Capping Stack Consultancy

Capping stack and containment

Capping stacks have been developed in recent years as part of a contingency system to deal with uncontrolled blowouts during the drilling of subsea wells. After the clearance of debris, the capping stack is lowered over the well, and landed on either the BOP or the LMRP. Once connected, the valves on the capping stack are closed by an ROV to seal off the flow from the well and provide a temporary barrier while a relief well is drilled to permanently kill the well.

The main components of a capping stack include a wellhead connector, pipework to divert the flow from the well, choke valves to control and stop the flow, block valves to provide a barrier, and ROV panels to operate the valves. Capping stacks are also often fitted with a system for the connection of flexible flowlines to allow the flow from the well to be directed to a containment system. This usually involves a series of flexible flowlines and risers linked to a surface vessel where the well fluids can be processed, stored and offloaded for export.

The fluid flow from the well will be a complex mix of oil and gas; as a result, the forces on the capping stack need to be carefully evaluated to ensure safe landing on the equipment. This requires a thorough understanding of the fluid mechanic associated with multiphase flows. The presence of gas introduces the added complication of hydrate formation as the gas comes into contact with the sea water, requiring the injection of hydrate inhibitor.

Capping stacks and the associated containment systems form part of a contingency system to be activated in the event of an uncontrolled blowout situation. The logistics associated with the transportation and offshore installation of the equipment are a major part of the contingency system and as a result require thorough prior engineering and the development of detailed procedures.

Crondall Energy capabilities

Crondall Energy has significant capabilities and experience in offshore engineering, particularly in the fields of subsea hardware, flow modelling, flowlines, risers and risk and reliability. These capabilities are very complementary to the engineering assessment of capping stacks and containment systems. Specific areas include:

- Performance assessment of subsea hardware;
- Functional requirements and equipment selection;
- Risk and reliability assessments including FMECA;
- Technical assurance;
- Fluid mechanics of multiphase flows;
- Engineering of flowline and riser systems;
- Flow assurance analysis and mitigation measures;
- Installation and deployment engineering;
- Engineering of process systems for floating production units;
- Development of codes and standards;

Capping Stack Consultancy

Previous projects

OSPRAG Capping Device: Crondall Energy was engaged by OSRL to perform an independent review of the OSPRAG Capping Device (OCD), including challenging the list of additional equipment recommended for the OCD. The work involved the review an evaluation of transport and shipping calculations including the sea fastening and grillage, the offshore deployment methods, the uplift forces on capping device during landing, the need for an additional drilling connector, and the development of an interface template to check the clearance of the OCD on a series of BOPs.

The work resulted in a reduction of 80% in the cost of the additional equipment it was recommended to purchase.

Artic Containment System: Crondall Energy was engaged to perform an in-depth assessment of the deployment procedures of an Arctic containment system to be used to collect hydrocarbon well fluids in the event of a drilling riser rupture. A dome unit is lowered over the incident well to safely collect the leaking fluids and transport them back to a nearby process vessel. The critical issue was the evaluation of the forces acting on the containment dome as it is lowered into the turbulent jet issued from the leaking well.

The results from the work highlighted the significance of the loss of buoyancy of the containment dome, which dominated over the hydraulic forces from the turbulent jet, allowing the dome to be safely lowered over the jet to collect the hydrocarbon fluids.

An independent consultancy focused on providing the very best engineering and technical advice in the subsea engineering arena