OUR PERSPECTIVE

PURCHASING A SEPARATOR

What to consider:

- Is momentum being used to separate liquids causing the emulsion stream to change direction?
- Have you included a mist extractor?
- Is a vertical or horizontal separator best suited to your production needs?
- Have you included baffles in your separator design?
- What kind of protection is on the float?

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SEPARATING YOUR SEPARATORS

Known by many different names – separators, filter separators, knockout pots, cyclone separators, centrifugal separators, vertical separators, SCUDs, horizontal separators, spherical separators, flash tanks, scrubbers, slug catchers, line drips – they are designed to do what their name suggests. The main job of a separator is to separate hydrocarbon streams – oil, gas, water – produced at the wellhead into their constituent phases.

The principles behind separators are simple. Momentum, gravity settling, and coalescing are used to separate the phases. One, or more of these principles can be used in a separator.

Momentum can be used to separate liquids by causing an emulsion stream to suddenly change direction. The heavier part of the emulsion cannot change direction as quickly as the lighter part can, so separation occurs.

The principles behind separators are simple – momentum, gravity settling and coalescing.

Gravity can also help separate the streams. This is not always the case as oil of API gravity 11 starts to become heavier than water and will actually reside underneath water in a vessel. This is often called phase inversion.

According to C. Richard Sivalls book, "Oil and Gas Separation Design Manual", we can identify some common features found on most separators:

1. Centrifugal inlet, where the bulk of separation usually occurs
2. A large settling section to allow settling and, if required, some extra surge room
3. A mist extractor to coalesce smaller particles that do not settle out by gravity
4. Controls, like level control floats and dumps, backpressure control valves, relief valves, gauges and other instrumentation

Design criteria for a separator differ between a low pressure oil well, (made up mainly of a large volume liquid phase) and a high pressure gas well, where the gas volume is high, and the liquid is often a high gravity hydrocarbon. Either one may contain free water as well.

Other factors affecting separation include operating pressure, temperature, and composition. However, an increase in pressure, or a decrease in temperature will typically affect separation positively.

It's the internal features such as baffles that distinguish off-the-rack separators from the more customized and better performing separators that are manufactured to meet your specific production requirements.

In order for a separator to effectively handle the liquids it, a number of baffles and shields are required. These provide the floats with a quiet chamber that's not constantly turbulent. The baffles also separate the phases from the incoming emulsion so that it cannot be constantly "upset" every time a slug of fluid/gas enters.

Off-the-shelf, low budget separators may be fitted with a float in the wide open diameter but all that is protecting it is a small piece of steel located about two feet above. This approach may work in some instances, but if you need to know how much water and oil you have before you meter it, think about buying a brand-name separator that meets your unique requirements.

Including a mist extractor removes 99.9 per cent of the entrained liquids from the gas stream.

When purchasing a separator, the mist extractor is often overlooked. The mist extractor is made of stainless steel and woven wire. Mist extractors are proven to remove 99.9 per cent of the entrained liquids from the gas stream. Correct placement of the mist extractor is crucial to its performance. Joe Buril, President Grand Valley Design, separator manufacturer, says that poor placement of the mist extractor in a horizontal separator causes significant issues for producers. When not done correctly, liquids get carried over into the gas line. Spending more time on design requirements for the separator at the beginning of the process will prevent downstream hassles of entrained liquids.

You will also need to consider the separator configuration – horizontal or vertical. Vertical separators are typically used when there's more gas than liquid. If there are liquid slugs anticipated, but overall low liquid rates are likely, a simple increase in the height will keep you covered. Horizontal separators can handle larger volumes of liquids, and also will help release dissolved gas from the liquids. The larger interface area makes a difference.

Some variations on these themes are "boots". Picture a horizontal vessel that may occasionally have a gas or water slug. By adding a small vertical portion to the vessel you combine some of the advantages of each configuration and buy some residence time.

While not as commonly used, spherical separators provide more economical alternatives for people with very high-pressure requirements. The sphere provides a maximum of protection with a minimum of steel.

There are other designs, including the very small separators that can often be seen in shallow gas areas. Here, small amounts of liquids and gases need to be separated prior to measurement, but done economically. These units are sold for prices under $15,000 including catalytic heat, meters, PSV's, fuel gas scrubbers etc., and all that in a 4' x 5' box hanging off a small diameter pipeline.