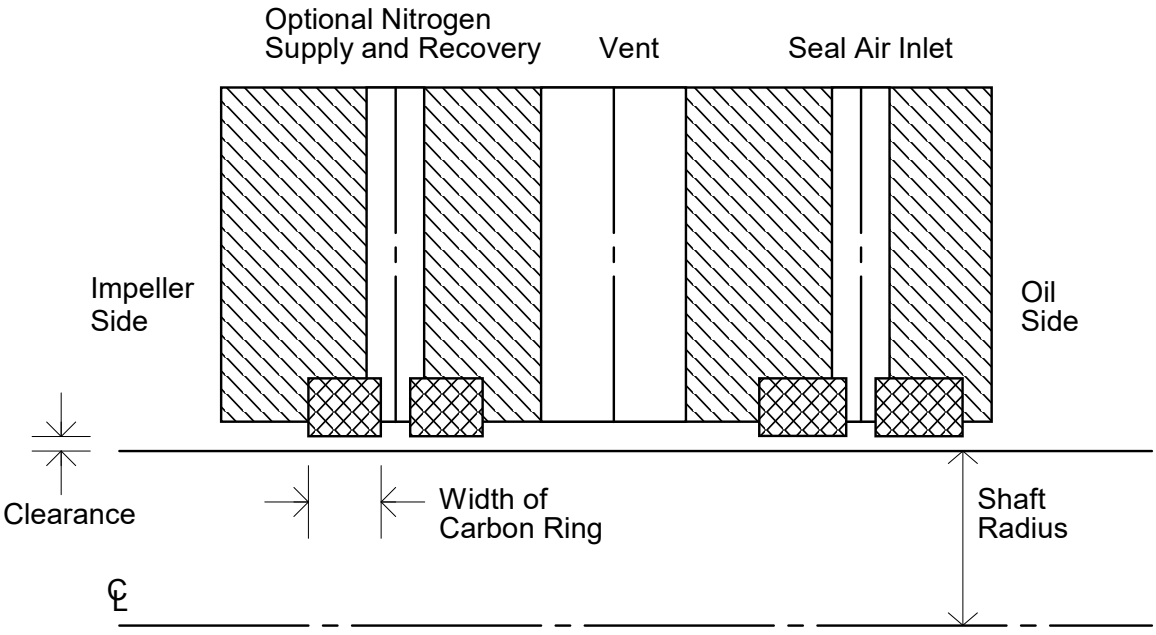
Carbon Ring Seal Leakage

Carbon ring seals are used to separate oil from the high pressure air. Radial clearance between the shaft and the ring seals allows the shaft to rotate while restricting the leakage flow between the shaft and seals. The rings are able to move radially to remain centered on the shaft when the shaft moves from the centerline position.

Some designs combine the air and oil seals into one cartridge while other designs use separate air and oil seals. Seal Air is supplied to the oil seal to provide a buffer of low pressure air between the oil and the high pressure air. This air buffer prevents the flow of oil into the pressurized air. A vent is provided between the air and oil seals to release the air which leaks through the seal. The vent is usually at atmospheric pressure.

In some designs, a vent is provided in the air seal to allow for the recovery and/or supply of Nitrogen. Nitrogen is supplied while the compressor is idling to prevent any Nitrogen in the compressor from leaking and Nitrogen is recovered during operation for return to the compressor inlet. Although this feature is usually used for Nitrogen applications, the principle is applicable to other gasses.



The seal leakage calculation is based on a technical report by Bauer, P., Glickman, M., and Iwatsuki, F., May 1965, "Analytical techniques for the Design of Seals for Use in Rocket Propulsion Systems, Volume II Dynamic Seals," Technical Report AFRPL-TR-65-61, Air Force Rocket Propulsion Laboratory, Research and Technology Division. A correction factor which is not present in the report is used to adjust the calculations to fit the experimental results performed by AMS Seals, Inc. and other air compressor companies.