RESERVOIR

API PLAN 52/53A

Installation, Operation & Maintenance Instructions

Foreword

This manual covers the installation and operation of Lemco reservoir systems. These systems are designed to support rotating equipment operating with either dual un-pressurized (tandem) or dual pressurized (double) mechanical seals as an effective method of controlling emissions and monitoring seal performance.

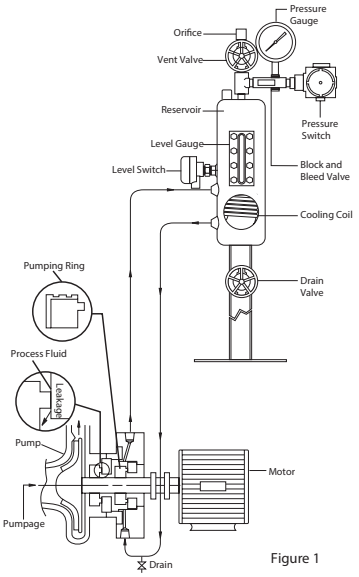

Figure 1

⚠ The pluggings of unused seal connections before operation is the responsibility of the end user.

NOTE Pressure relief devices are not provided by the manufacturer (see the ASME code Section VIII, Division 1. Paragraph UG-125 for user responsibilities).

Plan 52 Working Principle

In a dual un-pressurized (tandem) arrangement, two seals are used. The primary seal operates in the process liquid at seal chamber pressure. Cooling and lubrication of this seal is achieved by use of any of the API flush Plans 11-41. The secondary seal operates in a buffer liquid at a pressure lower than seal chamber pressure, typically atmospheric or low-pressure flare header pressure. Buffer liquid circulation via thermal siphoning and the pumping ring is essential to cool and lubricate the secondary seal. Leakage from the primary seal is contained by the secondary seal in the Plan 52 reservoir system. The leakage is disposed of according to its vapor pressure. Vaporizing products are vented to flare or vapor recovery system, while condensing products can be routed to a sump or other approved drain. Various different instrument configurations are available for monitoring seal performance. (See Figure 1)

Plan 53A Working Principle

In a dual pressurized (double) seal arrangement, two seals are used. Both seals operate in the Plan 53A barrier liquid, which is maintained at a pressure above seal chamber pressure. In addition to cooling and lubricating both seals, the barrier liquid serves to isolate the process from the atmosphere. Product emissions are effectively blocked as the differential pressure ensures that leakage will be barrier liquid across the primary seal into process and across the secondary seal to the atmosphere. Various different instrument configurations are available for monitoring seal performance. (See Figure 2)

NOTE While circulation for both Plans 52 and 53A can be obtained by thermal siphoning, Lemco recommends forced circulation, which can be achieved by a pumping ring or external pump.

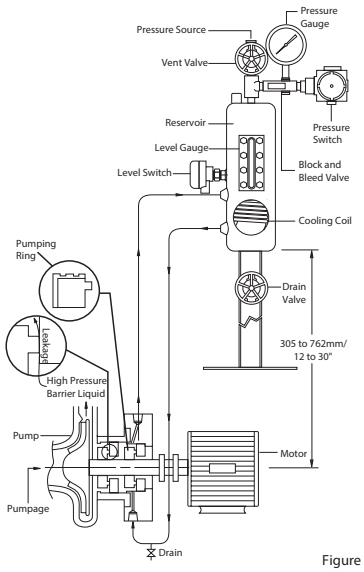

Figure 2

Installation

Please note that carbon steel reservoirs have been fogged with a rust inhibitor. Compatibility with the process should be confirmed or the reservoir should be flushed.

Mount the reservoir in a vertical position within a 3 foot radius of the vertical centerline of the seal chamber. The reservoir should not be mounted directly above the pump.

Locate the reservoir such that the bottom of the reservoir is 12 to 30 inches above the horizontal centerline of the pump or the inlet port of a dual seal of a vertical pump.

⚠ The pluggings of unused seal connections before operation is the responsibility of the end user.

Connect the seal supply line from the lower seal connection on the reservoir to the bottom gland plate connection, marked Buffer/Barrier In (B.I.).

Connect the seal return line from the top gland plate connection, Buffer/ Barrier Out (B.O.), to the upper seal connection on the reservoir.

To maximize thermal siphoning and the flow output of the pumping ring, it is imperative to minimize all friction loss in the piping loop between the gland plate and the reservoir. A minimum of 1/2" pipe or 5/8" tubing (preferably larger) should be used. All bends must be large radius with a maximum of 6 recommended.

To ensure piping is self-venting and to further enhance circulation, the piping or tubing from the gland plate to reservoir should follow a minimum slope upward of 1/4 inch per foot. It is recommended that a drain valve be installed at the lowest point in the piping loop. See Figure 3 for schematic of piping layout.

