



SPED Update

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Will Dimensional Control Eliminate Field Fit-Ups?

Most pipers know that the last step in piping construction is the Field Fit-Up (FFU) process. FFU is the practice of allowing extra length on selected pipe spools to mate the pipe runs as actually cut, prepared and installed in the field. A survey technique, termed "dimensional control" uses more accurate survey techniques to precisely determine the pipe runs and mating flanges so that the final Hook-Up / Close – Out Spool can be shop prefabricated.

There are cumulative errors in laying foundations, fabricating equipment and pipe spools, field welds, assembly, operational break in, material creep and modifications over time. Because these cumulative errors cannot be realistically predicted, welders determine the as built position and orientation of equipment and pipe and close the gap with a final piece cut and welded in the field. This is easy for small diameter yard pipe in new or hazard free existing construction where hot work permits are easy to get and there is plenty of room for welding stands and clamps.

It is rare, however, to find a vapor-free environment with plenty of room for field fabrication materials, tools and trades in today's safety conscious, remote worksite, multi-contractor/supplier jobsite.

Dimensional Control Surveying and Laser Scanning have been available for some time but the software to reconcile and manage their data has matured. Modern Dimensional Control quickly corrects multiple 3D measurements using 3-dimensional mathematical calculation and modeling software. According to Tom Greaves, CEO of Spar Point Research LLC, "the key

is cost-effective, real-time updates to dimensional databases that can be checked against the design model. The technology to capture field dimensions is getting both more accurate and faster. Here's where rapid survey acquisition with total stations, laser scanners, GPS/RTK systems with small crews comes to the fore."

Example: FPSO Riser Hookup

BP Plutonio FPSO Project represents a typical application of high accuracy Dimensional Control to fabrication onshore for exact fit offshore. The joint development uses 43 subsea wells – 20 producers, 20 water injectors and three gas injectors – tied back to a single spread moored FPSO facility to process produced fluids and export crude. The FPSO connects to a network of subsea flowline and control systems that include 150km of flowlines, nine manifolds and 110km of instrument and control umbilicals.

Onshore pre-fabricating of the offshore piping hook-up spools offers the opportunity to make significant cost and schedule savings. Hi-Cad/Intertek used an accurate Dimensional Control technology / process developed on multiple worldwide onshore and offshore Hook-Up Projects. Dimensional Control surveying techniques and a specialized software application were used to precisely determine the tie in between the riser (Dummy Head) and existing FPSO Flange. Using the highly accurate surveyed data of the flanges establishes the dimensional information required for the Hook-Up Spool pre-fabrication including flange perpendicularity and bolt hole orientation when applicable. Final verification survey work of the completed spool provides confirmation of dimensional quality to given tolerances and assurance of first time fit.

The actual spool in the pictures was prefabricated, tested and painted prior to the FPSO departing to the offshore location (there were 11 similar configurations Hook-Up Spools). Once the Flow-line / Riser was pulled up from the seabed and locked into position above the FPSO Riser Guide, the Hook-Up Spool was quickly positioned and the fit-up successfully made. No hot work, clashes or rework, just first time fit. (Photos on page 2)

Conclusion

Clearly pipers will have to learn how to work with laser survey and scanned data in a variety of forms. The payoff is worth it for many applications.

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Photos - Plutonio FPSO Project Riser Hook-Up Spools (Courtesy of Hi-Cad/Intertek)

