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*Welcome to the **MCI**LEARN Series*

## *Your Webinar Will Begin Shortly*

Today's Topic:

# Maintaining your MCI® A/C Compressor

If you do not have an audio connection, please dial 866-339-6642 and enter *8173541434*. The stars must be entered

# Agenda

- Construction & Configuration
- Operating Speed Range
- Rate of Oil Carryover
- Unloader Operation
- Clutch Assembly
- Shaft Seal Assembly

# Safety Precautions

- Always wear proper protective gear.
- Use caution when working around moving belts, pulleys and fans.
- Some refrigerants in the presence of an open flame produce toxic gases.
- Never apply heat to a sealed refrigeration system or container.
- Refrigerants displace air and cause death due to suffocation.
- Exposed coil fins can cause painful laceration.
- Be sure manifold gauges and hoses are in good condition.
- Never operate any unit with the compressor discharge valve closed.
- Open main electrical disconnect before working on HVAC system motors
- Beware of high voltage and high amperage on climate control systems

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# MCI HVAC Compressor Configuration & Construction

# Compressor Configuration & Displacement

## MCI-003

V-4 Four Cylinders
39.4 cu/in

## Carrier 05G

Radial 6 Six Cylinders
40.1 cu/in

# Compressor Construction

## MCI-003

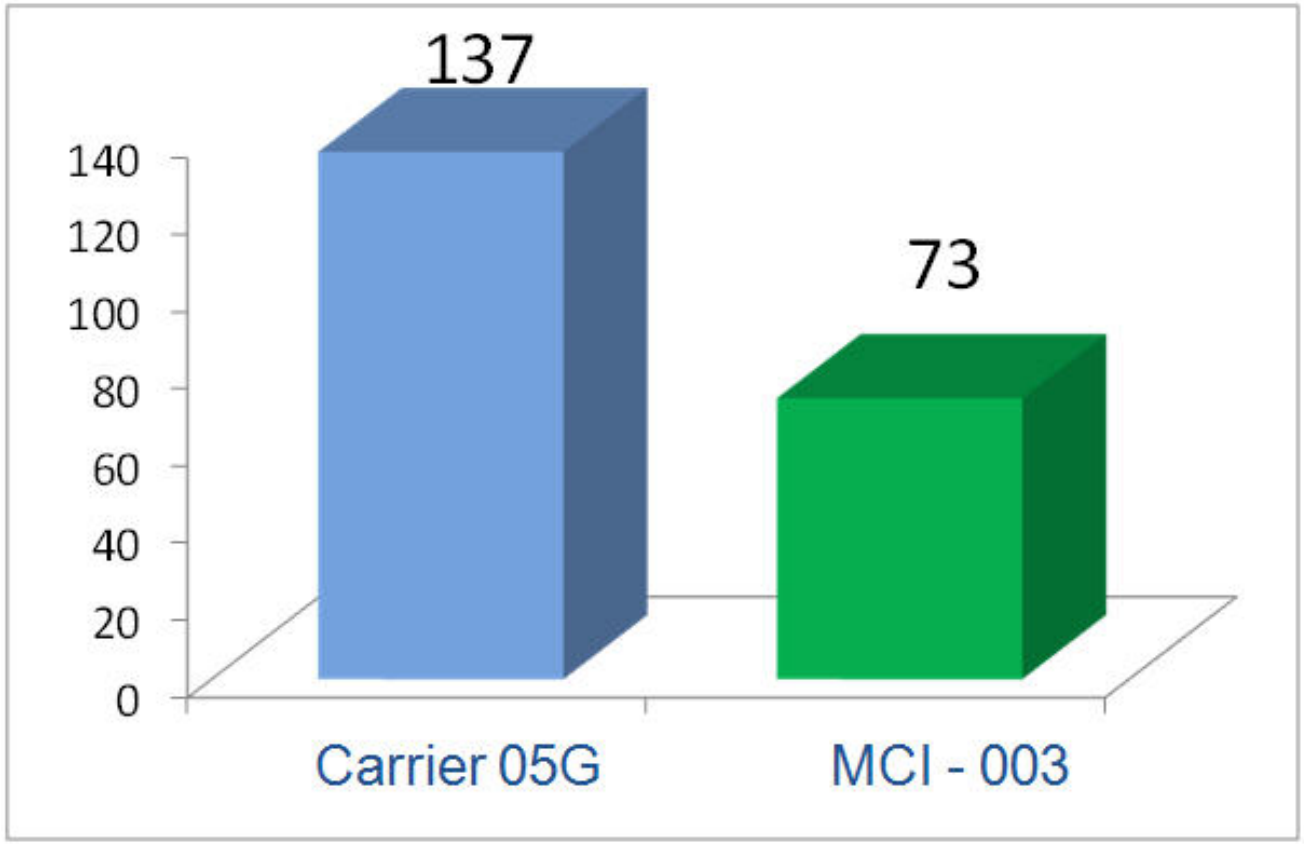
Aluminum Housings
Aluminum Cylinder Heads

