

RDP

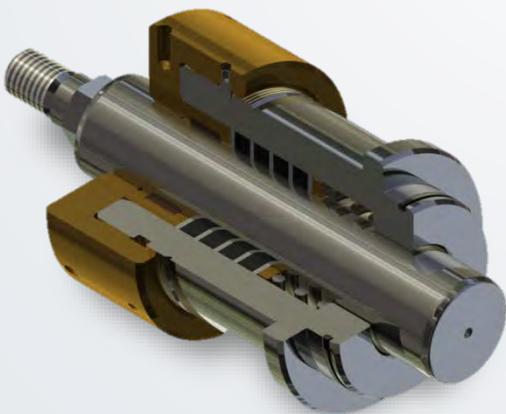
Reciprocating Plunger
Pump Seal Plans

EMISSION CONTROL



energy **API 674**

The environment is an increasingly sensitive issue and industry has a duty to control the escape of pollutants. Our Seal Plans and Emissions Containment Systems offer a range of products to lubricate, monitor seal condition, and control or eliminate the escape of hazardous liquids and gasses to atmosphere.



IT'S ALL ABOUT THE SEAL

Each application presents unique demands on the seal arrangement. Ruhrpumpen offers systems constructed around either the well established compression packing, or custom designed chevron type seal packs in a variety of carefully selected materials. A typical configuration may feature an arrangement of packing with anti-extrusion rings and 'live loading'. This introduces spring energization removing the need for regular adjustment and reducing maintenance cycles. Unlike a Piston Pump, the seals are static and act against a moving Plunger. Plungers are hard faced with ceramic or high nickel alloys to resist wear.

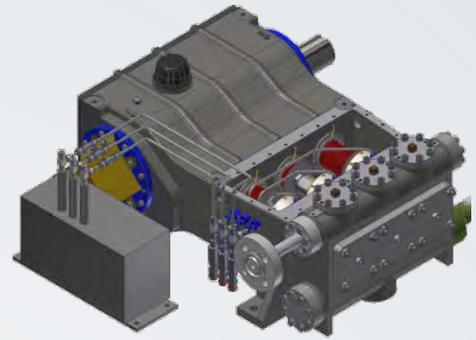
ADD LUBRICATION TO EXTEND SEAL LIFE

Standard packed glands naturally leak very slightly, about 1-2 drops per minute, this is often insufficient to lubricate the seals at the rear of the gland, which can lead to shortened seal life. At the base option level we can add lubrication systems to extend seal life by injecting lubricant in front of these seals. This also keeps the packing cool and acts as a barrier, keeping the seal stack free of particulates.

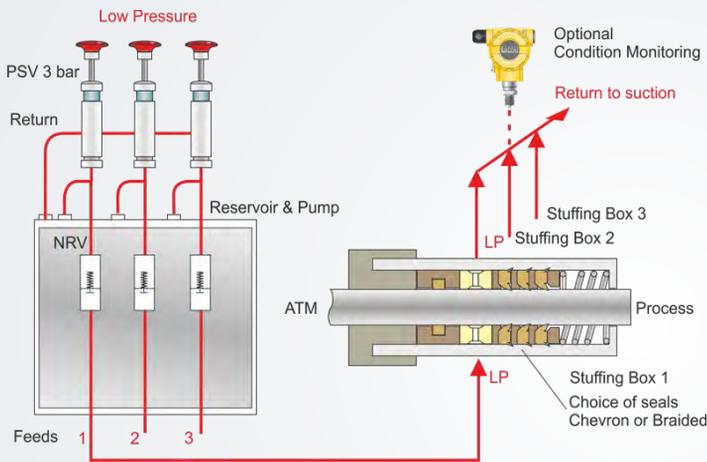
ADD EMISSION CONTROL

As an extension of the standard lubrication option we offer a number of emission control solutions. These are selected considering the severity of the application. Gland leakage/spent lubricant can be simply directed to a flanged connection for disposal, or piped back to the pump inlet. More complex systems feature instrumentation to monitor seal condition, to alert if maintenance is required, or trigger safe pump shut down.

