FIRST OIL ACHIEVED FOR JUBILEE, OFFSHORE REPUBLIC OF GHANA by Cody Moffitt and Mac McKee

The Jubilee field, located in the West Cape Three Points and the Deepwater Tano Blocks, is some 37 miles offshore Ghana. Kosmos Energy, Technical Operator, led an Integrated Project Team (IPT) for the development. The IPT also included key project personnel from partners Anadarko Petroleum Corporation, Tullow Oil and Ghana National Petroleum Corporation.

Tullow, the Unit Operator, has built in-country infrastructure and a production operations organization. The IPT handed over the facility to Tullow just prior to first oil in fall 2010.

When the concept work commenced in early 2008, field data was minimal and up-to-date detailed survey and bathymetry data did not exist. The fast-track nature of the project and this lack of field data blurred the line between concept engineering and Front End Engineering Design (FEED). Despite these challenges, INTECSEA engineers completed the field layouts, design basis document, technical specifications, and bid packages by August of 2008. The design philosophy was robust and flexible enough to incorporate and adapt to evolving parameters as new data became available.

Water depths in the development area range from 900m to 1,700m. The field is bisected by three active channels, with the intervening ridges exhibiting megaripples, near-surface faulting, and other features indicating a geohazard-rich environment. The largest channel, running north-south with a depth of up to 150m and a width of nearly 2km, divides the field and drove the layout to include east and west systems. Each side of the field is tied back to a turret-moored Floating Production, Storage and Offloading vessel (FPSO) located north of the drill centers and situated directly above the main channel.

The current subsea architecture consists of two riser bases, five production manifolds, two water injection manifolds, one gas injection manifold, nine production trees, six water injection trees and two gas injection trees. Additional trees may be added to the development at open manifold slots, if needed. The production manifolds are daisy-chained, with three manifolds on the west side of the development and two on the east side. Water injection manifolds are also in a daisy-chained arrangement on the west side of the field, while the single gas injection manifold is situated on the east side. Production system infield flowlines are looped to allow for round-trip pigging and are rigid, wet-insulated pipe. Gas and water injection infield pipelines are single lines made of rigid, non-insulated pipe.

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Keep Dreaming

Many of my (admittedly aging) generation have most likely read several of Jules
Verne's books, including From the Earth to the Moon (1865). Jules Verne
was ahead of his time and can probably be credited with creating the science fiction
genre almost 100 years before Isaac Asimov gave science fiction literary
staying power. In From the Earth to the Moon he
describes the launch of a manned capsule to the moon
and apparently was able to perform some surprisingly reasonable
calculations to size the space cannon. His
vision and imagination preceded the first space flights by
almost a century. When I read the book, man had
not yet stepped on the moon.

What is unique about Jules Verne and others of his
kind is the ability to not let perceived reality interfere
with their imagination and vision. One needs almost a
childlike capability for wild imaginings unbridled by
the experience of what adults refer to as knowledge.
Sometimes that prompts the term dreamer or even
imagination..."beam me up Scotty!"

When I read From the Earth to the Moon
many of his farfetched ideas had already been
realized and soon afterwards we would put a man
on the moon. Many of my grandparents' generation,
however, would have likely dismissed his stories as
simply entertaining nonsense.

Dreamers like Jules Verne, whether they are novelists,
scientists or rebels in their own field, serve as a
catalyst to our scientific and industrial evolution. We
need fantasists, the wilder the better, the "wouldn't it
be nice if" type of dreams to stimulate our engineering
vision, dreams and fantasies, to propel the industry far
down the road. The "imagineers", the wilder the better,
serve as a catalyst to our scientific and industrial evolution.

Two riser bases, one on each side of the channel,
are each designed to accommodate four production
risers and one gas injection riser. Both the east and
west side riser bases are currently populated with two
production risers and one gas injection riser. The gas
injection line on the east side allows for gas disposal
into two gas injection wells and provides gas lift to the
production risers, as required, through a system of
pipe and valves interconnecting the production and
gas headers. Since the west side of the development
does not currently include any gas injection wells, the
gas injection riser on the west side provides only gas
lift functionality.

The nine risers are all flexible and are configured
as plait waves to avoid touchdown in the active
channel and to provide lateral stability. Along with
the four production risers and two gas injection / lift
risers routed to the riser bases, the development
includes two water injection risers terminating at a
double-hub pipeline end termination (PLET), as well
as a gas export riser which rests on a temporary
subsea parking frame until such time as a gas export
pipeline is installed. Two electro-hydraulic, multiplexed
(EH-MUX) umbilicals are also hung from the FPSO
turret, with one routed to each side of the field. These
umbilicals communicate with and supply power,
control fluid, and chemicals to the subsea hardware.

