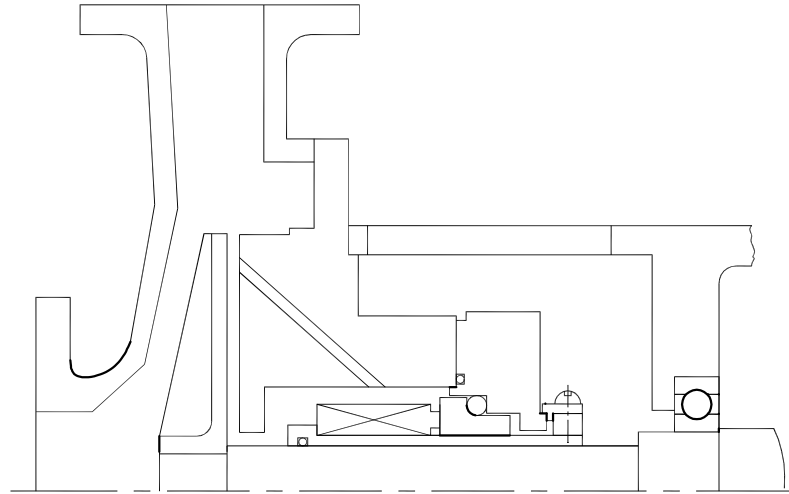


API PLAN 01



FEATURE

- INTERNAL SEAL FLUSH THROUGH THE PUMP BODY
- SIMILAR TO PLAN 11.

PURPOSE

- KEEP STUFFING BOX TEMPERATURE AS NEAR TO PUMPING TEMPERATURE AS POSSIBLE.
- EXCESS SEAL HEAT REMOVAL.

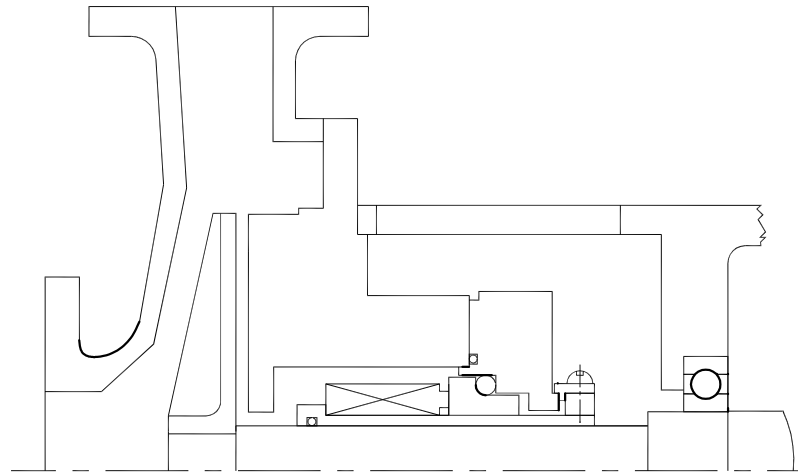
APPLICATION

- FOR LIQUIDS THAT THICKEN OR SOLIDIFY AT AMBIENT TEMPERATURE CAUSING CHOKING OF PLAN 11 PIPING.

CAUTION

- FOR CLEAN FLUIDS ONLY.
- HEAT REMOVAL MAY NOT BE ENOUGH AT THE SEAL FACES.

API PLAN 02



FEATURE

- DEAD ENDED SEAL CHAMBER
- NO FLUSHING
- NO CIRCULATION

PURPOSE

- PRESERVE HEAT IN THE STUFFING BOX.
- AVOID ICING ON ATMOSPHERIC SIDE.

