DECOMMISSIONING:
NEW TOOLS FOR A
NEW ERA

PETER DEVINE, VERSABAR, USA, DELVES INTO THE HISTORY OF DECOMMISSIONING ACTIVITY IN THE GULF OF MEXICO.

A long North America's Outer Continental Shelf in the Gulf of Mexico, clusters of oil and gas platforms produce some 1.6 million gallons of oil and 6 billion ft³ of gas daily. Of the 2900 production platforms standing on the OCS as of May 2013, 273 were on expired leases while another 156 were no longer producing or serving exploration or support functions and were thus contained as idle iron. Which means that fully 22% of all those OCS platforms have been placed on schedule to be decommissioned, a number which has moved the decommissioning industry to search for efficient, safe and cost-effective methods of removing these structures.

One company that is well suited for such a challenge is Versabar, a heavy-lift specialist founded in New Orleans, Louisiana in 1981. Versabar built its reputation on responding to challenges posed by the energy sector. In 1997, a Versabar prototype successfully decommissioned a 1984 Gulf of Mexico topside and transported it back to port at 8.4 knots (Figure 1). It was not until four monster hurricanes swept through the Gulf of Mexico that the development of a new vessel for the company's offshore lift technology took a sharp upward tick. In all, Hurricanes Ivan, Katrina, Rita and Ike sent over 250 topsides to the bottom. In May of 2007 the company deployed the ‘Bottom Feeder’, a 4000 t capacity lift vessel purpose-built to retrieve sunken platforms and debris.
Seabed retrieval

While the Bottom Feeder was constructed out of simple elements – standard cargo barges, winches, truss frames, blocks and wire rope – as a lift system it proved to be both versatile and sophisticated. Its design incorporated features that would later prove perfectly suited to the task of decommissioning standing structures. With its twin A-frame gantries and its four main hoist blocks, it was able to accommodate lift packages with a wide range of eccentricities by floating over the loads and distributing the weight among the four hooks, a method that was amply demonstrated during the decommissioning, tow and reeving of a 3000 t jacket (Figure 2). With its shallow draft it was able to access places where deep-draft derrick barges could not go. Using custom-made ‘Pelican Hooks’ and wire rope slings with oversize sling eyes, engineers developed a ‘divers-less hook-up’ protocols that enabled the Bottom Feeder both to pick up and to unload lift packages without the presence of divers or other personnel. This proved to be a popular feature with offshore operators as it enabled them to reduce their offshore exposure.

Decommissioning evolution

In 2009, applying the lessons they had learned, Versabar engineers developed the next generation heavy lift vessel, the VB-10000. Deployed in September of 2010, it incorporated the same fundamental technology as the Bottom Feeder but dramatically upstaged the principal elements – barges, winches, wire rope and gantries – thus tailoring it to the task of decommissioning. The clearance between the barges increased from 110 ft to 266 ft while the clearance from waterline to gantry frame more than doubled, from 93 ft to 175 ft. The increase in these two critical dimensions gave the VB-10000 the capability of floating over most standing topsides and using its four main hoist blocks to maximum advantage. At the same time, a state-of-the-art DP3 system was installed and each barge was outfitted with four 1000 horsepower thrusters, giving the lift system the ability to maintain station without the use of the mooring anchors. Lift capacity was likewise nearly doubled, from 4500 t to 7500 t. The VB-10000 became the largest lift vessel ever built in the US (Figure 3).

During salvage operations subsheet hook-up was a diverse procedure but installation of the Pelican Hooks did not require divers. In 2011 an operator challenged Versabar engineers to provide a complete diversless solution, and by late summer the company had deployed ‘the Claw.’ The Claw is an underwater grappling device consisting of twin sets of massive steel ‘jaws’ much as those one might see in miniature arcade games. Each set of jaws weighs 1100 t and mounts on the VB-10000’s twin gantries. The Claw proved to be a success, slipping its tines into the battered structures and gently bringing them to the surface intact (Figure 4). The Claw also proved its versatility when used to perform piece by piece decommissioning of standing topsides that would otherwise have had to be removed in smaller pieces (Figure 5).

Topside removal has traditionally been accomplished by welder’s torches and derrick barges. However, the jackets or caissons upon which they stand are not as straightforward, requiring the use of pile jetting along with mechanical or abrasive cutting devices or explosive charges, as they must be severed a minimum of 15 ft below the mudline. In some cases, when internal cutting is not an option, operators must excavate below the mudline and send down divers with external cutting devices to perform the task. All those processes present technical and operational challenges and involve considerable offshore exposure of personnel and marine assets.

