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INCORPORATED
ENGINEERS AND ARCHITECTS

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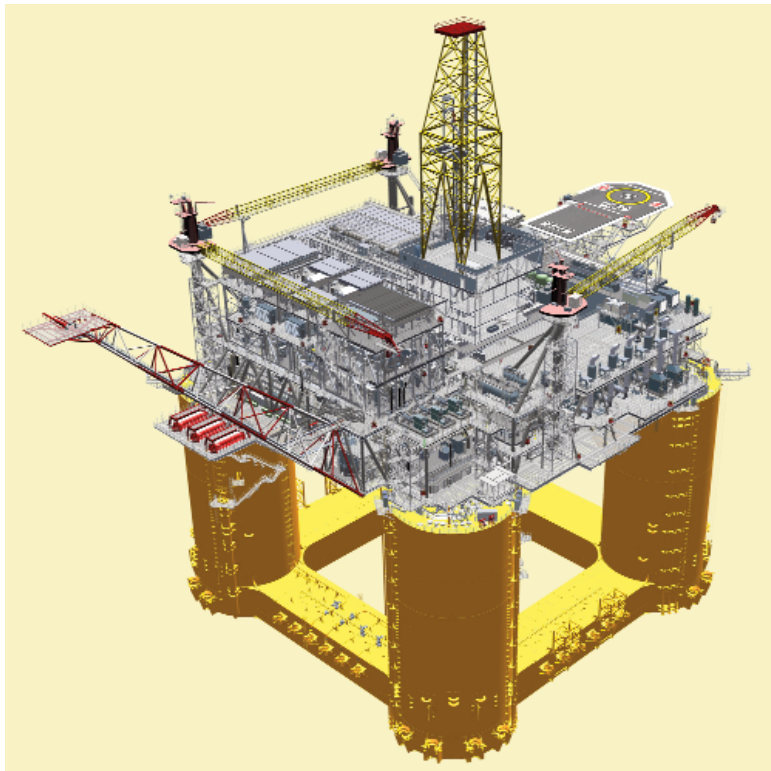
Volume 56 1st Quarter 2013

The Creation of Olympus

By: Pierre A. Olivier, P.E.

In the mold of, but more massive than, previous Shell Offshore Inc. Deepwater Gulf of Mexico (GOM)floating platforms "Olympus", as it's named, is nearing christening after a long journey from concept to an operating oil and gas platform. In June, 2013 this Tension Leg Platform (TLP) will be towed from the Kiewit Offshore Services (KOS) fabrication/integration yard located in Ingleside, Texas to Mississippi Canyon Block 807 for installation and eventual production. The TLP was originally named "Mars B" because of the proximity of it to its sister and predecessor, "Mars", a highly successful Shell platform in the Mars basin. The name change occurred to avoid any confusion between platforms, and to allow Olympus the opportunity to gain the fame under its own name that it's destined to achieve.



3-D Model of Olympus TLP
(Courtesy of Shell PTP/D Surface Engineering Design Drafting)

Design began on the Olympus host, the combination of the hull and topsides, in the summer of 2008. As has been the case on several previous Shell TLP projects, many Waldemar S. Nelson and Company (NELSON) engineers and designers working in both the New Orleans Nelson and Shell offices contributed to the detailed design of the facility. Professionals in the disciplines of electrical, controls and instrumentation, structural, mechanical and process prepared designs that were used to procure much of the equipment and to produce fabrication/installation drawings that were used by the many small and large fabricators that contributed to the project.

Weighing in at approximately 22,400 tons, the Olympus topsides consists of five major modules, named for the primary contribution that each module makes to the whole. As such, Olympus is the heaviest and tallest Shell GOM TLP constructed yet to date. Heaviest in part because of the world class 2,000,000 lbs Hook Load Rig centered on the topsides, and tallest because of new environment design criteria that resulted from Hurricane Katrina. Secured to the seafloor by four large diameter steel tendons attached to each column, the hull supports the topsides, the lower deck of which stands 112 ft above sea level. As a comparison, the distance between column centerlines on Mars is 200 ft and on Olympus is 250 ft, an increase of 25%. Further, the Olympus topsides is 25 ft higher above the sea than is Mars,