## Carrier 05G

Aluminum Housings
Cast Steel Cylinder Heads

# Compressor Weight Comparison

Dry weight comparison (lbs)



# Smaller Physical Size of Compressor

The MCI Compressor is **5 INCHES** or 30% Narrower

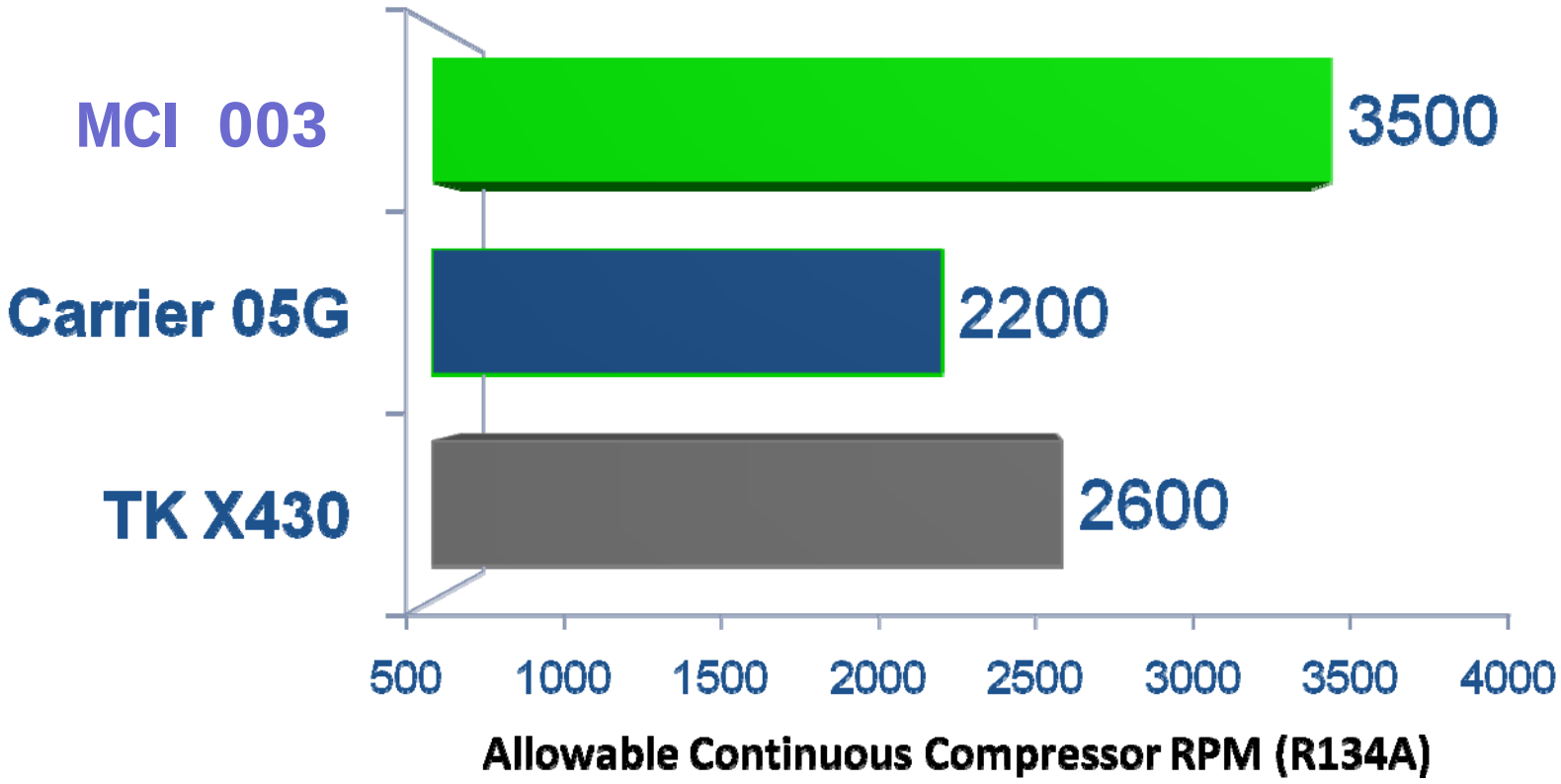
= Space Savings in Engine Compartment

= Easier to Install and Service

