Henry Technologies' Oil Control System

The need for greater system flexibility, lower operating cost, and energy conservation has brought about the growing application of parallel compressor systems. This type of system uses multiple compressors with one common discharge line and a common suction line (See Fig. 1). Parallel systems have some potential problems, one of them being the maintenance of the correct oil level in the compressor crankcase at all operating conditions. Crankcase oil level must be controlled. The Low Pressure Oil Control System provides this control as well as a method of regulating the oil level in each individual crankcase. It eliminates the need for complex piping and valving. It does not require that the compressors be level, or be the same make or model. Our System consists of three basic components:

1. Oil Separator
2. Oil Reservoir
3. Oil Level Regulators

Each compressor has an Oil Level Regulator attached to control the oil level in each individual compressor. The regulators are supplied oil by the common Oil Reservoir, which in turn is supplied oil by the Oil Separator.

Oil Separators

The heart of any oil control system is a high efficiency Helical Oil Separator.

How It Works

In any refrigeration system, refrigerant and oil are always present: refrigerant for cooling, oil for lubrication of the compressor. Certain amounts of oil will always leave the compressor crankcase with the refrigerant.

The prime function of an Oil Separator is to separate the oil from the refrigerant. Our Helical Oil Separators achieve approximately 99% efficiency of oil separation. In parallel compressor systems only one Oil Separator is required for two or more compressors, so the oil is returned to the Oil Reservoir which in turn distributes oil to the Oil Level Regulators on the compressor crankcase.

Figure 1: Low Pressure Oil System

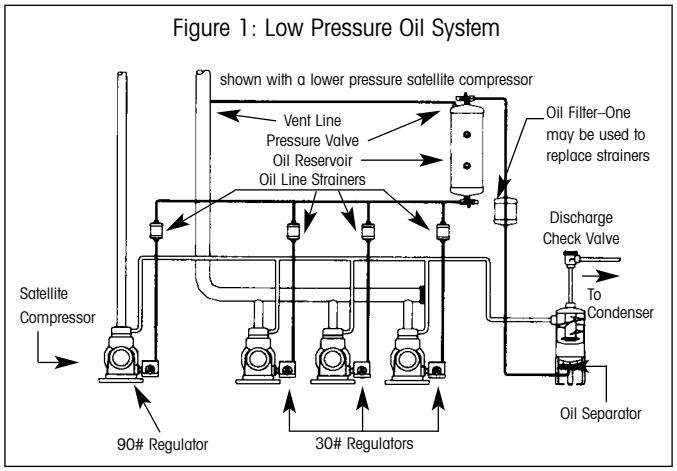
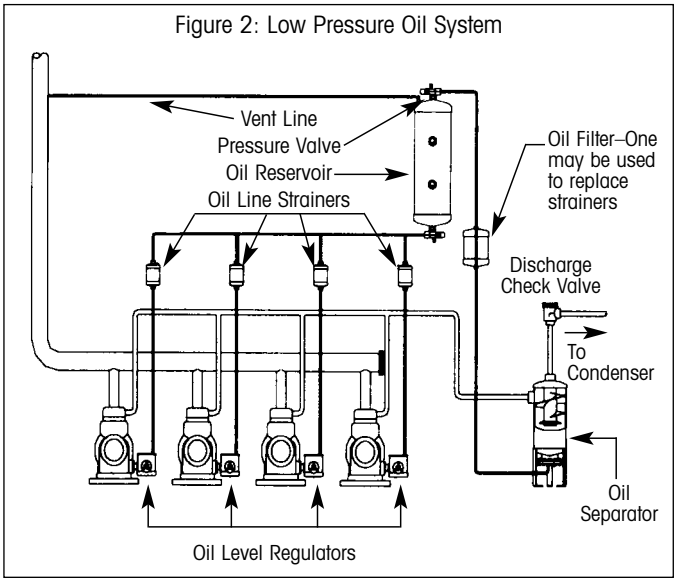


Figure 2: Low Pressure Oil System



How To Install

The Oil Separator must be mounted securely in a vertical position. The Oil Separator is usually installed reasonably close to the compressor in the common discharge line between the compressors and the condenser (See Fig. 1). The flare connection on the Oil Separator is the oil return connection. A line is run from this connection to the top of the Oil Reservoir to keep the reservoir supplied with oil. It is required that all oil systems have a discharge check valve installed between the oil separator and the condenser. This prevents refrigerant migration and back feeding during compressor off cycles.

Before the Oil Separator is installed, an initial charge of oil must be added to it, so that only a small amount of separated oil is required to actuate the float mechanism to return the oil to the Oil Reservoir.