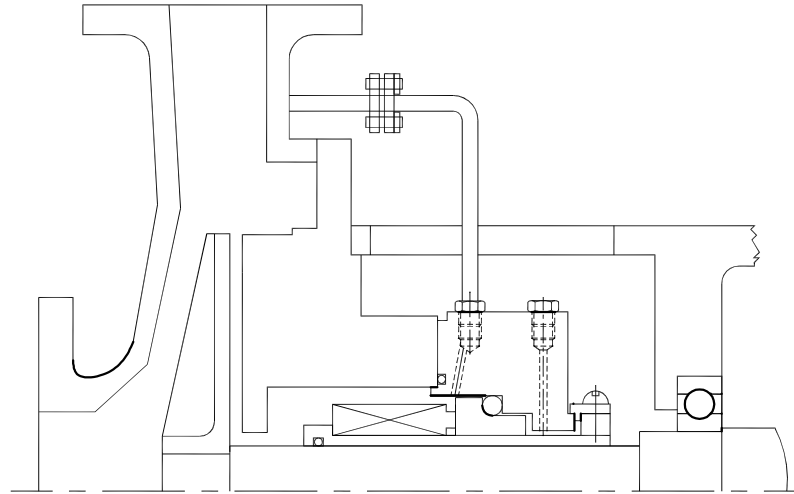
APPLICATION

- LOW TEMPERATURE, LOW PRESSURE FREEZING LIQUIDS.
- FOR NORMAL SERVICE. USED MORE IN CASE OF CONICAL STUFFING BOX WITH VORTEX BREAKER AND FLOW ENHANCER FOR UNIFORM HEAT DISTRIBUTION.
- CAN BE USED WITH A JACKETED CYLINDRICAL STUFFING BOX FOR HEATING OR COOLING A RELATIVELY STAGNANT LIQUID IN THE STUFFING BOX.

CAUTION

- DO NOT USE FOR SOLVENTS WITH LOW BOILING POINT, OR HIGH VAPOUR PRESSURE

API PLAN 11



FEATURE

- DISCHARGE FLUSH.
- CONNECT PUMP DISCHARGE TO STUFFING BOX THRO' ORIFICE.

PURPOSE

- HEAT REMOVAL, VENTING.

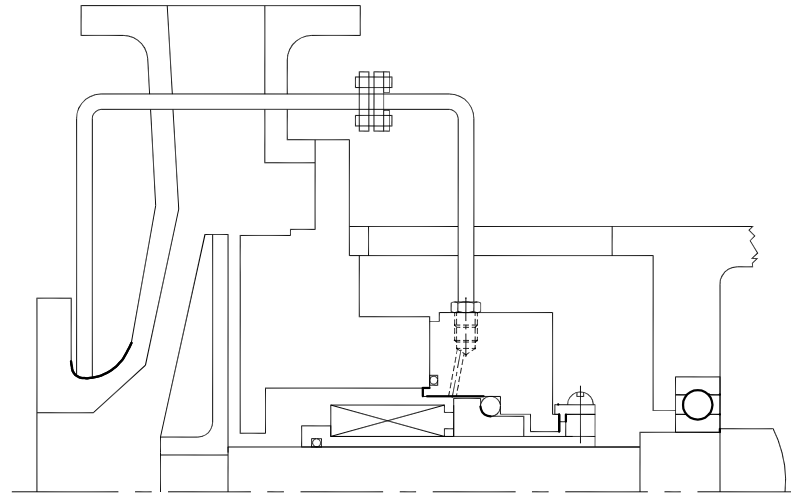
APPLICATION

- DEFAULT PLAN FOR ALL SINGLE SEALS ON GENERAL DUTY, FOR CLEAN LIQUIDS.

CAUTION

- FOR HIGH HEAD PUMPS, PROPER ORIFICE DESIGN REQUIRED TO AVOID IMPINGEMENT AND PROPER THROAT BUSH CLEARANCE REQUIRED TO ENSURE PROPER FLOW.

API PLAN 13



FEATURE

- SUCTION FLUSH.
- CONNECT PUMP SUCTION TO THE STUFFING BOX.

PURPOSE

- HEAT REMOVAL AND VENTING.
- REDUCE STUFFING BOX PRESSURE.