⚠ Do not place any valves in the piping loop that could restrict the flow. If ball valves or gate valves are used for isolation of the seal chamber and reservoir, it is important to ensure that these valves are locked open during filling and operation.

If the reservoir is equipped with a cooling coil (standard on models 1618, 1518, 1820, and 682 compliant), connect water lines to the reservoir. In addition to supplying cool flush to the seal(s), cooling of the Buffer/Barrier fluid helps improve thermal siphon.

Connect wiring to any instrumentation that may have been

furnished, such as a pressure switch or level switch, in accordance with the instrument manufacturer's recommendations and in accordance with the area classification and local codes.

Installation (continued)

The weld pad level gauge will require retorquing as the gaskets lose resiliency under initial bolt pressure at factory assembly. Using a torque wrench, tighten nuts in five ft-lb. increments following a center to outside alternating sequence until the full torque value has been achieved. The tank/gauge will have a tag with the correct torque value written on it.

NOTE Thermal shock and mechanical stress must be minimized during startup. Take all necessary precautions.

Plan 52 — (dual un-pressurized/tandem seals) should now be connected to the vent, vapor recovery or flare system. Caution should be used in piping to the system to ensure proper venting of the reservoir. A check valve should be installed by the customer on the vent line of each reservoir. This is to prevent pressurizing the reservoir during periods of elevated flare, vapor recovery or vent pressure.

⚠ Do not open valve to vent or flare system until the reservoir has been filled with buffer liquid.

Plan 53A — (dual pressurized/double seals) should now be connected to an external pressure source such as the plant nitrogen header. A pressure regulator is required to maintain the proper pressure in the reservoir. A pressure gauge is normally supplied and recommended by Lemco to allow monitoring of pressure.

⚠ Do not pressurize reservoir until the reservoir has been filled with barrier liquid.

Remove the fill plug on the top of the reservoir and fill with the selected buffer/barrier liquid, valves in the piping from the reservoir to the gland should be locked open. Fill the reservoir to proper level, normally the mid-point of the level gauge. The gas volume should be at least 25 percent of the reservoir capacity to allow for liquid expansion due to temperature increases during operating. Close the fill connection. Check for leaks in the piping or reservoir system.

Plan 52 — Check to ensure the unit is properly connected to the seal and to the vent system. Slowly open the valve to the vent system.

Plan 53A — The regulator should be in the closed position. Check to ensure that unit is properly connected to the seal and the pressure source. Open the valve between the reservoir and the regulator. Set the pressure in the reservoir to 25 to 30 psig above seal chamber pressure, or as recommended by the seal manufacturer. This should be done slowly to avoid gas ingestion and to allow for a leak check as the unit is pressurized.

Pressure Switch

Plan 52 — In a Plan 52, the pressure switch is set to activate on increasing pressure and indicates an increase in leakage or a failure of the primary seal. The recommended set-point is 10 to 15 psi above the normal vent/flare pressure.

Plan 53A — In a Plan 53A, the pressure switch is set to activate on decreasing pressure and indicates a loss of source pressure. The recommended set point is 10-15 psi below the normal source pressure.

Level Switch

Plan 52 — In a Plan 52, a level switch in the low position is used to indicate a loss of volume due to an increase in leakage or failure of the secondary seal. Additionally, a level switch can be located in the high position to indicate an increase in volume due to an increase in leakage or a failure of the primary seal. The process fluid dictates the position of the level switches in a Plan 52 application. If the process leakage will vaporize in the reservoir, there is little need for a high level switch and a pressure switch is more suitable. If the process leakage will condense in the reservoir, a high level switch is recommended.

Plan 53A — In a Plan 53A, the level switch is located in the low position and used to indicate an increase in leakage or a failure of either seal.

Maintenance

The following items should be checked and logged on a regular basis:
- Reservoir Pressure
- Reservoir Buffer/Barrier Liquid Level

NOTE On a Plan 52, an increase in liquid level indicates increased leakage across the primary seal. A drop in liquid level indicates an increase in leakage of buffer fluid across the secondary seal.

NOTE On a Plan 53A, a decrease in liquid level indicates increased leakage across either seal. A drop in pressure indicates a loss of the external pressure source or a regulator problem.

⚠ Any major changes in pressure or liquid level should be addressed immediately with proper corrective action.

On regular basis when the above readings are taken, the reservoir and associated piping should be given a visual inspection for leaks or other potential maintenance problems.

Buffer/barrier liquid should be drained and changed after any seal upset/failure and during planned maintenance. This will ensure the quality of the liquid and enhance the sealing environment.

Maintenance (continued)

NOTE For more information on any of the components or instruments, please visit the following websites:
- Block and Bleed Valve - www.pgiint.com
- Pressure Switch - www.ueonline.com
- Pressure Gauge - www.usgauge.com
- Level Switch - www.magnetrol.co