Oil Reservoir

The Oil Reservoir is the holding vessel for stand-by oil necessary for the operation of the AC&R Low Pressure Oil Control System. It is available in 2 gallon (2 sight glass ports) and 4 gallon (3 sight glass ports) models. Observe the oil level inside the vessel through the sight glass ports. The valve on top of the Oil Reservoir receives oil from the Oil Separator, and the bottom valve distributes oil to the Oil Level Regulators. The valves are backseating and have a ¼" flare connection, allowing the addition or removal of oil from the reservoir. To add oil to the Oil Reservoir manually, close the valve and fill the Oil Reservoir through the ¼" flare connection on the side of the valve. Open valve after filling. To remove oil from the Oil Reservoir, close the valve and use the ¼" flare connection on the side of the valve to drain the oil out. Open valve after draining.

High pressure gas returns the oil from the Oil Separator to the Oil Reservoir. Pressure could build up in the Oil Reservoir to adversely affect the Oil Regulators. To prevent this, a vent line is installed from the top of the Oil Reservoir to the suction line (See Fig. 1). This line permits the pressure in the Oil Reservoir to be approximately the same as the suction line and the compressor crankcases.

New System Start-Up

On system start-up of a new parallel system, oil should be added to the Oil Reservoir to the upper sight glass port, not above it. It is commonly accepted that in a new refrigeration system, some oil will be absorbed by the refrigerant as the system becomes balanced out. After two hours of operation, the Oil Reservoir, if necessary, should again be filled to the upper sight glass, and also after two days, by which time the entire refrigeration system should be balanced out. Then the Oil Reservoir must be observed on each service call. No oil should be added again until the oil level falls below the lower sight glass port.

Existing System Start-Up

When installing this Oil Control System on a parallel system that has been in operation for some time, the amount of oil should be added cautiously. With the efficiency of the new Oil Separator, the oil return could likely be sufficient to fill the Oil Reservoir. Add oil to the lower sight glass port only. Observe for one day. After the second day, if the oil level has not risen to the upper sight glass, add oil. If the oil level has risen above the upper sight glass port, remove the excess oil from the Oil Reservoir.

Reservoir Pressure Valve

We recommend the use of our Reservoir Pressure Valve with our Oil Reservoir. Mount the valve on the ⅜" male flare suction vent connection on top of the Oil Reservoir (See Fig. 1). The S-9104 maintains a 5 lb. positive pressure differential in the Oil Reservoir over the crankcase pressure. This positive pressure will insure an adequate oil supply to the Oil Level Regulators. The oil level in all of the Oil Level Regulators is calibrated at this 5 lb. positive pressure. Some Parallel Compressor Systems have a Satellite Compressor (See Fig. 2) which maintains a higher suction pressure than the other compressors in the system. The S-9104H provides a 20 lb. positive pressure in the Oil Reservoir for this application.

Oil Level Regulators

The oil level regulator controls the oil level in the compressor crankcase with a float operated valve.

Oil level regulators are designed at attach directly to the sight glass housing on compressor crankcases (See Figs. 1 & 2). Adapter kits are available for compressors that have a different sight glass configuration. The sight glass from the compressor or one supplied with an adapter kit, bolts to the second regulator flange for visual observation of the oil level.

The oil supply line from the reservoir is connected to the ⅜" flare fitting on top of the regulator. Install Oil Line Strainer S-9105 to remove dirt, metal chips, etc. so the foreign material will not plug the small orifice of the Oil Level Regulator (See Figs. 1 & 2).

These regulators feature a ⅜" Flare Equalization Connection on the side of the regulator that allows

Fixed Level Regulator
S-9010

Adjustable Regulators
S-9090 & S-9130

the crankcases to be interconnected. This maintains the same pressure in all of the crankcases including any compressor that is running. This prevents running compressor(s) from siphoning the oil out of the idle compressor(s).

The ⅜" Flare Equalization Connection is at the half sight glass level. It also helps prevent over filling of the regulators caused by oil returning down the suction line to an idle compressor. If a regulator fills up to a half sight glass, the oil will be picked up by the Equalization Connection and sent to the running compressor crankcase.

S-9090 & S-9130 Adjustable Regulators

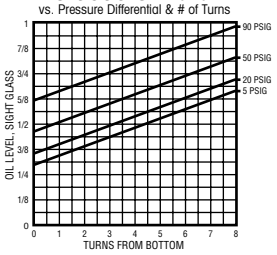
The S-9090 and S-9130 regulators allow the oil level in the compressor crankcase to be maintained at any level between ¼ and ½ sight glass.

