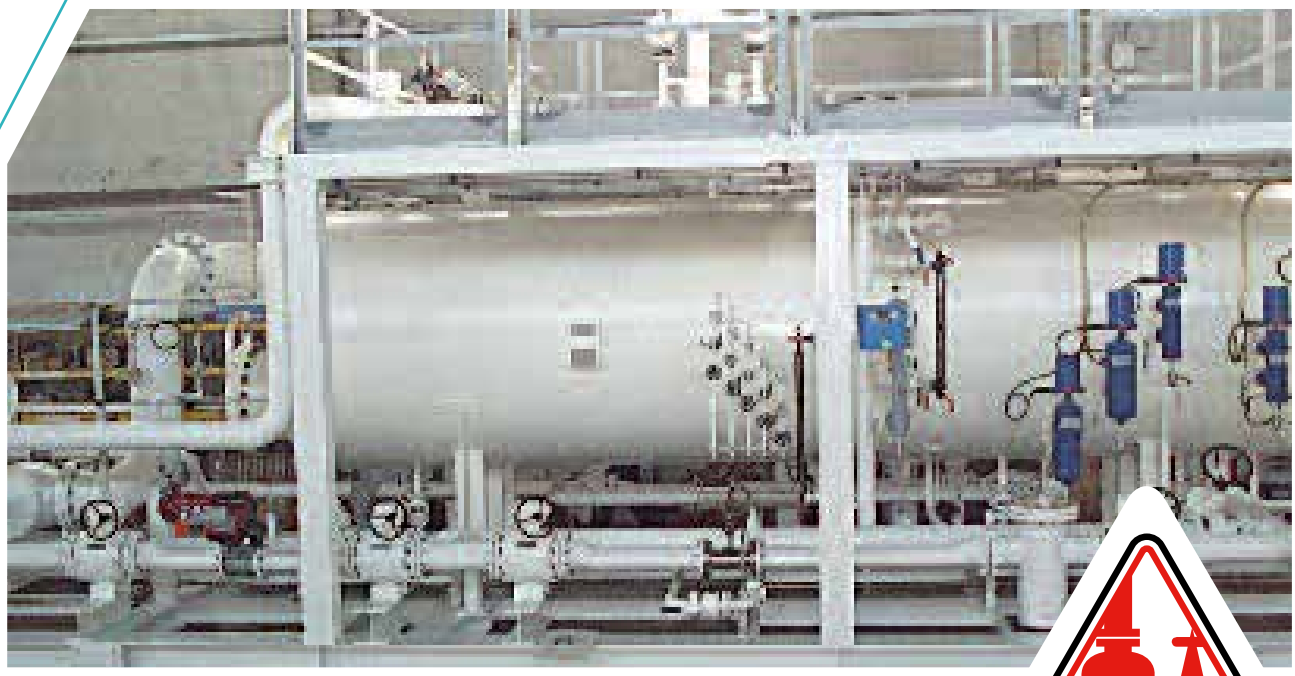
TWO AND THREE PHASE SEPARATORS



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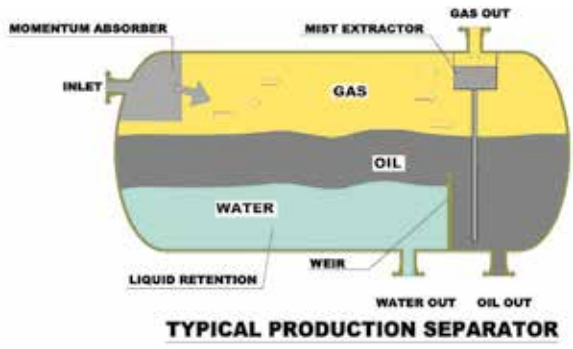
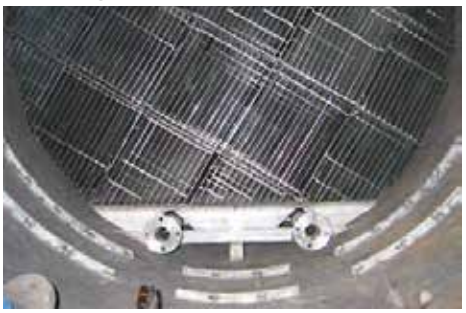
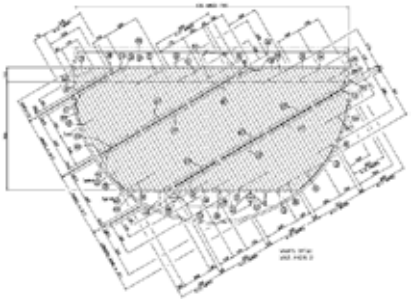
General Principle of Operation



TYPICAL PRODUCTION SEPARATOR

REPCo separators are used for the separation of gas from liquids and can be of the two or three phase type. As an example three phase separators are used to separate inlet streams into gas, oil/condensate, and water. Designed on a wide range of internals specific to each application and so suitable for any combination of gas/oil ratios, pressures, and flow rates. Separator process designs are generally divided into two distinct types: gas-dominant flow streams and liquid-dominant flow streams.
The first is used to remove free liquids (oil/ condensate and /or water) from primary gas production streams prior to further gas processes, such as dehydration, compression etc.
The second is used to remove free gas from the primary production streams, two-phase configuration then to additionally separate the liquid phases (oil/condensate and/or water) in a three-phase configuration, prior to further downstream processing of the gas and liquids, in preparation for equipment such as heater treaters, dehydrators, and that involved in water cleanup operations. The process design of the associated pressure vessels for this type of service requires operating data of the gas, oil/condensate, and water produced. The process design also requires knowledge in respect to the separation of gas, oil/condensate, and water. From experience REPCo has such knowledge and so has the capability to design and fabricate suitable efficient separators.