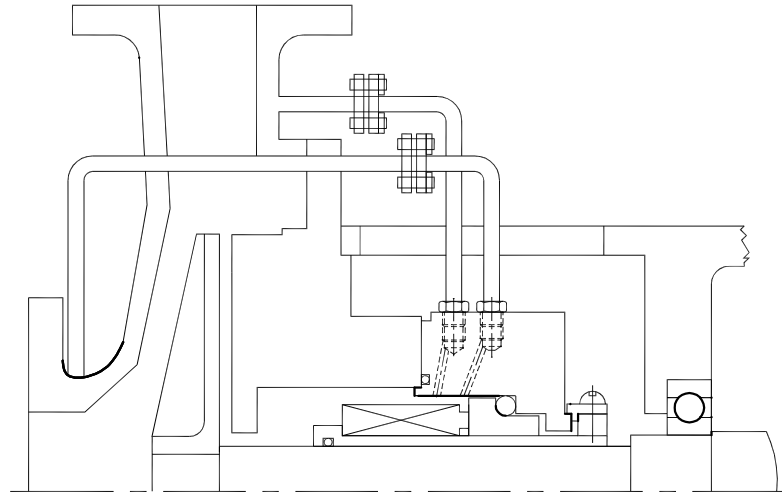
APPLICATION

- VERTICAL PUMPS WITHOUT BLEED BUSHING BELOW THE SEAL CHAMBER WHERE PLAN 11 CAN NOT INDUCE THE FLOW IN ABSENCE OF PRESSURE DIFFERENTIAL.
- MULTISTAGE HIGH PRESSURE PUMPS HANDLING VOLATILE LIQUIDS.

CAUTION

- VAPOUR PRESSURE MARGIN MUST BE CHECKED SO THAT SEAL CHAMBER PRESSURE IS HIGH ENOUGH TO AVOID VAPOURIZATION.
- THIS PLAN WILL NOT WORK WHERE STUFFING BOX PRESSURE IS ALMOST EQUAL TO SUCTION PRESSURE.

API PLAN 14



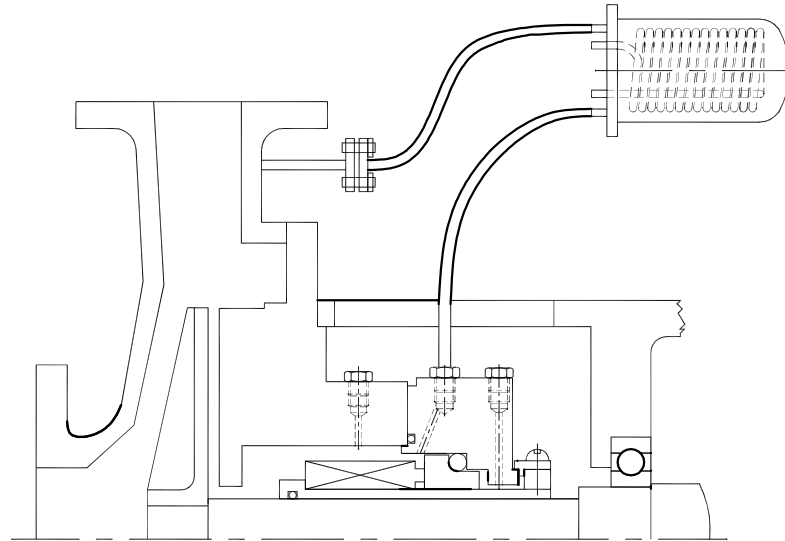
FEATURE

- A COMBINATION OF PLAN 11 & PLAN 13

PURPOSE

- COMMONLY USED ON VERTICAL PUMPS.

API PLAN 21



FEATURE

- DISCHARGE FLUSH THROUGH ORIFICE AND A COOLER (PLAN 11 WITH COOLER)

PURPOSE

- PROVIDE COOL FLUSH.
- IMPROVE VAPOUR PRESSURE MARGIN.
- IMPROVE LUBRICITY (HOT WATER)