The S-9090 and S-9130 maintain the level at any pressure differential between 5 and 90 psi. If the oil level in the crankcase is too high or too low, the level can be adjusted by turning the adjustment screw on top of the regulator. This can be done while the system is in operation. Our exclusive design eliminates the need of shutting down the system and disconnecting the oil feed lines in order to adjust the regulator.

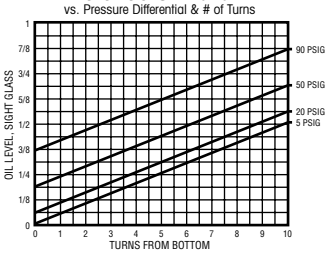
All regulators have an operating pressure differential range that should not be confused with its working pressure. The operating differential is the difference of pressure between the oil feeding into the regulator and the component where the regulator is controlling oil level. Specifically, the reservoir pressure minus the crankcase pressure. If the differential pressure is too low for that regulator, insufficient oil flow to the compressor may result. If the differential pressure is too high, the regulator will over-fill.

Adjust the oil level by removing the seal cap, the locking disk (S-9130 only), and rotating the adjustment clockwise to lower, counter clockwise to raise the oil level. Replace cap and locking disk when done. Each full turn of the adjustment mechanism moves the oil level approximately 1/16". Oil levels on these regulators are typically factory set just below ½ sight glass.

S-9090 Oil Level
vs. Pressure Differential & # of Turns



S-9130 Oil Level
vs. Pressure Differential & # of Turns



S-9010 Fixed Level Regulator

The S-9010 regulator maintains the oil level in the compressor crankcase at ⅜" sight glass. The S-9010 maintains the level at any pressure differential between 5 and 30 psi. It is not adjustable.

Regulator Shut-Off Valves

These brass valves mount on the oil inlet connections and equalization line connections of our Oil Level Regulators. The valves allow each Oil Level Regulator to be isolated if service is required on a Compressor, Oil Level Regulator, Oil Line Filter-Drier or Strainer. All models have a female swivel connection which allows 360° positioning of the male connection for most convenient mounting of the oil line or equalization lines.

Sight Glass Oil Level	Compressor Manufacturer	Sight Glass Configuration	Adapter Kit Catalog Number
½	Dunham-Bush Big 4	3 Bolt 1⅞ B.C.	3-033-201*
½	Trane	3 Bolt 1⅞ B.C.	3-033-201*
½	York	3 Bolt 1⅞ B.C.	3-033-201*
¼	Carrier (mdls. EA & ER)	3 Bolt 1⅞ B.C.	3-033-201*
¼	Copeland (over 5 tons)	3 Bolt 1⅞ B.C.	3-033-201*
½	Copeland (under 5 tons)	1⅛-12 Thread	3-033-202
½	Prestcold (mdl. "K")	1⅛-12 Thread	3-033-202
½	Dunham-Bush (mdl. "D")	4 Bolt 2⅛ B.C.	3-033-203
¼	Carrier (DA, DR, 5F, 5H & 06D)	1½-18 Thread	3-033-204
½	Schancke-Grasso	2" x 16 Thread	3-033-205
½	Trane	5 Bolt 2½ B.C.	3-033-206
¼	Copeland (older mdl.)	4 Bolt 2⅛ B.C.	3-033-207
½	Vilter	1½ NPT Thread	3-033-208
½	Vilter	2" NPT Thread	3-033-209
¼	Copeland (mdl. "8R")	3 Bolt 1⅞ B.C.	3-033-212
½	Prescold (C, E, R, L, LG)	42 mm Thread	3-033-216
½	Trane (mdl. "K")	¾ NPT Thread	3-033-218
½	Schancke-Grasso	1¼ NPT Thread	3-033-219
½	Grasso Thermtrol	1" NPT Thread	3-033-228
½	Bristol	15/16-20 Thread	3-033-242
½	Bock	4 Bolt 1 31/32 B.C.	3-033-244
½	Maneurop	1⅛-18 Thread	3-033-246
½	Bitzer	4 Bolt 2" B.C.	3-033-253

* Kit 3-033-201 includes with all oil level regulators. NOTE: For com-pressors not listed above, a universal adapter kit is available (3-033-217). This adapter kit has a 3-hole flange to mount to the regulator. The compressor end of the kit is a 1¼" OD steel tube. The existing compressor sight glass gland or flange must be bored out or bushed down to accept the 1¼" tube. The tube is then brazed or welded to the reworked gland or flange and installed on the compressor. A sight glass, seals, & hardware are included in the kit.