Efficiency

Separator performances (both vertical and horizontal type) are determined by the characteristics of the fluid being separated, the size of the vessel and the type of internals installed.

Typical expected performances are:

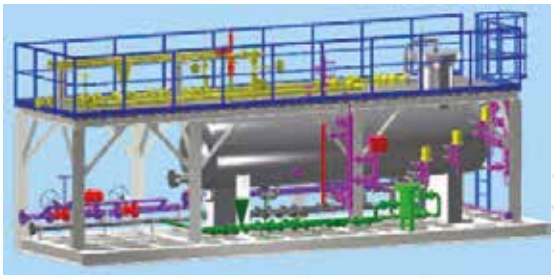
- Liquid carryover in the effluent gas stream will not exceed 0.1 gallons per MMSCF (or 99.9%of liquid droplets larger than 10 microns) if a vane bundle or wire mesh demister is installed;
- Particles of water carryover in effluent oil not larger than 400 microns;
- Particles of oil carryover in water not larger than 200 microns.

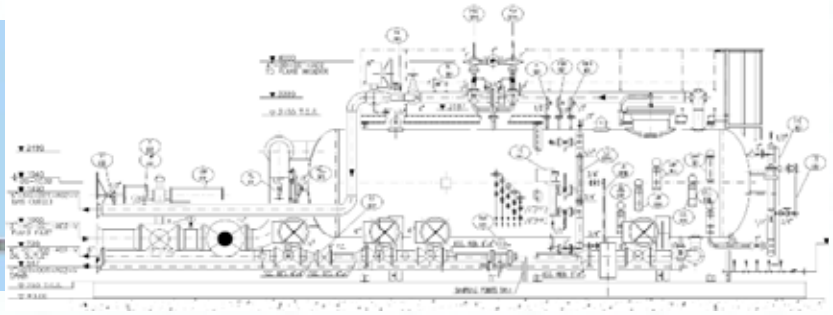
To enhance oil/water separation in 3-phase separators, revolution internals, perforated baffles and vane coalescing sections can all be added. BS&W content in the outlet oil stream is significantly reduced with the inclusion of one or a combination of these items.

Technical/Design

The technical requirements for oil and gas separators are normally based on the standard API SPEC 12J. Stokes law (which defines liquid separation in relation to fluid flow, density and viscosity of the liquids) is the main criteria considered in REPCo separator design.
The separator design can be applied to both vertical and horizontal vessels.

Type	Advantages	Disadvantages
Vertical	- Liquid level control is easier - Will handle larger quantities of sand and mud without fouling - Easier to clean out - Less tendency for re-evaporation of liquid	- On skid assemblies, more difficult to ship - Requires a larger diameter for a given gas capacity
Horizontal	- Easier to ship on skid assemblies - Easier to pipe up - For a given gas capacity, diameter is smaller than vertical - More area available for settling when two liquid phases are present	- Liquid level control more critical than with the vertical type - Not so easy to clean mud, sand, and paraffin from the vessel





REPCo separator design provides or makes provisions for the following:

1. Inlet momentum control and primary separation section.
To improve the initial separation of liquid from the gas using the principles of deflection for controlling inlet momentum such as splash plates, dished heads and cyclones. The nominated device controls the inlet momentum by redirecting the stream to dissipate the energy of the inlet fluid.
2. Secondary separation section.
To allow liquid particles to easily migrate toward the liquid sump under gravity. This section can include a flat vanes bundle in order to speed the liquid/liquid coalescing process.
3. Liquid accumulation section.
To provide a liquid retention time for the purposes of enhanced liquid/liquid separation while breaking-out any residual gas left in the solution. For an example in three-phase separators sizing, the liquid section is normally based on retention time, which in turn is heavily influenced by the crude oil gravity, the operating temperature and the required outlet BS&W.
4. Vapour demisting.
REPCo vane type demister is normally installed to remove entrained droplets at the gas outlet of the separator (see REPCo bulletin no. IL/005 associated with “vane type” demisters). As an alternative wire mesh can also be used for this purpose.
5. Others.
- Baffles and weirs are appropriately positioned to ensure separation of the oil/condensate from the water. In addition adjustable weirs may be supplied to allow for varying process conditions.
- Vortex breakers are fitted on all liquid outlets to ensure smooth and even draining operations
- Sand jet facilities for claning may be inorporated in liquid sumps in cas of sand carryover problems during operation.

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