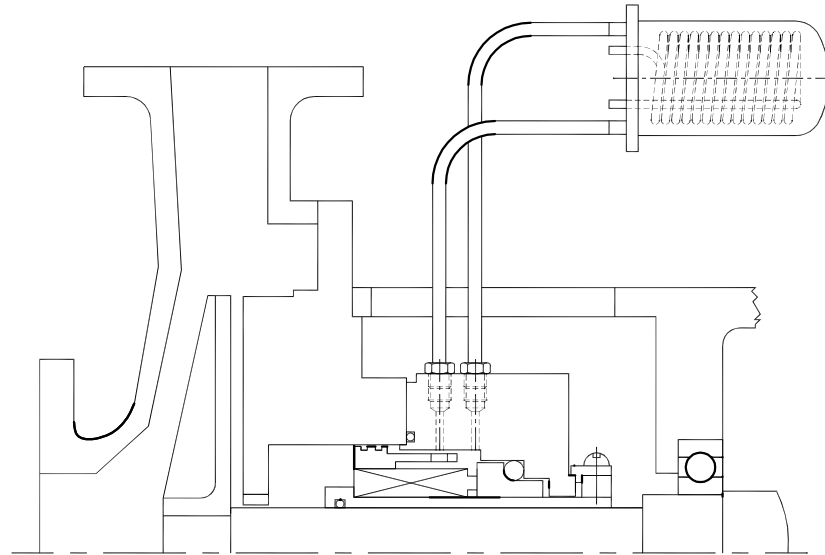
APPLICATION

- HOT WATER, LIQUIDS NEAR VAPORIZATION.

CAUTION

- COOLER MAY GET CHOKED ON WATER SIDE.
- NOT TO BE USED FOR VISCOUS OR SOLIDIFYING LIQUIDS.
- NOT FOR SLURRIES.

API PLAN 23



FEATURE

- RECIRCULATION OF STUFFING BOX LIQUID BY PUMPING RING THROUGH COOLER, WITH STUFFING BOX ISOLATED BY CLOSE CLEARANCE BUSH .

PURPOSE

- BRING DOWN STUFFING BOX TEMPERATURE TO SAFER VALUES.
- IMPROVE VAPOUR PRESSURE MARGIN.
- IMPROVE LUBRICITY.
- ENERGY SAVING.

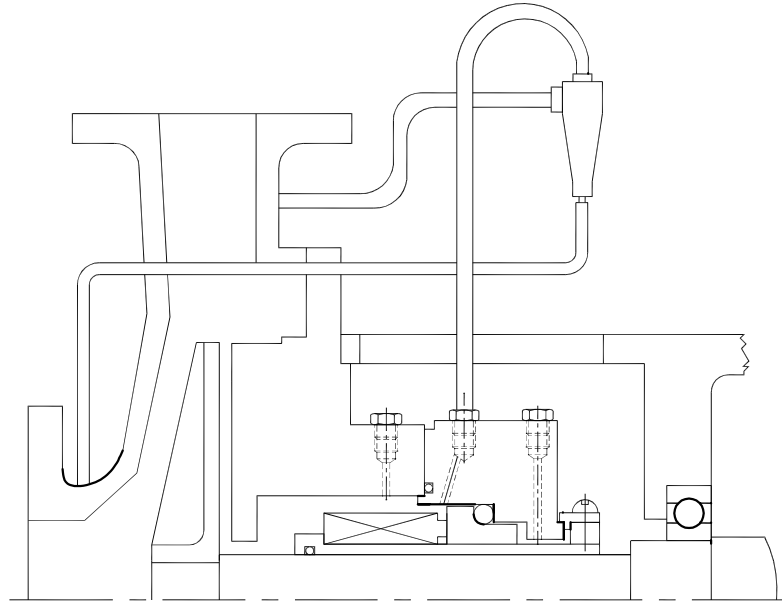
APPLICATION

- BOILER FEED PUMPS & HYDROCARBON DUTIES.

CAUTION

- HEAT EXCHANGER CHOKING ALTHOUGH MUCH LESS LIKELY THAN PLAN 21
- USE WITH CAUTION IN CASE OF HIGH FREEZE POINT AND VISCOUS LIQUIDS.

API PLAN 31



FEATURE

- DISCHARGE FLUSH THROUGH CYCLONE SEPARATOR.

PURPOSE

- SEPARATION OF SOLIDS FROM THE LIQUID.

