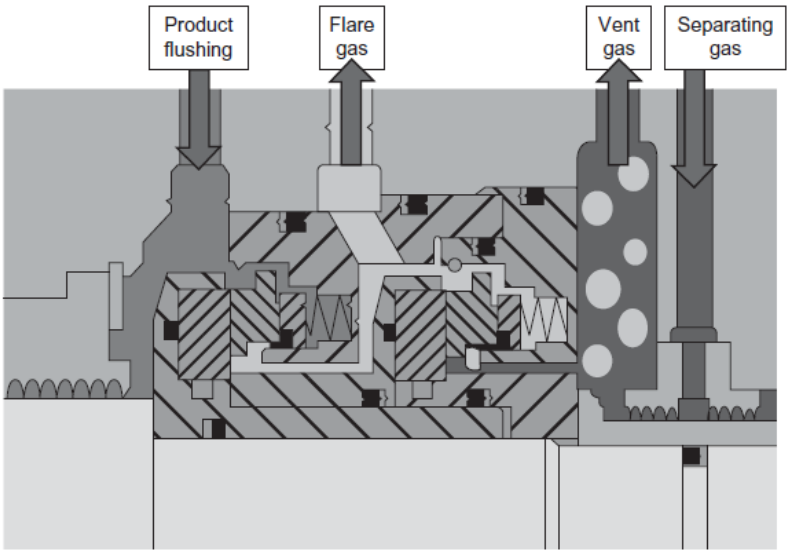
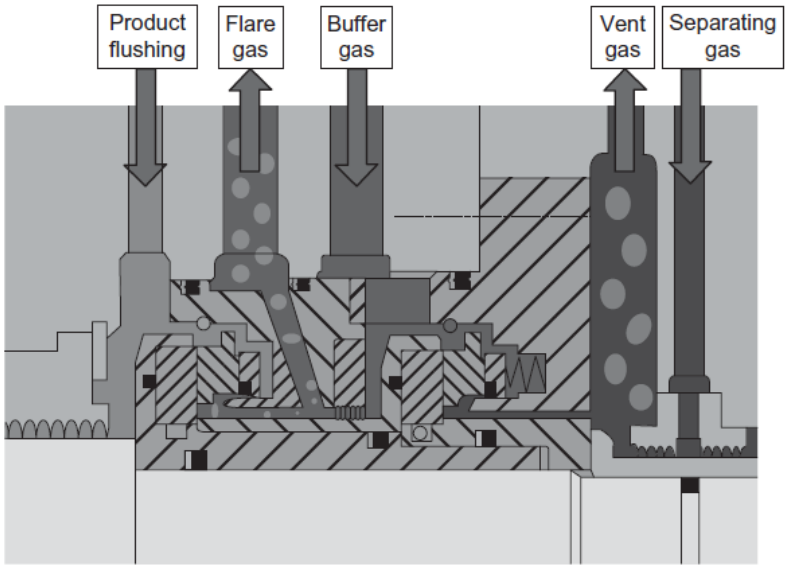


Tandem Dry Gas Seals without Intermediate Labyrinth

Tandem Dry Gas Seals

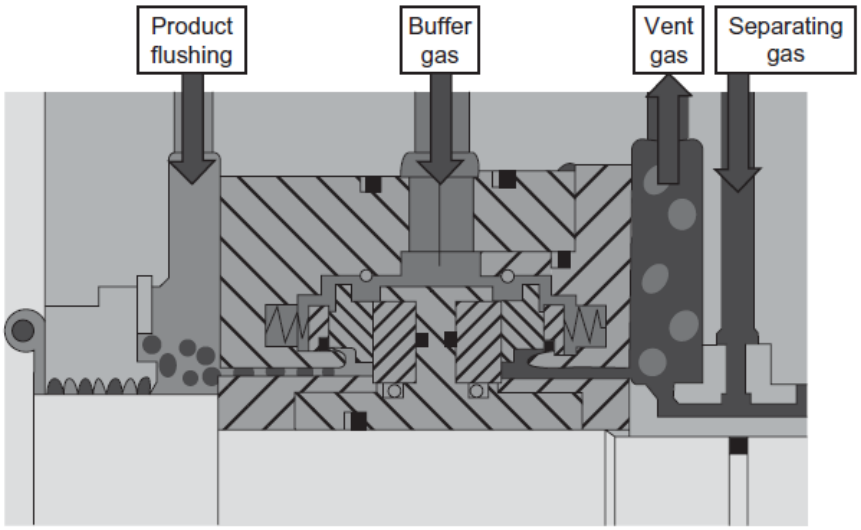
The tandem dry gas seal as seen above. Relates to applications where small product leakages of process gas are admissible. The seal on the atmosphere side acts as a safety seal. The tandem arrangement provides a particularly high degree of operational safety. The seal on the product side and the seal on the atmosphere side are able to absorb the complete pressure differential. Under normal operating conditions the full pressure is reduced only by the seal on the product side. The space between the seal on the product side and the seal on the atmosphere side is cleared by a connection to the flare. The pressure differential to be sealed by the seal on the atmosphere side equals the flare pressure, so leakage to the atmosphere side or to the vent is very low. If the main seal fails, the second seal acts as a safety seal.



Tandem Dry Gas Seals with Intermediate Labyrinth

Tandem Dry Gas Seal with Labyrinth

A tandem seal with intermediate labyrinth is shown above. This seal is used in applications where the product leakages to the atmosphere as well as buffer gas leakages to the product are inadmissible, for example, on H2, ethylene or propylene compressors. In this type of seal the product pressure to be sealed is reduced via the seal on the product side. The entire process gas leakage is discharged via connection to the flare. The seal on the atmosphere side is pressurized with a buffer gas such as nitrogen via connection to the buffer gas. The pressure of the buffer gas ensures that a current flows via the labyrinth to the primary vent outlet.



Double Gas Seals

Double Gas Seals

A double gas seal, as shown above, is used where product leakages to the atmosphere are inadmissible and tandem arrangements are not suitable because of too small product gas pressures. Buffer gas leakages into the product must be admissible and the buffer gas pressure must be higher than the product pressure. This seal is used when a neutral buffer gas of suitable pressure is available. Typical applications are to be found mainly in the chemical industry, for example, on HC gas compressors. A buffer gas, for example, nitrogen, is fed between the seals at a higher pressure than the product pressure. One part of the buffer gas leakage escapes to the atmosphere side and the other part to the product side.

Barrier Seals

Outboard of the dry gas seal is a barrier seal, which separates the gas seal from the compressor shaft bearings (Figure 1). A separation gas (typically nitrogen or air) is injected into the barrier seals. The primary function of the barrier seal is the prevention of lube oil migration into the gas seal. The barrier seal also serves as the last defense in the event of a catastrophic failure of the primary and secondary gas seal. Traditional labyrinth seals or segmented carbon ring seals are used in most barrier seal applications today. Segmented carbon ring barrier seals offer the advantage of substantially lower separation gas flow requirements due to the larger shaft clearance associated with labyrinth seals. The author has previously presented a more detailed comparison of segmented carbon ring versus labyrinth barrier seals (Stahley, 2001).

References:

Dry gas seal system design standards for centrifugal compressor applications, John S. Stanley

API614 (lube oil and shaft sealing systems)