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protecting it even from the predicted 1000 year wave. While Mars is expected to exceed its original 20 year design life, Shell managers dictated that Olympus would be designed for 50 years as the forecast for continued oil and gas production in the deepwater GOM is excellent. Though this article will focus only on the topsides and hull, when considering all of the other phases of the work: wells, subsea facilities, flowlines, pipelines, etc., it must be mentioned that the sum total yields a project that contributes mightily to the economy of the Gulf Coast region. Furthermore, the Olympus project, guided by Shell's philosophy of promoting local sustainable development, invested $5,000,000 in various not-for-profit organizations. For example, Shell, through the Mars B Development Olympus TLP made a $1,000,000 contribution to the Bayou Country Children's Museum in Thibodaux, LA. Cheers to our client.

THE WELLBAY MODULE

Centered on the platform and supporting the Drilling Rig is the 24 well slot Wellbay Module. Appearing to be a sophisticated complex of steel members, this module must support the massive weight of the Rig and ultimately the production risers that

Drilling Rig on transport barge

deliver fluids extracted from the reservoir below. The Rig is not stationary, rather, it can "skid" to any of the well slots in order to install production risers after drilling has been completed. In fact, plans are to drill from only four of the slots, which will represent a time savings for this most important activity. Once each production riser is installed, it will be secured to the Wellbay by a hydraulically operated tensioning system. The "tensioners" ensure that the risers can accommodate movement of the platform. The transfer of the riser loads from the tensioners to the module occurs via a"tendome", a three dimensional ring of columns, the composite structure of which can support hundreds of thousands of pounds of force. Nelson structural engineers were the primary designers of this equipment, the concept of which was first used on Shell's URSA TLP.

The next visible feature of the Wellbay Module is the Production Manifold, a separately fabricated specialty skid consisting of piping and valves that direct the fluids to the nearby Process Module for treating. Although quite large in size, this module cannot support all of the equipment required to support drilling operations as will be described below.

THE DRILLING MODULE

To the east of the Wellbay Module is the Drilling Module, aptly named because supported above its upper deck are five separate "Drilling Support Modules" (DSM). These modules are enclosed 36 ft tall buildings designed to store materials and/or equipment required to support Rig

Wellbay Module viewing Production Manifold side

Process Module being moved to Transport Barge

driven equipment. The platform's main Switchgear/MCC room is located on the first floor of the module with the TG sets founded on its roof. Waste Heat Recovery Units on two of the TG sets capture heat that is required for process heating. On previous TLPs it was common practice to house the TG sets in a custom designed building, but on Olympus the choice was made, for improved economy, to use vendor furnished individual TG enclosures. Nelson electrical engineers were instrumental in preparing specifications and requisition packages for acquiring the TG sets, switchgear, Motor Control Centers (MCC) and other associated equipment.

Also located on this module are chemical pump and tank skids, some water treating equipment and the platform's sole west side crane. An ample open space exists on the upper deck of this module for future expansion, the magnitude of which is sometimes limited by buoyancy.

THE PROCESS MODULE

This module contains most all of the equipment that receives, separates and treats well fluids and compresses gas that becomes sales quality oil and gas. A multitude of manual and control valves, piping, pumps, vessels, heat exchangers/coolers and other specialty equipment dominate the landscape. Nelson's mechanical and process discipline engineers were most active on this module, in particular sizing and then procuring the equipment. New design criteria, such as blast design loading and fire proofing, required the development of details not used on the prior generation TLPs. It's from this module that the finished products are metered and shipped to the export pipelines, a 16"diameter oil line and a 16" diameter gas line.

THE HULL

While the hull is designed by Shell and their contractors in Houston, the systems by which the hull is operated are designed by Shell and its contractors, including Nelson, in New Orleans. These systems include most importantly the pumps and controls that operate the ballast /deballast systems, and the addition and removal of chemical and other fluids that are stored in hull tankage. Unique to Olympus is the incorporation of a "Passive" design (for a TLP) wherein there are no confined equipment spaces that require entry during operation of the platform. Though deemed to be a safer design, this design proved to be a challenge to locate some equipment and piping on the top of the column that otherwise would have been within the columns. Also, there are no hull column penetrations below the water's surface, hence minimizing the chance for leakage.