MCI – 003 = 12 in. wide

Carrier 05G = 17 in. Wide

# Maximum Continuous Operating Speed

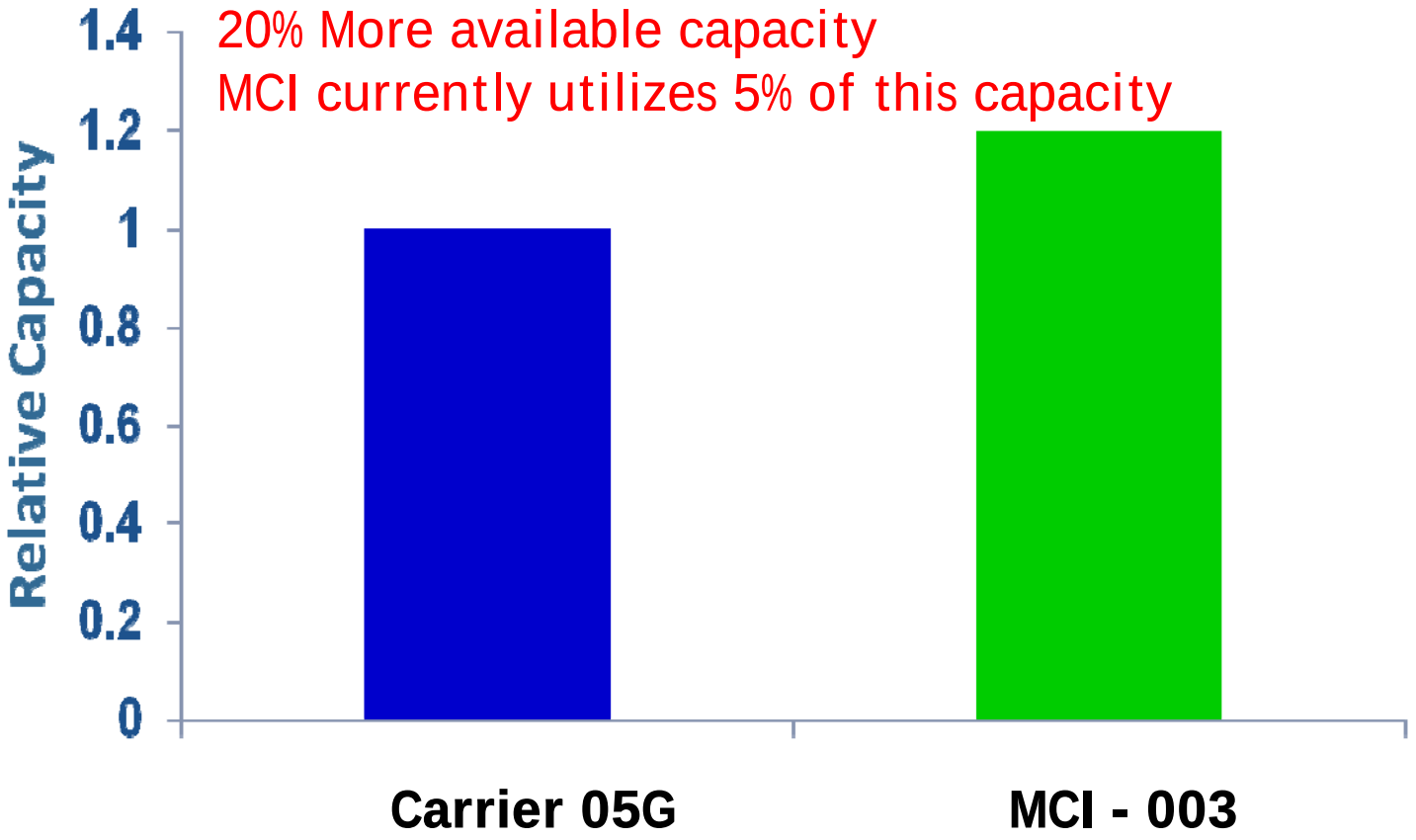


# Advantages of Increased Operating Speed

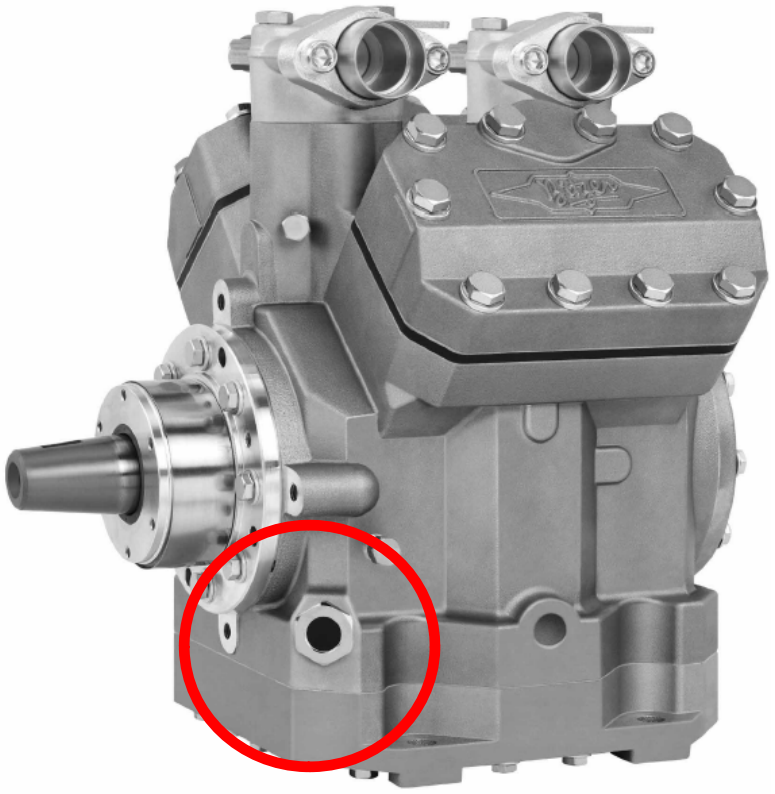
Why Does Speed Matter?

= Higher Allowable Pulley Ratios

= More Capacity Out of Smaller Compressor



# Sump Sight Glasses



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# Quiz 1

# Answers to Quiz 1

1) *The MCI compressor is a 4 cylinder radial design*

**FALSE**

2) *The MCI and Carrier compressors have nearly the same cu/in displacement (± 1.0 cu/in) but the MCI compressor has nearly 20% more capacity*