One offshore operator has likened jacket removal to “a visit to the dentist for a root canal” or, to be more precise, half a dozen root canals.

Safer procedures

Perceiving a clear need for a new approach to decommissioning these structures, Versabar and one of its clients set out to develop a safer, more efficient and environmentally friendly method of severing subsea structures. Their goal was to find a way to clearly sever jackets and conductors 15 ft below the mudline with a minimum of direct personnel exposure and at the same time remove the accompanying structures following completion of the cutting operation.

While Versabar committed to engineer a working prototype, the client offered the ideal facility to put that prototype to the test: a 250 t caisson-mounted topside just three miles offshore near the Texas Louisiana line.

“From our perspective, the initial challenge was two-fold,” said Versabar President Jon Khachaturian. “First, to develop a powerful and efficient cutting wire which could cut through piles and conductors with internally grated casing strings, and secondly, to determine the best way to bring this wire to bear against an underwater structure at least 15 ft below the mudline.”

After months of testing at Versabar’s Belle Chasse and Houston facilities, Khachaturian and his engineering team determined that the optimum cutting solution was a standard 2 in. wire rope threaded with custom engineered tungsten-carbide beads 6 in. in length and 4 1/2 in. in diameter. Durable and dependable, when operated by hydraulic winches, the wire proved capable of sawing

Figure 1. An early Versabar prototype decommissions a 1300 t topside.

Figure 2. The Bottom Feeder tows a 3000 t jacket to a reeving site.

Figure 3. The VB-10000 decommissions a 2500 t fire damaged topside.

Figure 4. The Claw croaks a 1800 t topside.

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through a pipe 24 in. in diameter with a 2 in. steel wall in less than an hour (Figure 6).

Meanwhile, the company's engineers addressed the delivery system for the cutting wire. What was required was a structure robust enough to support the wire during the cutting process while having the capability to penetrate and anchor itself in the seabed during the operation. Furthermore, it would be required to accommodate the winches, HPUs and other equipment needed to operate the system.

"Through our operating experience with the VB-10000, we know that it would provide an excellent support system for this kind of cutting operation, so our 'Versacutter' prototype was engineered to be used in conjunction with the VB-10000," Khachatryan said.

The result was a lift frame composed of two multi-pronged anchor arms to stabilise the cutter in place, and two sharply pointed digger arms to penetrate the mud with the cutting wire and lower it into position against the structure. The 1300 t cutting frame itself was lowered from the twin gantries of the VB-10000, which also provided the dock space needed for the winches, HPUs and operators' stations.

Lift and go home

After dockside testing was complete, the prototype was deployed to the project site. With anchor arms and digger arms working in unison, the cutting wire sawed through the mud and cleanly severed the 60 in. caisson along with both internal and external conductions, a total of eight interfaces of steel and concrete. Total elapsed time for the entire process was just ten hours. "As far as personnel exposure goes, our technicians basically stood by and watched while the cutter did its job," Khachatryan pointed out.

Following the successful cut, the VB-10000 lifted the entire structure (Figure 7) and carried it back to port where it was placed on a barge for the trip to a salvage facility, completing the project.

"One of the most important features of this approach," adds Ian Todd, Versabar Director of Marine Projects, "is that of removing the uncertainty which often accompanies conventional cutting methods. This system proves the cut by passing the wire through. You make the lift and go home."

Summary

Versabar is moving to the next phase of development, building on lessons learned from developing and operating the prototype. The company is constructing a production model that will provide a powerful, efficient and reliable cutting system that can be deployed on a wide range of structures in differing water depths. Most important to the decommissioning industry, it will be an environmentally friendly and remotely operated system.

Versabar has salvaged/decommissioned over 175 000 t of steel as of September 2014. Single piece removal has limited much of the hazardous activity associated with salvage and decommissioning, including the double handling of materials, numerous personnel transfers and the multiple lifts that occur through conventional decommissioning procedures. Reducing diving activity and limiting the presence of welding/grinding personnel on the structures has done much to create a safer decommissioning environment.

"When it comes to decommissioning or salvage, the thing to remember about topsides and other offshore structures is that they don't come out the same way they went in," Khachatryan says. "We're working in a different era now. We need new tools to perform the old tasks - safer, cleaner, more efficient tools."