THE REST/COMING TOGETHER

Nelson's staff contributed to the project in other areas including supporting roles in document control, procurement, administration, project and construction management, and soon to be commissioning and assistance during installation, which is scheduled for the summer of 2013. Though "first oil" is just around the corner, we hope for and anticipate involvement with this world class TLP for many years to come.

Hull arriving at KOS from South Korea

Helideck lifted onto the Quarters Module

operations. One of the DSMs is an electrical switchgear/storage building that contains transformers. In many cases, Rig power is provided by a standalone power generation station, but on Olympus the main platform power generation station will deliver the 10 MW required by the Rig. Hence, the Electrical DSM houses the interface equipment. The four other DSMs contain pumping equipment for, and bulk storage of, products used by Drilling, particularly cement and barite.

On the east (outboard) side of the module is a platform crane, the most used of the three platform cranes. In addition to moving drilling riser pipe from storage on the Quarters Module roof and pipe/casing from the roof of the DSM to the Drilling Rig, it transfers loading hoses from supply boats as well as containers and consumables that are required to sustain the facility. The remainder of space on this module is consumed by utility skids and storage tanks.

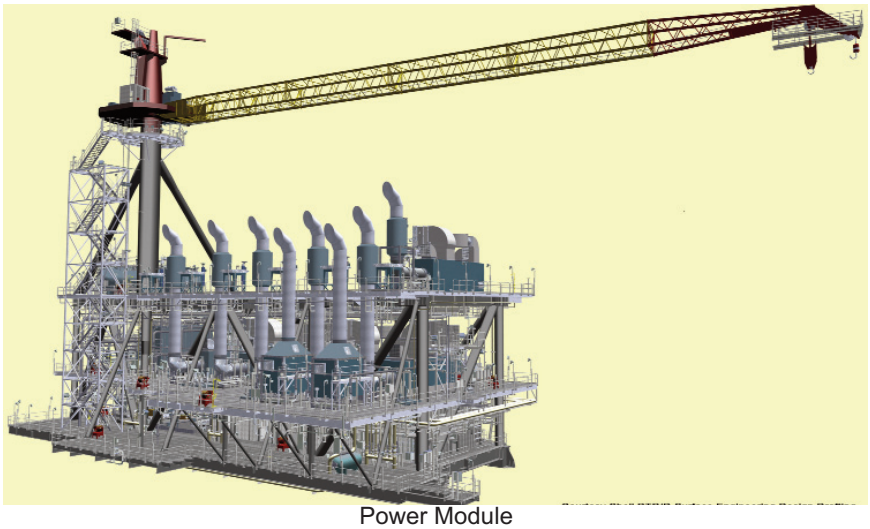
THE QUARTERS MODULE

To the south of the Wellbay, and furthest from the process area is the Quarters Module. This blast resistant designed, four level building contains office spaces and accommodations for a staff of 192 persons on board (POB). Nelson's Architectural Department led the Architectural, Mechanical (HVAC and Plumbing) Electrical and Structural design of the "outfitting" for the "Living Quarters" (LQ). As is usually the case, our lead architect Robert Olivier worked closely with Shell Operations to define an architectural program based upon some mandated and also some desired functional features.

On the first floor, the busiest of the 50,000 sq ft LQ, is the Galley and Dining Hall, TV and Recreational Rooms, Fitness Room, some Offices and Electrical and Workshop spaces. The dominant feature of the second floor is the "bridge of the ship", the Control Room where all platform operations are monitored and controlled by the platform's Distributed Control System. An Incident Command Center is adjacent, which also serves as a Conference Room. Also on this floor are office spaces and conference rooms where daytime business is conducted. The upper two floors contain two and four man cabins and a sick bay. On the roof of the Quarters Module are several mechanical/electrical rooms, the platform's Emergency and Essential Generators, as well as the building's chilled water HVAC equipment. All previous TLPs used conventional DX split HVAC systems, but it was judged that based upon the heat loading, a chilled water system would prove to be the most viable, especially since there is a requirement for 100 % redundancy for chilling and certain air handling equipment. Above the roof is the helideck, differing from previous TLPs in that the landing surface is built of aluminum structural beams and decking.