Typical 3 feed and 6 feed systems are shown below:



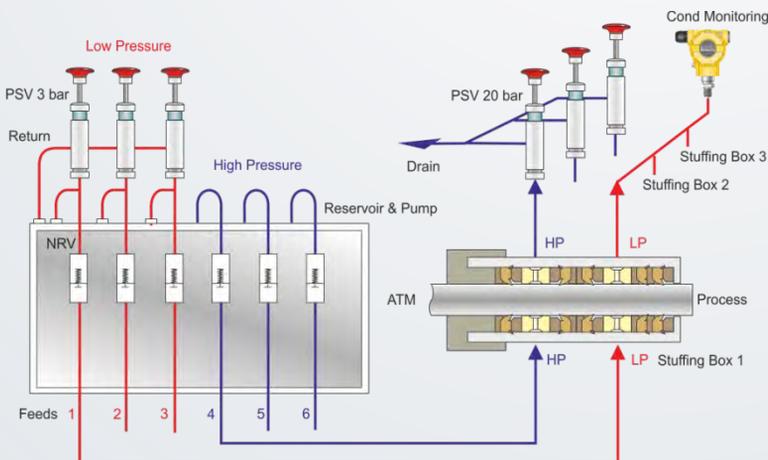
TYPICAL 3 FEED SYSTEM



Typical 3 Feed System

Our standard stuffing box is fitted with an additional low load, low pressure seal behind a lantern ring fed with low pressure lubricant. This provides essential lubrication to the rear seals and a controlled leak path routed to suction via a check valve. Residual leakage is collected in the Distance Piece Chamber from here it can be safely piped into the skid drain pan, or to disposal as preferred.

TYPICAL 6 FEED SYSTEM



Typical 6 Feed System

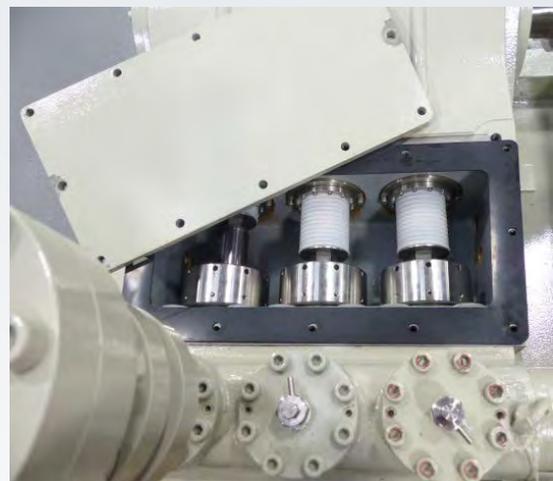
Adding to the 3 feed concept an extra lantern ring and further seals are introduced in a back to back format. This tertiary arrangement is fed with high pressure lubricant to form a fluid barrier both to lubricate the whole seal stack and prevent migration of process media to atmosphere.

Instrumentation on the low pressure section monitors seal condition to alert for maintenance, or trigger safe Pump shut down.



ADD ZERO EMISSION

For the most stringent applications we offer a gas tight sealed Distance Piece Chamber combined with our newly developed Flexiseal technology, this ensures that no media or gas can escape uncontrolled into the environment. While it is simple to seal the Distance Piece Chamber it is far less straightforward, yet equally vital, to isolate the drive components, particularly from hazardous gas ingress. The Flexiseal is our solution to prevent this secondary means of escape. Seal reliability is paramount therefore before its release the Flexiseal has received over 10 million cycles of accelerated wear testing that is still ongoing.



Gas tight Distance piece chamber and Flexiseals

WE WILL HELP YOU CHOOSE YOUR SEAL PLAN

All the products described previously can be used in isolation or combined with any of our companion systems to provide a bespoke seal plan to suit your individual needs. The table overleaf shows just some of the Seal Plans available. Our engineers will work with you to create a system perfect for you.