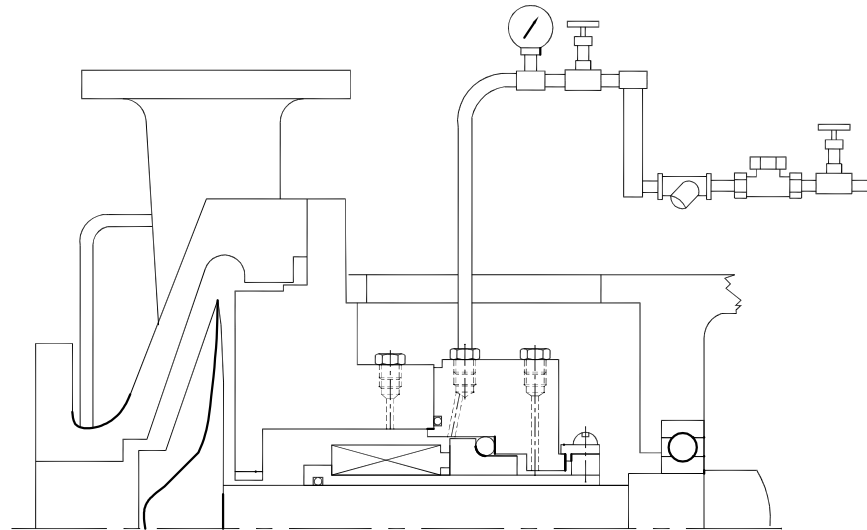
APPLICATION

- LIQUIDS WITH THICKER & HEAVIER SLURRY PARTICLES.

CAUTION

- HIGHLY UNRELIABLE & NOT RECOMMENDED.

API PLAN 32



FEATURE

- EXTERNAL CLEAN FLUSH WITH CLOSE CLEARANCE THROTTLE BUSH

PURPOSE

- IMPROVE SEAL ENVIRONMENT
- REDUCE STUFFING BOX TEMPERATURE TO AVOID FLASHING
- AVOID VACUUM IN THE STUFFING BOX
- IMPROVE SEAL CHAMBER PRESSURE FOR BETTER STABILITY OF LIQUID

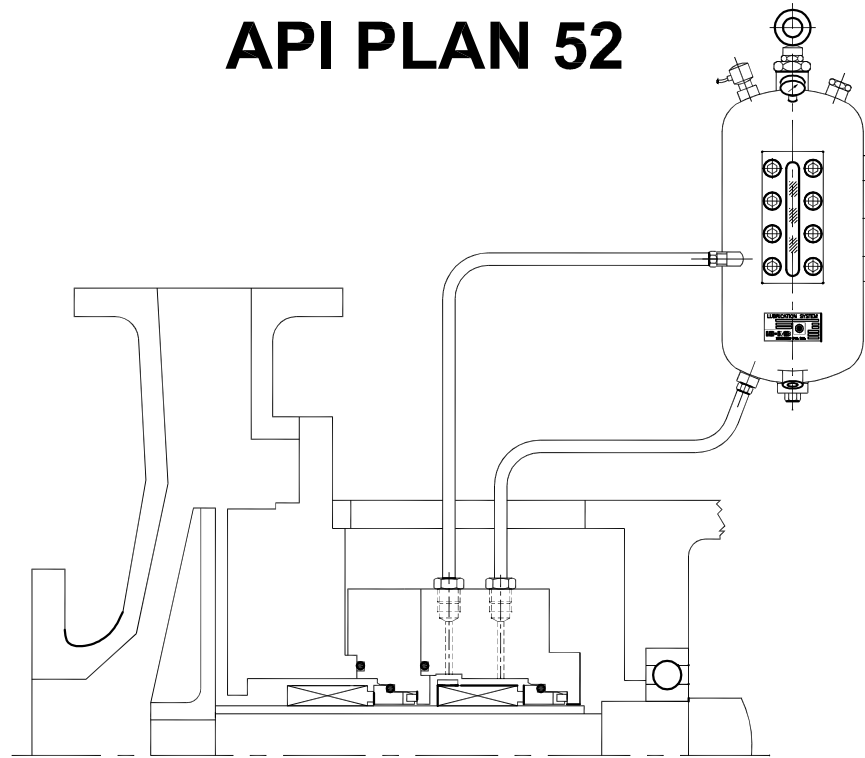
APPLICATION

- THICK AND STICKY SLURRIES AT ELEVATED TEMPERATURES (ETP PLANTS)
- LIQUIDS WITH HIGH SLURRY CONTENT LIQUIDS
- IMPROVE THE PERFORMANCE OF CONVENTIONAL SEAL WHICH HANG UP AND FAIL OCCASIONALLY DUE TO SCALING, POLYMERIZATION, SOLID IMPURITIES ETC.

