Postgraduate Certificate in Advanced Subsea Engineering for Oil and Gas

Subsea Processing and Boosting

Subsea processing and boosting are critical technologies for the extraction and transportation of oil and gas from subsea wells. This explanation will cover key terms and vocabulary related to these topics for the Postgraduate Certificate in Advanced Subsea Engineering for Oil and Gas.

1. Subsea Processing
Subsea processing refers to the separation and treatment of oil, gas, and water at the seafloor before they are transported to the surface. This technology reduces the amount of fluid that needs to be transported, which lowers the cost and complexity of subsea operations.

Key terms related to subsea processing include:

* **Christmas tree**: A tree-shaped assembly of valves, fittings, and chokes that controls the flow of fluids from a subsea well.
* **Manifold**: A structure that distributes fluids from multiple wells to a processing system.
* **Separation**: The process of separating oil, gas, and water using gravity or mechanical means.
* **Treatment**: The process of removing impurities such as sand, solids, and CO2 from the fluids.
* **Boosting**: The process of increasing the pressure of the fluids to enable them to flow more easily to the surface.
* **Subsea control module (SCM)**: A system that controls and monitors the subsea processing equipment.
* **Hydraulic power unit (HPU)**: A unit that provides the hydraulic power required to operate the subsea equipment.

2. Subsea Boosting
Subsea boosting is the process of increasing the pressure of the fluids produced from subsea wells using a pump located on the seafloor. This technology allows operators to maintain production rates as the reservoir pressure declines.

Key terms related to subsea boosting include:

* **Multiphase pump**: A pump that can handle a mixture of oil, gas, and water.
* **Drive system**: The system that provides the power to operate the pump.
* **Barrel**: A unit of measurement for oil, equivalent to 42 US gallons.
* **Production umbilical**: A cable that connects the subsea equipment to the surface and provides power, control, and communication signals.
* **Electrical power unit (EPU)**: A unit that provides the electrical power required to operate the subsea equipment.
* **Subsea distribution unit (SDU)**: A unit that distributes power and signals to the subsea equipment.
* **Flowline**: A pipe that transports the fluids from the subsea well to the surface.

3. Practical Applications
The following are some practical applications of subsea processing and boosting:

* **Subsea separation and boosting**: In this application, the fluids are separated and treated at the seafloor, and the oil is boosted to the surface using a multiphase pump. This technology is suitable for deepwater fields with low reservoir pressure.
* **Subsea boosting and surface separation**: In this application, the fluids are boosted to the surface using a multiphase pump, and then separated and treated at the surface. This technology is suitable for shallow water fields with high reservoir pressure.
* **Subsea processing and surface boosting**: In this application, the fluids are processed at the seafloor, and then boosted to the surface using a conventional pump. This technology is suitable for fields with high water cut and low reservoir pressure.

4. Challenges
The following are some challenges associated with subsea processing and boosting:

* **Complexity**: Subsea processing and boosting systems are complex and require careful design, installation, and operation.
* **Reliability**: The subsea equipment must be reliable and able to operate in harsh environments for extended periods.
* **Maintenance**: The subsea equipment must be maintained and repaired periodically, which can be challenging and expensive.
* **Cost**: Subsea processing and boosting systems are expensive to design, install, and operate.
* **Regulations**: Subsea operations are subject to strict regulations and standards, which can add to the cost and complexity of the projects.

5. Examples
The following are some examples of subsea processing and boosting projects:

* **Statoil's Johan Castberg**: The Johan Castberg field is located in the Barents Sea, and it is being developed using a subsea production system with a capacity of 65,000 barrels per day. The system includes 30 wells, a manifold, a separation and boosting system, and a subsea control module.
* **Shell's Appomattox**: The Appomattox field is located in the Gulf of Mexico, and it is being developed using a subsea production system with a capacity of 175,000 barrels per day. The system includes 17 wells, a manifold, a separation and boosting system, and a subsea control module.
* **Total's Kaombo**: The Kaombo field is located offshore Angola, and it is being developed using a subsea production system with a capacity of 230,000 barrels per day. The system includes 59 wells, a manifold, a separation and boosting system, and a subsea control module.

In conclusion, subsea processing and boosting are critical technologies for the extraction and transportation of oil and gas from subsea wells. The key terms and vocabulary related to these topics include Christmas tree, manifold, separation, treatment, boosting, subsea control module, hydraulic power unit, multiphase pump, drive system, barrel, production umbilical, electrical power unit, subsea distribution unit, flowline, complexity, reliability, maintenance, cost, and regulations. The practical applications of these technologies

include subsea separation and boosting, subsea boosting and surface separation, and subsea processing and surface boosting. The challenges associated with these technologies include complexity, reliability, maintenance, cost, and regulations. The examples of subsea processing and boosting projects include Statoil's Johan Castberg, Shell's Appomattox, and Total's Kaombo. Understanding these key terms, practical applications, and challenges is essential for anyone pursuing a Postgraduate Certificate in Advanced Subsea Engineering for Oil and Gas.