AC COMPRESSOR TRAPPED BUSHING SEALS

By Rob King and John Decker

LEVEL CONTROL

The seals low leakage rate is predicated on the dynamic function of the seal's design features and clean oil supplied to the seal at a defined differential pressure relative to the gas pressure adjacent to the seal. This is accomplished by the use of an overhead tank with a level control scheme to maintain 5 feet oil level above the compressor centerline with gas reference on top of the oil from the discharge end, inner seal drain and vent annulus in multistage applications. This gas pressure is for all intents and purposes the same pressure as the inlet seal due to equalizing line function. (In single stage overhung units the sensing point is the inner leakage/vent annulus.) This level control scheme essentially tracks process pressure as the controller and its' associated level control valve react to varying gas pressures while maintaining the level set point. The level control logic also provides outputs for level alarm, aux pump start and compressor trip, as well as the signal to the level control valve. When the trip level is reached, the output to the level control valve is vented and the level control valve goes to its fail close mode on loss of signal. The result is the remaining oil in the tank is shunted to the seals for coast down purposes. The level control scheme versus DP control offers improved tracking to process changes and will absorb most process upsets do to the capacitance offered by the volume of gas above the oil in the head tank without creating potential instability of 'hard' DP system.

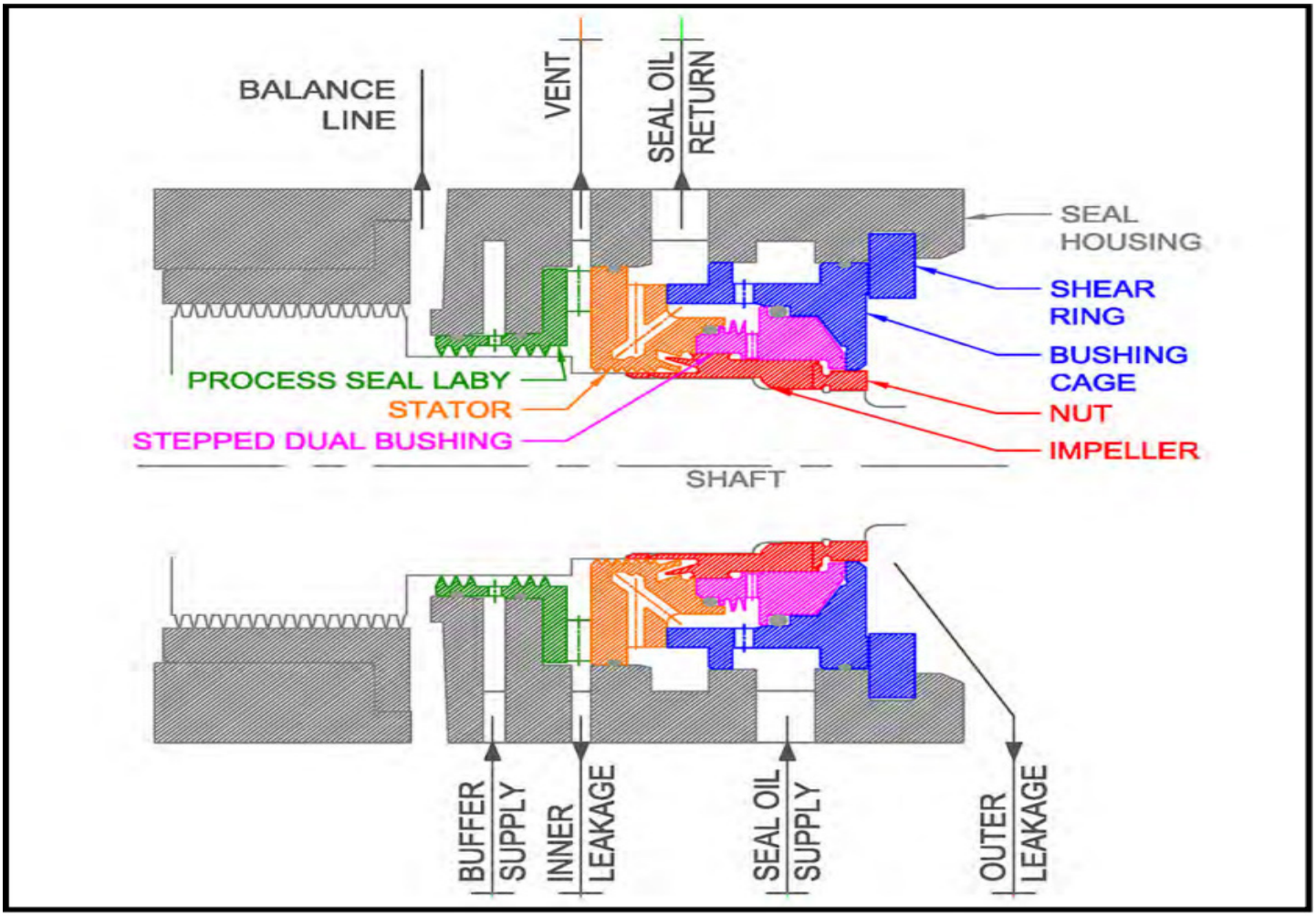

Figure 1

SEAL OIL SYSTEMS

Seal oil systems may be combined with the compressor lube oil system or separated if needed due to process concerns of contaminating lube oil or higher process gas sealing requirements. In the combined system, the reservoir is shared while separate pumps, filters, and coolers may be required for the higher pressure seal oil requirement than the lube oil pump circuit can accommodate. In separate systems having unique seal system and a unique lube oil system, a barrier seal/ baffle is used between the bearing housing and seal cavity to keep the oil from the individual systems from migrating between systems. “Traps” (sometimes called drain pots) are an important part of the seal oil system which captures the inboard sour oil leakage. They are gas tight with regard to the drain function and are typically snap acting to open/close upon reaching level set point, to dump the oil either back to the reservoir, via a degassing tank or to an alternate location depending on the concern for contaminates to the seal oil integrity. In most installations there is an oil gas mixture that goes to the trap. This mixture enters the trap on the side of the vessel with the gas exiting the top of the vessel through a demisting element and a monitored/controlled orifice assembly and finally back to the compressor inlet, flare line or alternate location. The flow of the gas from the trap back to the inlet or flare can also be used in a scheme to control the buffer gas being supplied to the process seal labyrinth inboard of the trapped bushing seal. The process labyrinth seal and trapped bushing seal are separated by the drain and vent annulus of the seal housing/cavity. By measuring the seal flow to the process labyrinth and the flow downstream of the trap, the gas flow from the trap can be controlled to be 50% of the total flow supplied to the process labyrinth. The 50% of flow not going toward the trap is then going toward the process. Calculations can be made to size the orifice and control elements appropriately to provide sufficient gas velocities to process labyrinth to keep process debris from back diffusing toward the seal, using this flow control logic. The use of the buffer system keeps the trapped bushing seal clean and also keeps the gas – oil interface in the overhead tank clean from contaminates. The buffer gas is also not subject to the same criteria of seal gas for a dry gas seal, and needs to be considered in the overall process gas stream make up.

As with most all lube oil and seal oil systems, cleanliness is of critical importance to reliability. Careful attention to cleanliness details must be observed during all seal installations and systems maintenance to avoid contamination and their inherent problems. It is recommended to functionally test the seal system including the alarm and trip set points, during the course of major outages to ensure the system functions as originally intended. This exercise also provides operators and equipment engineers the opportunity to refresh their knowledge of the systems.

The trapped bushing seal can still offer the reliability needed and the RMS engineering team has the resources to support these efforts

Here is a powerful yet simple rule. Always give people more than they expect to get - Nelson Boswell

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