CAUTION

- NOT TO BE USED FOR COOLING ONLY. ENERGY COST IS VERY HIGH.
- EXTERNAL LIQUID SHOULD BE COMPATIBLE.
- USE PROPER METHODS TO AVOID EXCESSIVE PRODUCT DILUTION.
- ENSURE CONTINUOUS SUPPLY EVEN DURING SHUTDOWNS .

API PLAN 52



FEATURE

- UNPRESSURIZED BUFFER FLUID CIRCULATION THROUGH RESERVOIR OR COOLER

PURPOSE

- MINIMIZE FUGITIVE EMISSION.
- IMPROVE VAPOUR PRESSURE MARGIN BY COOLING AND BY REDUCING PRESSURE DIFFERENTIAL ACROSS INNER SEAL FACES.
- AVOID PRODUCT COMING IN CONTACT WITH ATMOSPHERE.

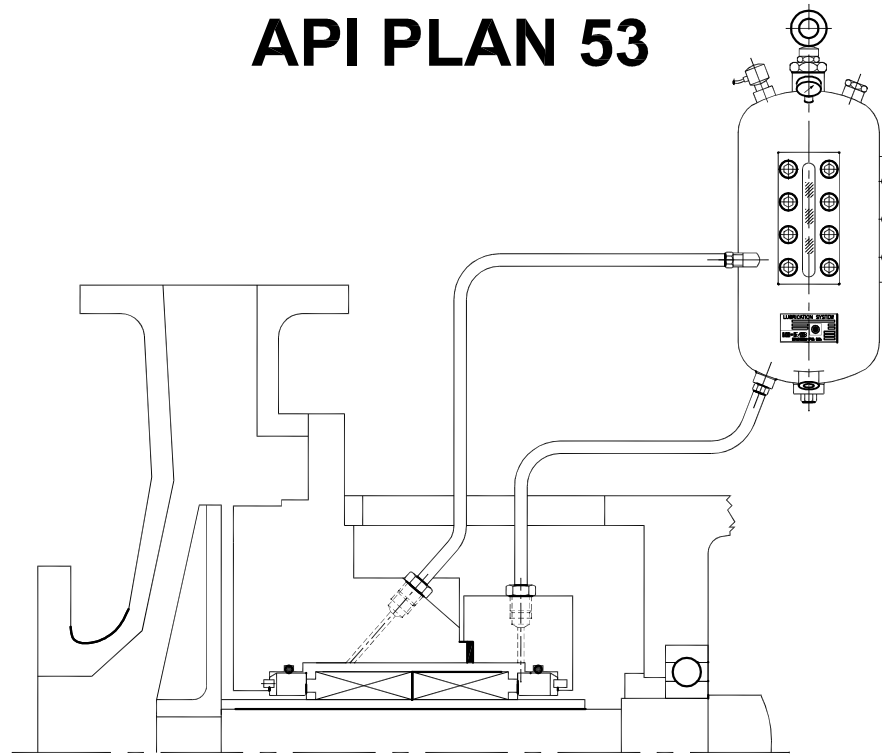
APPLICATION

- FOR TANDEM SEAL ON
- VACUUM DISTILLATION PUMPS .
 - REACTOR CIRCULATION PUMPS.
 - HIGH VAPOUR PRESSURE & VOLATILE DUTIES .

CAUTION

- DO NOT USED ON EXCESSIVELY DIRTY APPLICATIONS.
- PROPER INSTRUMENTATION NECESSARY FOR DETECTING INNER SEAL LEAK.

API PLAN 53



FEATURE

- STATIC PRESSURIZED BARRIER FLUID SYSTEM FOR DOUBLE BACK TO BACK SEALS.

