

What does a LWIV or Well Intervention Unit consist of in this day and age? By Grant Pierce



TFMC Well Control Package in garage with Pressure Control Heads on pallet over the moonpool onboard LWIV Island Performer GoM 2015

Coming from a background in Well Intervention over nearly 3 decades, and over the last five years being focused on Light Well Intervention in the subsea space, I thought I would write an article on what I think makes up a LWIV or Well Intervention Unit in this day and age.

Today there are a number of vessels out there. The main players in the LWI industry whom operate their own vessels are AKOFS Offshore, C-Innovation, Helix Energy Solutions Group, Oceaneering, Sapura Energy Well Services, TIOS Group, & FTAI most recently.

Whereas most of these companies also operate their own Well Intervention kits, some partner up with other service providers who then provide the Well Intervention kit and associated services. A few of the most notable partnerships are Helix and Schlumberger, TIOS and TechnipFMC.

The Intervention Package side is the key ingredient to getting the work performed. The following companies provide these Well Control Packages: Baker, Expro, Trendsetter Engineering, & WOM. These companies then partner up with a vessel provider or a rig provider.

There are also some companies that provide the control systems (IWOCS) separately such as Optime Subsea Services, Proserv, & JDR to name a few.

Considering Subsea Intervention work is a niche area, the first thing that makes a vessel or unit is the experienced crew involved. Unlike a drilling rig where you will sometimes see green hard hats floating around on deck, this is not something you normally see on a LWIV or Well Intervention Unit.

Most of the crews have worked together of a long period of time and have a synergy between them that make operations gel. Between marine crews, roV crews, survey crews, well control package crews, integrated service crews which typically include slickline/eline (and maybe braided line), pumping equipment, and coiled tubing downlines, what you have is a very experienced bunch. You can have the best people in the world, but they are only as good as the equipment they work with.

So, what are the basics of a LWIV or Well Intervention Unit? The vessel or unit itself should be dynamic positioning compliant, with DP2 or DP3 classed, as station maintaining ability when over a well or attached to a well is paramount. DP2 and DP3 compliant vessels simply means with a single failure they should not lose position. With DP3, more redundancy is built in.

Traditionally a Module Handling Tower (MHT) with a large enough capacity Active Heave Compensated (AHC) winch to convey and extract heavy equipment to and from seabed is the basis for equipment stackup and stability of same equipment. Though, in recent years vessels have been developed without an MHT with larger deck space including a larger moonpool hatch to facilitate larger equipment to be moved around such as XT's and subsea equipment that makes up subsea field architecture.

These vessels and units will consist of a moonpool with easily accesible hatch so as to convey Well Control Packages, XT's, etc through with safety and efficiency paramount. Also in this MHT there are a number of auxillary winches that are utilized to pick up tooling and hold wireline sheaves while work is underway.

Inside the MHT offset to one side, much like a drilling cabin, will be housed a control cabin. From this control cabin the MHT winch is controlled along with other services to be run in the well such as wireline. Everything is typically monitored from this cabin the same as a drilling operation would be monitored from the drilling cabin. This is the command and control point during an operation whereby the Vessel Supervisor would speak to Crane Operator, ROV Supervisor, Marine Personnel, Well Control Supervisor, Integrated Service Crew Supervisor, etc.

Next important pieces of equipment will be the cranes onboard utilized to convey equipment to seabed and extract same back to vessel for those over the side lifts, or through moonpool. The typical setup is a large capacity Active Heave Compensated (AHC) crane starboard aft and a smaller capacity crane port forward.

The main deck of the LWIV or Unit is sectioned off with guide rails (deck skidding systems) forward to aft down center line of the moonpool and port to starboard. On these rails, handling pallets are secured which hold the Well Control Package gear which is going to be run and extracted from the seabed, or if the goal is to set and/or retrieve XT, then these pallets also hold that equipment. Typically you will have different rated pallets based on weight of specific gear onboard. For instance, 50 Ton, 100 Ton, etc. The pallets are moved around by hydraulic pallet skid units.

In todays safety conscious setups, there are sometimes walk to work equipment nearby the towers or in the 'garage' to access the equipment at high reach places and to also maintain these lengthy Well Control packages. This is to keep man riding to zero.

Onboard the vessel a survey crew and their equipment will be present and also ROV crews with, in my experience, 2x WROV's. Work ROV's allow the ability to maintain control of heavy equipment packages while moving to latch or unlatch from subsea XT. I have seen setups where both ROV's were housed in a

workshop forward of the MHT with Moonpools & Launch and Recovery Systems (LARS) for both ROV's and also LARS over port or starboard side whereby ROV could be launched in less rough weather.

In the UKCS some of the vessels there have the ability to perform Saturation Diving operations in addition to utilizing ROV's and though it is more common to use ROV's in other areas across the world, still something to be aware of. On these North Sea based vessels you may still find a Sat Diving spread.

The Well Control Package makes up an integral part of the Subsea kit and a Riser based package typically consists of a Well Control Package (WCP) including Lower Marine Riser Package (LMRP) with a XT connector below, an Emergency Disconnect Package (EDP), and Riser back to surface. With an Riserless Light Well Intervention kit you would have Well Control Package with a XT connector below, Lower Lubricator Package (LLP), Upper Lubricator Package (ULP) which acts as your containment mechanism for tools to be run in the well, and a Pressure Control Head (PCH). Please note these RLWI notations are specific to TFMC Stack #4 so will vary between contractors and specific stacks; other names for these RLWI stacks are SILS, SIL, RWIS*

For communication to the WCP there will be a control umbilical (hydraulic/electrical) which will be mounted nearby the MHT or without MHT nearby the moonpool on a powered reel. If MHT is utilized then a series of guide sheaves route the umbilical up to the top of the MHT and down through well center where it connects with an Umbilical Termination Head (UTH) to the WCP.

For the WCP and associated equipment there will be a hydraulic power unit (HPU) and some type of master control station (MCS) which controls all the functions of the WCP from opening/closing valves to MEG injection to shearing and disconnecting in an emergency situation.

As with any other vessel there will be tank storage either below or above deck for storage of brines, freshwater, chemicals, etc with piping and transfer pumps to move fluid to your downhole pumping equipment. High pressure pumping equipment is then mounted above deck usually aft with high pressure line installed and connected to the Coiled Tubing reels.

Depending on the type of operations to be done, a wireline unit with the ability to perform mechanical operations (slickline/braided line) and the ability to run electric wireline tools is usually present. Dual drum units are handy for this purpose, where one drum holds slickline and the other holds electric line. A variety of downhole tools will be present, again depending on application.

To aid in pumping Coiled Tubing reels with Coiled Tubing are typically used for downlines. In my experience, over the side injectors were used on a sliding plate which then allowed the downlines to extend out over the port side of the vessel. Some type of high pressure hose is then used at or near the seafloor to run between the CT downlines and the pump-in location on the WCP mounted with Emergency Quick Disconnects (EQD) in the case of an emergency and the need to disconnect while operations underway.

With a Riser Based system a Coiled Tubing unit can also be utilized and setup as it would be on a drillship, in a more conventional way. Advances are also being developed to run Riserless Coiled Tubing (RLCT) and those typically have Injectors at the surface and subsea to make sure tension is held between the 2 points.

These days all types of Well Interventions can be performed including decommissioning. There are of course more modules and pieces that can be added in order to pull tubing in open water, etc, but I didnt cover any of those. As you can see, a LWIV or Well Intervention Unit is a complicated piece of machinery. Much like Drilling though, a good crew with synergy makes an operation move along safely and efficiently.