



## LIQUID SEALS AND KNOCK-OUT DRUMS

### WATER SEAL

Liquid seals and/or K.O. drums may be designed as horizontal vessels located at a reasonable distance from flares or as vertical vessels in which case they can be incorporated at the base of the flare.

A good design indicates to locate the vessels as close to flares as possible in order to avoid condensate accumulation in the flare header.

flashback occurs in the flare stack.

Water is the most common fluid used in a liquid seal. Other fluids can be used as long as the fluid is compatible with the flaring gas flowing through the seal and with the temperature ranges encountered.

The fluid depth is variable. A typical depth of liquid is 150 mm, however it is possible to have a greater depth to increase the header pressure.

The liquid seals have special designed internals with an anti-pulsation device in order to insure a steady flow of flaring gases to the flare burner thus increasing the smokeless performance and decreasing the noise caused by uneven combustion.

The liquid level is preferably maintained by a constant overflow weir and proper siphon drainage.

The seal drum may be equipped with internal steam coil/sparger or an external electrical heat tracing for winterisation purposes.

Liquid seal is preferably installed vertically at flare system base.





## KNOCK-OUT DRUM

K.O. Drums are designed to remove effectively entrained liquid droplets from the flaring gases. Removal of entrained liquid from the flaring gas is very important for two reasons.

Primarily, the presence of liquid in the flaring gas promotes intense smoke during combustion. Also, if liquid passes through the flame at the flare burner it will cause “flaming rain” onto the ground below causing a serious safety problem.

The design of these drums is based generally on the criteria defined in API RP-521 and it considers residence time and drop-out velocity of the liquid particles in the vapour flow.

K.O. Drums can be designed as gravity separators and in this case they are usually horizontal vessels installed at a reasonable distance from flare.



K.O. Drums will be designed to avoid the accumulation of hydrocarbon liquid and they are equipped with instrumentation, control and pumps.





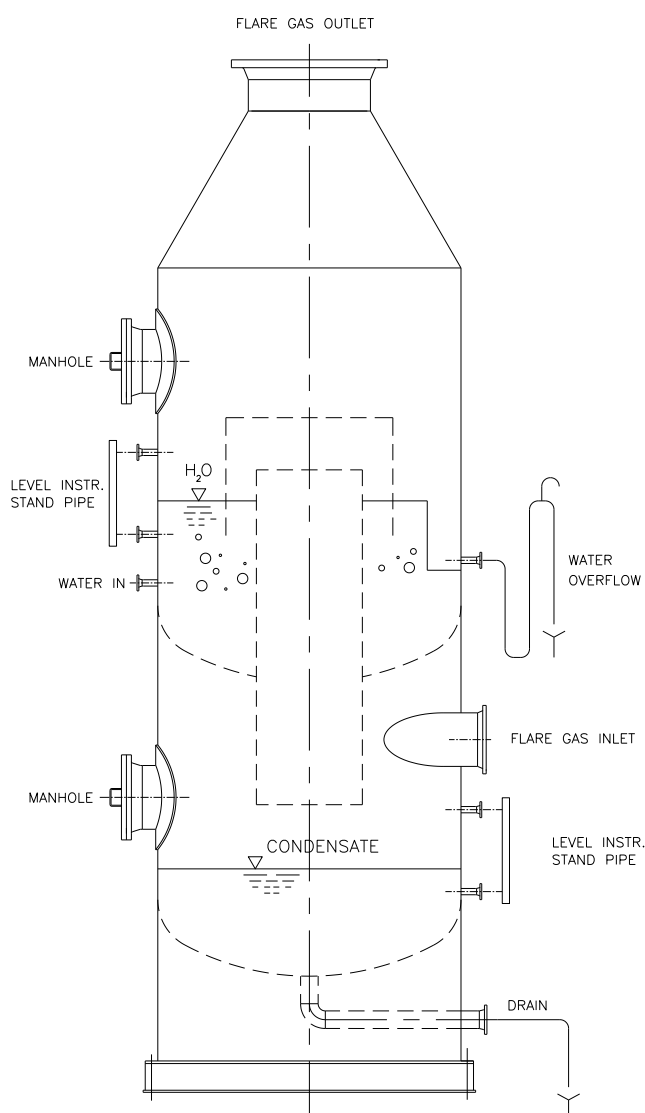
## COMBINED K.O. DRUM / LIQUID SEAL DRUM

A combined drum is split in two compartments.

The K.O. drum section has been designed to remove hydrocarbon liquid from the relief gas and it minimizes the possibility of carry-over and rain fire from flare burner.

The liquid seal section is utilized to provide positive pressure on the flaring gas header and to act as a flame arrestor in the event a flashback occurs in the flare stack.

The combined drums are usually vertically installed at flare base and the costs associated with interconnecting piping foundations and installation are significantly reduced.



Typical Combined K.O. Drum / Liquid Seal Drum