Two of the most significant changes throughout the
Jubilee Project included the installation of, and transition into,
standard gas injection lines and the installation of,
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In early 2009 WorleyParsons Europe started work on the ConocoPhillips Jasmine Field Development. Initially awarded the Pre-FEED scope, with options for FEED and detailed design, the project is now well into the detailed design phase with planned work continuing into 2011 and construction support into 2012.

The Jasmine field is located in about 80m of water in blocks 30/6 and 30/7a in the UK sector of the Central North Sea, about 240km southeast of Aberdeen, in the ConocoPhillips operated J-Block Area. The J-Block Area currently comprises three fields: Judy, Joanne and Jade. The Judy Platform currently serves as a hub for petroleum operations from production wells situated on the Judy Platform, fluids from the Joanne subsea manifold and fluids from the Jade normally-unmanned Wellhead Platform.

The Jasmine Development comprises the following:

- New Jasmine Wellhead Platform (JWHP)
- New Jasmine Accommodation and Utility Platform (JLU), bridge linked to the Jasmine Wellhead Platform (JWHP)
- New Judy Riser and Separation Platform with additional Judy well slots (JRP), bridge linked to the existing Judy Platform
- New 16-inch Multiphase pipeline from Jasmine Wellhead Platform to the Judy Riser Platform

The Jasmine Development will utilize the existing processing capacity on the Judy Platform.

The scope of work has been divided up between various WorleyParsons entities, with the London office performing the overall project management and topsides/process design work. The steel jackets are being designed by WorleyParsons Ranhill in Kuala Lumpur and the subsea pipeline, risers and flow assurance work by the INTECSEA UK office.

The design of the pipeline system has presented many challenges. The pipeline system is short, only 8.6km long, design pressure (150barg) / temperature (155°C) and classed as sour service. In order to comply with HSE requirements, a fortified zone is required at each end of the pipeline. This fortified zone extends for 150m from each platform, terminating at an SSIV and is designed for ‘no global yield’ under full wellhead shut-in conditions (641.2barg at 180°C).

INTECSEA’s Pre-FEED activities included preliminary engineering work on 3 options; a wet insulated single pipeline, a conventionally S-laid pipe-in-pipe system and a pipeline bundle. Due to the high temperatures of the fluids, a preliminary design of a subsea cooler was also developed. Cost estimates for each of the options (with and without subsea cooling) provided the main deliverable from this phase of the work. The steel jackets are being designed by WorleyParsons Ranhill in Kuala Lumpur and the subsea pipeline, risers and flow assurance work by the INTECSEA UK office.

The current scope for INTECSEA is for the detailed design, procurement and construction support for the ‘fortified zones’, i.e. the high pressure JWHP and JRP Risers and tie-in spools. Material for the JWHP riser has now been fabricated and is currently being shipped to the jacket fabricator in Italy.

The JWHP riser will be installed with the jacket in early 2011. The order for the JRP riser and riser tie-in spool materials has now been placed, with delivery due December 2011. INTECSEA’s scope also includes supporting CoP in their management of the Subsea 7 contract through the design and construction phase.

The JRP riser will be installed with the JRP jacket in 2012, with the pipeline bundle following soon after. The target for first gas is October of the same year.
In October, INTECSEA was recognized by the Ocean Energy Center, along with several other companies, as a Technology Pioneer for their participation in the DeepStar project. Brian McShane accepted the award on behalf of INTECSEA at the Ocean Star Gala event.

The vision for Deepstar evolved in 1991 when some individuals at Texaco recognized that significantly more technology and knowledge would be required to explore and produce reservoirs in deep water successfully. Texaco started initial framing studies with INTEC Engineering and evolved the concept that the industry as a whole would benefit more by doing it together. Texaco then took the concept to industry by selling “shares” in projects which became known as “The DeepStar Project” that is currently managed by Chevron.

Ocean Energy Center recognized the pioneering efforts of all the individuals and early companies who participated in the development of the first phase of the DeepStar Project. INTECSEA is proud to have had the opportunity to participate in this program and is thankful to all the individuals who invested so much time and energy in the program that has made it a valuable contribution to the industry.