THE POWER MODULE

Like its TLP predecessors, Olympus will generate power by natural gas driven Solar Taurus 60 turbine generators (TG sets), six in all. As mentioned, this plant will provide power to the Drilling Rig as well as for all motor



Power Module
(3D Image Courtesy of Shell PTP/D Surface Engineering Design Drafting)

The Louisiana Engineering Society Awards Charles W. Nelson, P.E. with the A. B. Paterson Award

Charles W. Nelson, P.E. and LES New Orleans Chapter President Wayne Westerfield, P. E.

Charles W. Nelson, P.E. was awarded the A. B. Paterson Award for Engineer-in-Management during the Louisiana Joint Engineers Conference in January. Charles was born in 1947 in New Orleans, attended public grammar school at John J. Audubon in New Orleans, and high school at St. Martin's Episcopal in Metairie. He received his Bachelor's Degree in Civil Engineering from Georgia Tech in 1970, and following graduation worked as a Research Engineer there in 1971 and 1972, building and operating a physical model of a hydroelectric power plant planned for north Georgia. In 1972, he entered the University of Florida, again working as a Research Engineer while earning his Masters of Science Degree in Coastal and Oceanographic Engineering in 1974. His graduate thesis presented model study results for floating body dynamics of a proposed offshore nuclear power plant.

From 1974 to 1978, he worked as a design engineer for Frederic R. Harris in their office in The Hague, The Netherlands. Project assignments included port designs in the Middle East, Europe and Asia, and structural designs for the first offshore oil and gas platforms built in the Dutch Sector of the North Sea, for which Harris won an annual design award in 1978.

In 1978, he returned to New Orleans, joining NELSON as a Senior Design Engineer. He has held progressive positions in the company since then, becoming President in 1986, President and Chairman of the Board in 2003 and Chairman in 2011. He has been an active member of ASCE and LES, attending national conferences of ASCE's Coastal, Ocean, Ports and Rivers Institute, and local and state LES activities. Project highlights from his project management resume include IMTT's Tanker Docks 2 &3 at St. Rose, Louisiana, Freeport Sulphur's Main Pass Sulphur Mine in the Gulf of Mexico, which was recognized as the NSPE OutstandingEngineeringAchievement in 1992 and the 2005 CG Rail ferry terminal at the Port of New Orleans' Elaine St. terminal.

In his corporate management experience, as President, he guided Waldemar S. Nelson and Company through the depressed oil and gas economy of the early 1980's, emphasizing geographic diversity of the practice. Under his tenure, the company's Houston office was opened in 2000 to serve long-standing and new clients in the oil, gas, port and power industries. Today, Houston activities account for roughly one-third of the company's 400 employees. Another milestone in his management career came in September of 2005, when he and his management team re-opened the company's home office in downtown New Orleans just 6 days after Katrina left much of the city and surrounding area out of commission. His civic involvement spans his 34 year tenure with the company, including board positions on the Boy Scouts of America, Salvation Army, World Trade Center of New Orleans, St. George's Episcopal School, the New Orleans Regional Leadership Institute, the Louisiana Technology Council, the Loyola International Business Center and the UNO Engineering Advisory Board. For over 12 years, he served on the World Trade Center International Business Committee, and presided as President of this prestigious organization in 2005 and 2006. LES recognized Mr. Nelson's community involvement by awarding him The Andrew M. Lockett Award of Civic Activities in February, 2004.

Mr. Nelson is married to the former Ms. Dorothy Duval of Houma, Louisiana. They have two sons, Lee, age 28 and Hunter, age 25.

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A Picture From Our Past
Circa 1950

Our company office at 1200 St. Charles Avenue in New Orleans has a history associated with technology that predated our occupancy. In the early 1950's, it held a local branch of International Business Machines, which became such a powerhouse of the computer industry. Our company was an early adopter of computing technology and had one of the first mainframe computers in the region.