PURPOSE

- AVOID PRODUCT LEAKAGE TO ATMOSPHERIC

APPLICATION

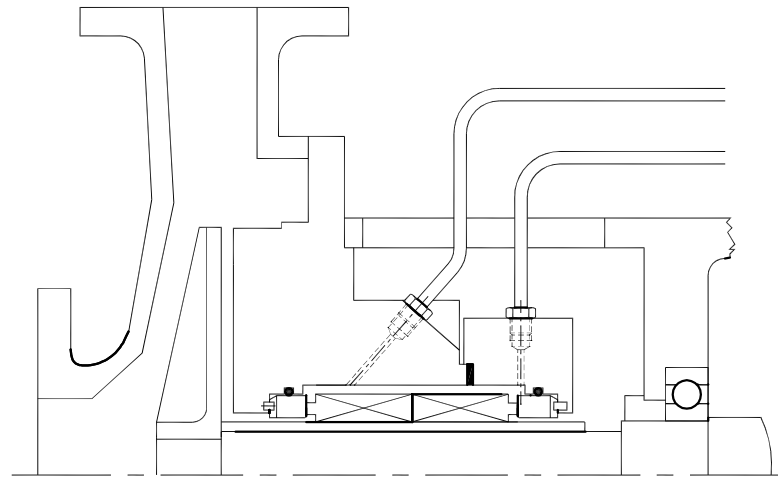
FOR DOUBLE BACK TO BACK SEALS ON

- AGITATORS & MIXERS.
- HAZARDOUS & HIGHLY TOXIC LIQUIDS.
- DIRTY, ABRASIVE & POLYMERIZING LIQUIDS.

CAUTION

- BARRIER LIQUID SHOULD BE COMPATIBLE WITH THE MEDIA.
- PROPER INSTRUMENTATION REQUIRED FOR LEAKAGE DETECTION.
- PRESSURE DROP OF BARRIER FLUID CAN RESULT INTO INSTANT LEAKAGE AND SEAL DAMAGE.

API PLAN 54



FEATURE

- PRESSURIZED FORCED LUBRICATION

PURPOSE

- AVOID FLUID LEAKAGE INTO SEAL CHAMBER.
- COOL THE SEAL CHAMBER.
- AVOID SOLIDS BETWEEN THE SEAL FACES BY MAINTAINING POSITIVE PRESSURE DIFFERENTIAL.

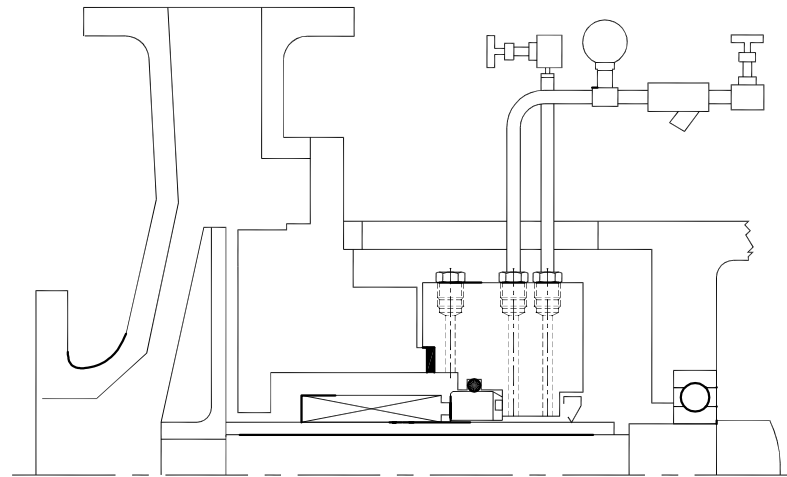
APPLICATION

- FOR DOUBLE BACK TO BACK SEALS ON
- HIGH TEMPERATURE SLURRIES.
 - HIGHLY TOXIC LIQUIDS .

CAUTION

- PRESSURE DIFFERENTIAL OF 1.5 KG/CM² ABOVE STUFFING BOX PRESSURE IS EXTREMELY IMPORTANT.
- SYSTEMS HAS TO BE PROPERLY ENGINEERED FOR UNINTERRUPTED SERVICE. FAILURES ARE EXTREMELY EXPENSIVE.

API PLAN 62



FEATURE

- QUENCH THE SEAL FROM ATMOSPHERIC SIDE WITH STEAM, WATER OR NITROGEN

PURPOSE

- PREVENT CARBONIZATION
- PREVENT BUILT UP OF WATER SOLUBLE SALTS ON THE ATMOSPHERIC SIDE
- HEAT THE FACES FOR CRYSTALLIZING AND SOLIDIFYING APPLICATIONS
- REMOVAL OF DEBRI OUTSIDE THE SEAL.

APPLICATION

- THERMIC FLUIDS
- SALT SOLUTIONS
- SOLIDIFYING LIQUIDS