Adjust the oil level by removing the seal cap, the locking disk (S-9130 only), and rotating the adjustment clockwise to lower, counter clockwise to raise the oil level. Replace cap and locking disk when done. Each full turn of the adjustment mechanism moves the oil level approximately 1/16". Oil levels on these regulators are typically factory set just below ½ sight glass.

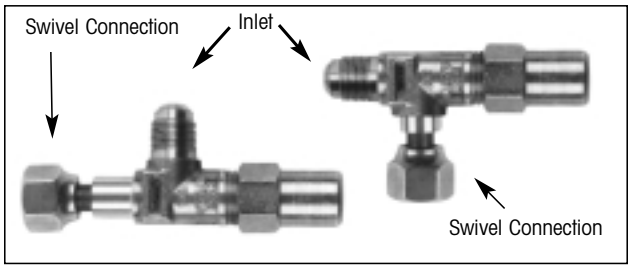
S-9010 Fixed Level Regulator

The S-9010 regulator maintains the oil level in the compressor crankcase at ½" sight glass. The S-9010 maintains the level at any pressure differential between 5 and 30 psi. It is not adjustable.

Regulator Shut-Off Valves

These brass valves mount on the oil inlet connections and equalization line connections of our Oil Level Regulators. The valves allow each Oil Level Regulator to be isolated if service is required on a Compressor, Oil Level Regulator, Oil Line Filter-Drier or Strainer. All models have a female swivel connection which allows 360° positioning of the male connection for most convenient mounting of the oil line or equalization lines.

Vertical Type S-9106V | Horizontal Type S-9106H



INDIVIDUAL REGULATOR PROBLEMS

PROBLEM	POSSIBLE CAUSES	REMEDY
An Oil Regulator maintain a high level. Oil feed line cool.	1. Oil Regulator level set too high	1. Readjust Oil Regulator.
An Oil Regulator maintain a high level. Oil feed line hot.	1. Leaking Oil Regulator valve.	1. Replace Oil Regulator.
An Oil Regulator maintains a low level or feeds slowly. Oil feed lines cool.	1. Oil feed line or float valve clogged with foreign matter. 2. Low reservoir pressure may be problem. 3. Oil Regulator level set too low.	1. Blow high pressure gas into feed line or inlet fitting to remove foreign material. A. Remove Oil Regulator from compressor and flush out. B. Install Oil Line Filter. 2. Increase reservoir pressure. 3. Readjust Oil Regulator.
Oil Regulators maintain a low oil level and/or foaming observed in regulator and reservoir. Oil feed lines hot. Oil failure switch may trip out.	1. System Oil Logged Oil Separator Feeding Oil Reservoir continuously. 2. Pressure differential between Oil Reservoir and crankcase over 5 lbs. 3. Oil Separator float stuck open or leaking. 4. Excessive oil being pumped by compressor.	1. Remove excess oil from system. See Note #1–below. 2. Replace Reservoir Pressure Valve or change spring in valve to 5 lb. spring. 3. Clean or replace float assembly or replace Oil Separator. 4. Replace or repair compressor.
Oil Regulators maintain a low oil level. An oil level cannot be maintained in Oil Reservoir. Oil feed lines cool. Oil failure switch may trip out.	1. Oil Separator float assembly clogged. 2. Undersized Oil Separator. Oil blowing by Oil Separator into system with discharge gas. Small amount of oil being fed to Oil Reservoir.	1. Clean or replace float assembly or replace Oil Separator. 2. Install larger Oil Separator.
Oil Regulators maintain a high oil level. Reservoir full. Oil feed lines hot.	1. System Oil Logged A. Oil Separator continuously feeding Oil Reservoir. B. Oil entering crankcase via suction line.	1. Remove excess oil from system. See Note #1-below.
Oil Regulators maintain a high oil level. An oil level is maintained in Oil Reservoir. Oil feed lines cool.	1. Liquid refrigerant build up in crankcase of compressors (oil boils at start-up).	1. Check for overcharged system. Install Suction Line Accumulator.

NOTE #1 Oil can be added to or removed from the Oil Control System by using the valves on the Oil Reservoir. The top valve for adding oil. The bottom valve for removing oil. See Oil Control Bulletin for details. However, for the quick removal of excess oil from an oil logged system, the oil return line leading from the Oil Separator to the Oil Reservoir can be removed. Attach a testing manifold or small valve to the line to control the flow of oil coming from the Oil Separator. Discharge the excess oil into a drum until the Oil Separator shuts off. At that point most of the excess oil will have been removed. The system and Oil Level Regulators should have stabilized. Reattach the oil discharge line back to the Oil Reservoir.