The Oil and Gas Production Process

All oil and gas production processes are similar. When well fluids arrive at the processing facility, they are composed of a mixture of oil, gas, and produced water. These three components must be separated into the correct specifications of oil and gas for metered export to pipelines and tankers.

The following figure shows a typical three-phase separator:

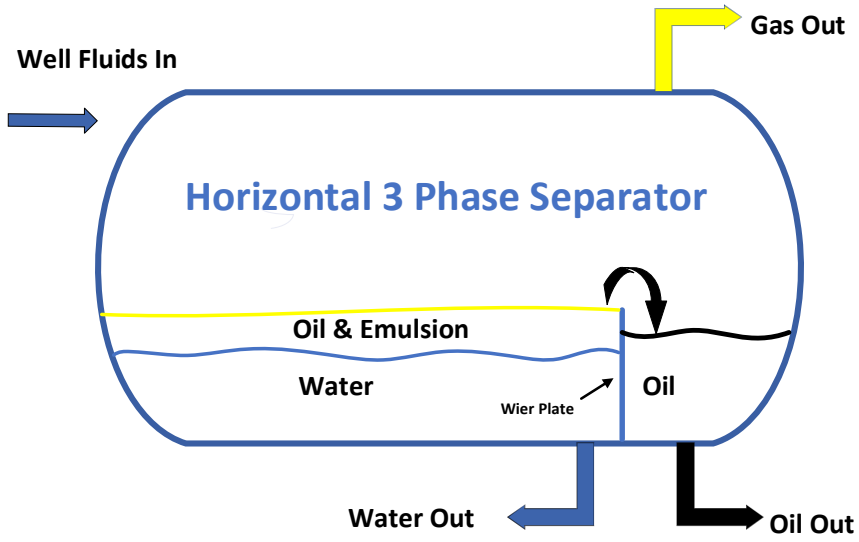

Figure 19.2 Three-phase separation.

Well fluids enter the separator where they dissociate from one another into gas, oil, and water, due to gravity and elapsed time, known as the residence time. Since water is the heaviest, it settles to the bottom of the separator and is drawn off.

Oil, on the other hand, rises to the top of the liquid and spills over a weir plate, where it is then drawn off. As pressure is reduced in the separator, the gas "flashes off" and is removed from the top of the vessel. This is not a perfect separation process hence further processing is required.

The following schematic shows a generic offshore installation processing configuration.

The figure shows a single production train, although it is common to have two or three trains operating in parallel to provide maximum flexibility and the ability to individually shut down parts of the system.

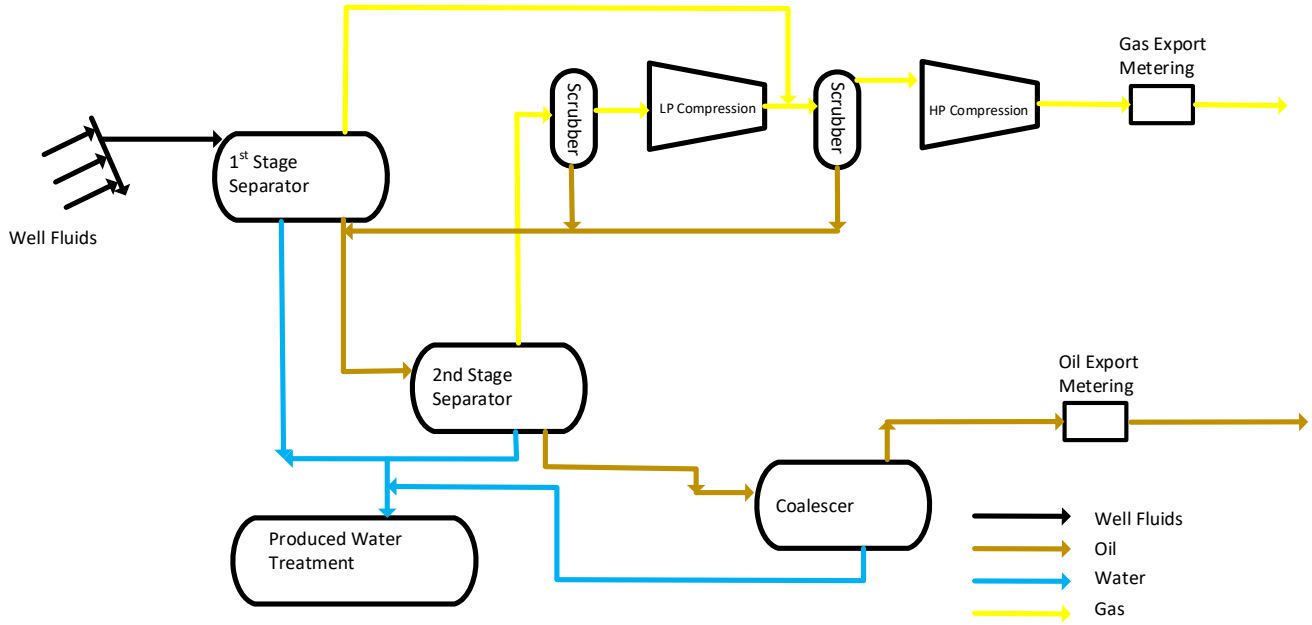

Figure 19.3 Generic production process.

The incoming well products are separated into three streams: oil, gas and water.

Oil Stream: The oil drawn off the first stage separator still has a percentage of water and entrained gas. It then goes through a second separation stage before final treatment in a coalescer to remove the remaining water. This oil is then fiscally metered before being exported to either a pipeline or tanker.

Gas Stream: The gas from the first stage separator will still have some water and oil entrained, so it must go through a scrubber to remove this liquid and return it to the second stage separator. The gas is then compressed during the high-pressure compression stage prior to fiscal metering and exported to the gas pipeline. Gas from the second stage is

at a lower pressure, hence this goes through low-pressure compression before joining the high-pressure stream.

Produced Water Stream: Water from the oil and gas separation process is known as produced water. This is typically cleaned to a very high specification (30 parts per million oil in water) prior to disposal into the sea or, in some cases, re-injected back into the reservoir to provide pressure support. The most common equipment used for treating produced water and achieving very low oil in water levels uses hydrocyclone technology, which uses vortex principles to achieve separation. An internet search will provide details on the theory and practical applications.