Flexiseals under accelerated test

Although you may be new to API674 Reciprocating Pumps, you should be familiar with API682 seal plans nomenclature. API674 reciprocating pumps do not use seal plans in the same sense as centrifugal products. The table overleaf helps to highlight some of the parallels between systems:

SEAL PLAN SUMMARY

Title	Similar API682 Plan	Application	Construction	How it works
Standard (Non Lubricated)	-	No concern about duty or media such as toxicity or lubrication.	Comprises a primary seal stack with no seal plan.	-
Forced Lubrication (3 Feed)	-	Media unable to lubricate the seals sufficiently Also used in high pressure and speed applications.	Comprises primary and secondary (unloaded) seal stacks separated by a lantern ring. A Mechanical Lubricator injects low pressure oil into the Lantern Ring to lubricate the seals.	Mineral oil is injected into the lantern ring chamber. Exploiting surface imperfections oil migrates along the plunger. During the suction stroke the packing relaxes and lubricant is drawn into contacting surfaces.
Barrier Fluid	53	RESTRICTS fugitive emissions of toxic media.	Comprises primary, secondary (loaded) and tertiary (unloaded) seal stacks separated by lantern rings. Barrier fluid is circulated through the first lantern ring at a higher pressure than discharge. Barrier fluid will be compatible with the pumped media.	Barrier fluid injection pressure is higher than the discharge stroke. Consequently barrier fluid migrates across the seals towards the front of the stuffing box rather than the rear, thus blocking media escape. Packing condition is critical to this process.
Sealed Rod Box	-	BLOCKS fugitive emissions of toxic media.	The Distance Piece Chamber (containing the stuffing boxes) features a solid metal cover. A gastight gasket with 'O' rings and Flexiseals prevent any media escape to atmosphere. PSV, drain and nitrogen purge connections are provided. Any accumulated fluid leakage is detected by level switch	By sealing the Distance Piece Chamber with static seals ALL gaseous and fluid emissions that occur from the stuffing boxes are fully contained. Any fluid leakage is safely collected and safely piped to plant disposal. A Nitrogen purge facility removes toxic media prior to maintenance.
Return to Suction	13	Directs main leakage to suction where fugitive emissions are of no concern. Also used to feed lubrication to primary seals.	Comprises primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Any leakage escaping the primary seal returns back to suction via the Lantern Ring. A check valve prevents back flow.	Any leakage that migrates past the primary seal stack collects in the lantern ring chamber. As the leakage pressure builds up it relieves into the suction line.
Packing Monitoring	65	Used where packing integrity is critical to reduce emissions. For predictive maintenance in remote applications and/or trigger safe shutdown	Comprises a primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Any leakage escaping the primary seal enters the Lantern Ring and is directed to a drain line. Instruments in this line monitor/report the leakage flow rate.	Should the packing leakage flow rate increase beyond an acceptable level an alert is triggered to indicate that the primary seals are worn and require replacement.
External Flush	32	Media may crystallise where it leaks from the stuffing box.	Comprises primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Clean (plant sourced) media is directed through the Lantern Ring to flush the Stuffing Box, the system includes inlet and discharge connections.	Clean media (normally non saline water) is injected into the Lantern Ring chamber with a high flow rate. Any media migrating past the primary seals is diluted and carried to the discharge of the flush.
Seal Heating/Cooling	-	Cooling: Protects seals in high temperature applications. Reduces cavitation risk of near gas media. Heating: Protects seals in cryogenic applications. Reduces risk of media solidifying.	Comprises a sleeve installed around the stuffing boxes with galleries to accommodate heating/cooling fluid. The system includes Inlet and discharge connections only. External closed loop system and/or heat exchanger are excluded.	Heating/cooling fluid is introduced into the sleeve with a certain flow rate to provide the appropriate heat transfer.
Discharge Flush (piped externally)	11	Used to decrease seal leakage.	Comprises primary and secondary (unloaded) seal stack separated by a Lantern Ring. External piping directs a small amount of discharge media to the Lantern Ring.	Use of primary and secondary seals reduces leakage. The flush from discharge provides extra lubrication and cooling to the secondary seals increasing reliability.
Discharge Flush (Internal galleries)	01	As above but internal galleries easier to heat in cold ambient temperature conditions.	Comprises primary and secondary (unloaded) seal stack separated by a Lantern Ring. Internal galleries direct a small amount of discharge media to the Lantern Ring.	Same as above.

BENEFIT FROM OUR EXPERIENCE

Ruhrpumpen has more than 65 years developing the pumping technology that drives progress. We design the RDP pump and perform our own R&D. We manufacture and test in the UK. We know our product and make it easy to do business.



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