provide relevant information or data to those groups within the contractor's own organization, which may have need of, or be impacted by, the subject information.
- Provide relevant information or data to other contracting parties and to the IMS, which may have need of, or be impacted by, the subject information.
- Coordinate review and approval for all procedures, data, instructions, drawings, etc. at relevant work interfaces.
- Coordinate review and approval of Change Requests to ensure that interface issues are recognized and addressed.
- Coordinate review and approval of all significant non-conformance reports and dispositions to ensure that interface issues are recognized and addressed.

Reporting

Following resolution of an interface issue, the resolving party will provide appropriate documents, including Change Request and significant non-conformance review and actions, to the affected parties and to the Interface Manager for the record. The Interface Manager will record all agreements and actions in a suitable form and other appropriate documentation, as required. Systems Interface information shown in the form(s) will also be tracked in a database to provide ready access to the data developed. A sample of typical IMS report is shown below.

INTECSEA
WorleyParsons Group

Interface Name	FTL-04 Production FTL Connection at SPAR			INTECSEA WorleyParsons Group
System:	Water Injection		Interface No.	Data Sheet No.
Interface Description	FTL Attachment to the DTU		FTL 153-01	FTL-153-01-01
Interface Location			Revision / Initials / Rev. Date	
Interfacing Parties	FPSO	FPSO engineering contractor	A / NH / 19/03/02	
	SUB-SEA	Sub-Sea engineerig & installation contractor		
	SPAR	SPAR engineering contractor		
	FAC	Client Facility management		

General Interface Information									Interface Specific Document		
No.	Description	Value	UOM	Responsible	STATUS R	A	G	B	Document No.	Rev.	Document No.
1	Nominal Dia	6.6"	inch	SUB_SEA			G		AGB-C-00-009		Subsea Installation Scope of Work (Volume 4)
2	Design Flow Rate	80	kbwd	FAC				B	DSG-RI-3890		*Riser Loads for FPSO Mooring System Design*
3	Length (Approx)	586	m	FAC			G		AGB-C-00-009		Subsea Installation Scope of Work (Volume 4)
4	Weight/meter Length	tba	kg/m	SUB_SEA		A					
5	Minimum Bend Radius	tba	m	SUB_SEA		A					
6	Design Pressure	5000	psi	FAC			G		AGB-C-00-009		Subsea Installation Scope of Work (Volume 4)
7	Maximum Operating Tension	40	Te	SUB_SEA			G		DSG-RI-3890		*Riser Loads for FPSO Mooring System Design*
8	Maximum Operating Side Load	27	Te	SUB_SEA			G		DSG-RI-3891		*Riser Loads for FPSO Mooring System Design*
9	Vertical Approach Angle for Max Op Ten'n	43	deg	SPAR			G		DSG-RI-3892		*Riser Loads for FPSO Mooring System Design*
10	Pull-In Load	tba		SUB_SEA	R	A					
11											
12											
13											

General Notes:

The general information included on this form is for interface imanagement only and is given in good faith.
For engineering purposes the reader must refer to the appropriate drawings and specifications for details.

IMS Tool

The INTECSEA IMS is a Web based application, accessible from all project locations through the Internet. The interface database resides on INTECSEA's server in Houston, where the program is maintained periodically updated when new features become available. The application will provide:

- WEB based Interface Management System for remote job site access and secure access from anywhere in the world;
- Unbiased procedures to formally assess, resolve and document interface issues and conflicts;
- IMS Team defined Fabricator(s), Contractor(s) and Sub-contractor(s) access rights;
- A high level Graphic User Interface (GUI) for quick location of project interfaces;
- Early warning of interface clashes, reduced schedule float, and notification of change;
- Reporting of schedule and cost issues;
- "Traffic Light" status to clearly present interface, management and contract issues;
- General data, e.g. interface liaison personnel details, interface matrices etc.;
- Single item data entry by each user to a "Virtual Database";
- Mass data file upload via IMS tools using industry standard application files (e.g. Excel, Primavera, MS Project, etc.); and
- Adaptable search tools for database Interrogation and Reporting.