Historically, INTECSEA has been an industry leader in subsea processing application studies. A previous Subsea Processing Joint Industry Project (JIP) conducted in 2007 concentrated on identifying Subsea Active Production Technologies (SAPT) for deep water and/or long offset tie-backs to host facilities or to shore. A State-of-the-Industry report highlighted available equipment and technology, current operational status and future strategic direction within this subset of the industry. Follow-up from this study led to the publication in Offshore Magazine of the 2010 Worldwide Survey of Subsea Processing: Separation, Compression, and Pumping Systems—State of the Industry Poster (http://www.offshore-mag.com/etc/mediabib/platform-Toffshore/maps_and_posters.Par.21618.File.dat/SubseaProcessing-022410ADG.pdf).

INTECSEA has recently begun its latest Subsea Processing initiative, an Arctic and Sub-Arctic Region Subsea Active Production Technology JIP. A key deliverable of the project is a technology characterization database to consolidate objective information for Operators to match their needs at an early conceptual stage with the most appropriate conventional, enhanced and active subsea production technologies.

INTECSEA launched the JIP via a kick-off meeting on December 8, 2010 in St. John's, Newfoundland, Canada with active participation from 3 other companies: Husky Energy, Repsol and Suncor Energy. Husky Energy and Suncor Energy are producing operators offshore Newfoundland and Labrador and Repsol is a partner in several discovery licenses offshore Newfoundland and in Arctic environments. They represent a group with future subsea processing interests associated with potential brownfield expansions and greenfield developments.

The current study will use information gathered during Phase One along with additional information on conventional and emerging subsea technologies and relate them specifically to the participant’s interests of offshore Newfoundland, Labrador and in Arctic environments. The JIP will focus on the generation of a database and a simple user interface tool to explain and select a wide spectrum of SAPT elements such as separation, boosting, compression, and direct electric heating that are suitable for typical stranded and existing field developments, along with the power and controls required to implement the technologies. The JIP will also address system installability, operability, reliability and maintainability issues that are specific to the environment.

The JIP work is being led out of INTECSEA’s St. John’s office and is being managed by PRAC (Petroleum Research Atlantic Canada) on behalf of the participants. The project is being supported by Ian Ball, Richard Voight, Julie Burke, Cody Moffitt and Dr. Kalyana Janardhan of INTECSEA and is scheduled for completion by the end of 2011. For further information on this project, please contact Julie at Julie.Burke@intecsea.com.
INTECSEA Networking: “Out and About”

**DOT AMSTERDAM 2010**  
*by Jeroen Timmermans*

The Deep Offshore Technology (DOT) Conference was held in Amsterdam, Netherlands, from 30 November to 2 December. INTECSEA was well represented at the conference with a stand in the exhibition area, four technical papers and participation on the conference committee. As usual, INTECSEA sponsored the conference proceedings, which were distributed at our booth. This provided good opportunities to meet potential clients and to discuss the state of the industry with old acquaintances.

The INTECSEA papers presented were:

- “At the Frontier of Deepwater Large Diameter Pipeline Design” by Thomas Dronkers
- “Minifold – A New Concept for Flowline-Attached Production Manifold” by Philip Cooper
- “Pipeline Strain Concentration During Deepwater Installation and Operational Conditions” by Sherif EL-Gebaly
- “The South Stream Project, Taking the Industry Another Step Forward” by Martijn van Driel

The paper “At the Frontier of Deepwater Large Diameter Pipeline Design” was awarded the prize for Best Paper, which was accepted by Thomas Dronkers. Congratulations on this excellent achievement to Thomas and his co-authors, Ping Liu, Martijn van Driel, Arjen Meijer and Shirley Zhou.

Next year the DOT will be held in New Orleans, so Delft and Woking are passing the baton back to the Houston office to ensure that INTECSEA continues to be represented as one of the industry leaders in deepwater technology.

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**A HOLE IN ONE**  
*by Cody Moffitt*

Jack Maingot made a HOLE in ONE at the Woodforest Golf Course Members and Guests Annual Tournament. I had invited Jack to play as my guest and after hitting just 10 to 12 practice balls on the driving range to warm up we proceeded to our starting hole. The other two guys that we were playing with had hit their tee shots on the 123 yard par three 7th hole of the back nine, and Jack then stepped up to his ball with an 8 iron and on his first stroke of the tournament hit a shot that headed directly for the hole. The ball landed on the front edge of the green and then rolled directly into the hole. Jack was in utter disbelief and was somewhat speechless as the realization of what he had just accomplished. Immediately a smile spread across Jack’s face that could not be chiseled off. After 50+ years of playing golf Jack made his first Hole-in-One on a course he had never played before, and on the first stroke. You can see his excitement in the picture. Congratulations Jack, on a job well done!

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For comments and additional information, please contact Michelle Lang via email: Michelle.Lang@intecsea.com.

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