**TRUE**

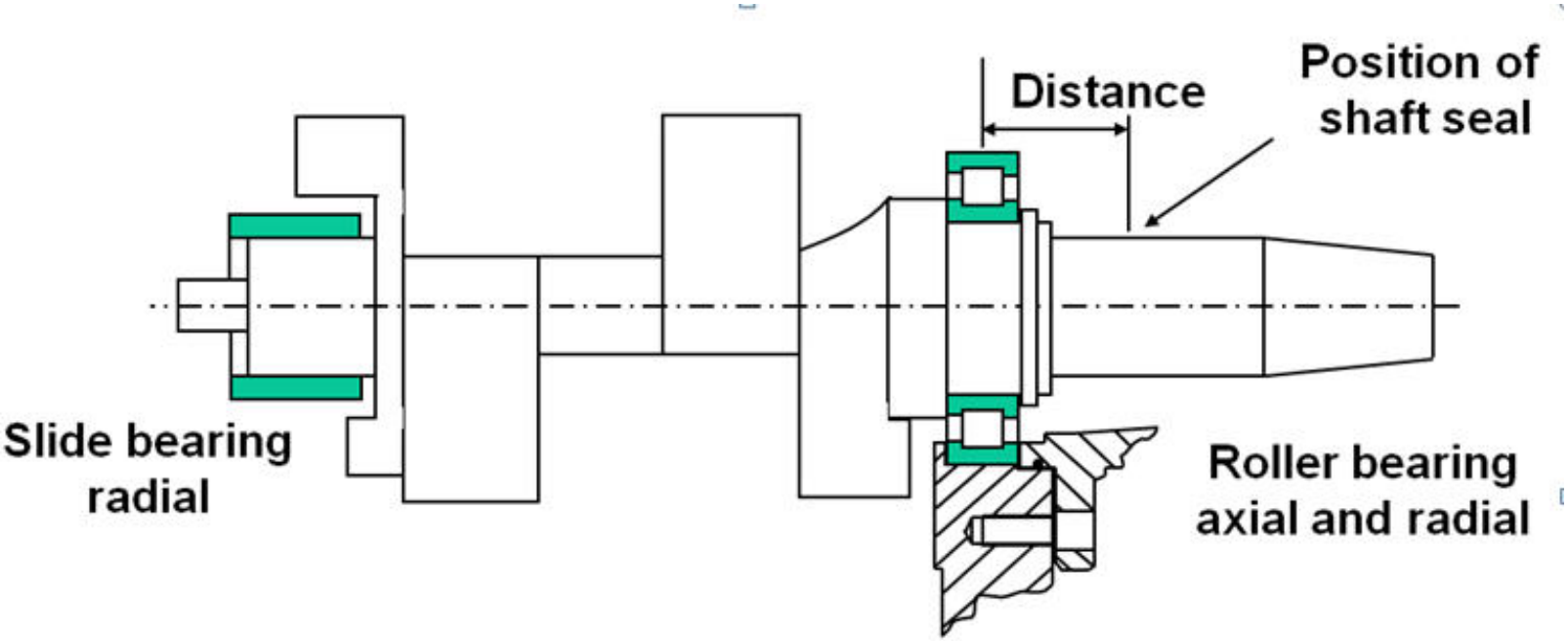
3) *The MCI compressor has two (2) suction valve mounting pads*

**TRUE**

4) *The MCI compressor 15% narrower than the Carrier O5G*

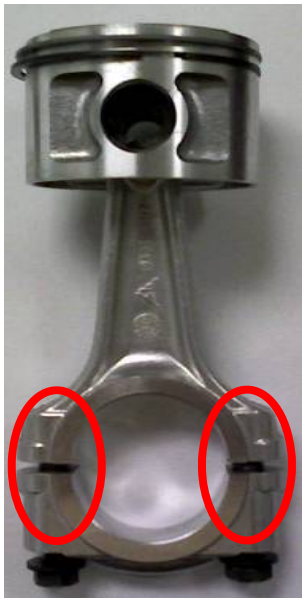
**FALSE**

# Eccentric Design Crankshaft




- **Classic drive: radial bushing – axial/radial bearing Extremely strong, high axial load at clutch, > 600 lbs while operating**
- **Minimal distance from roller bearing to seal ensures long service life of seal assembly**
- **Optimally balanced during manufacture➔ very low vibration level**
- **No angular drilling or plugging of crankshaft required - oil galley is drilled straight through the center of the crankshaft and cross-drilled to short side of the eccentric lobes**

# Connecting Rod Design



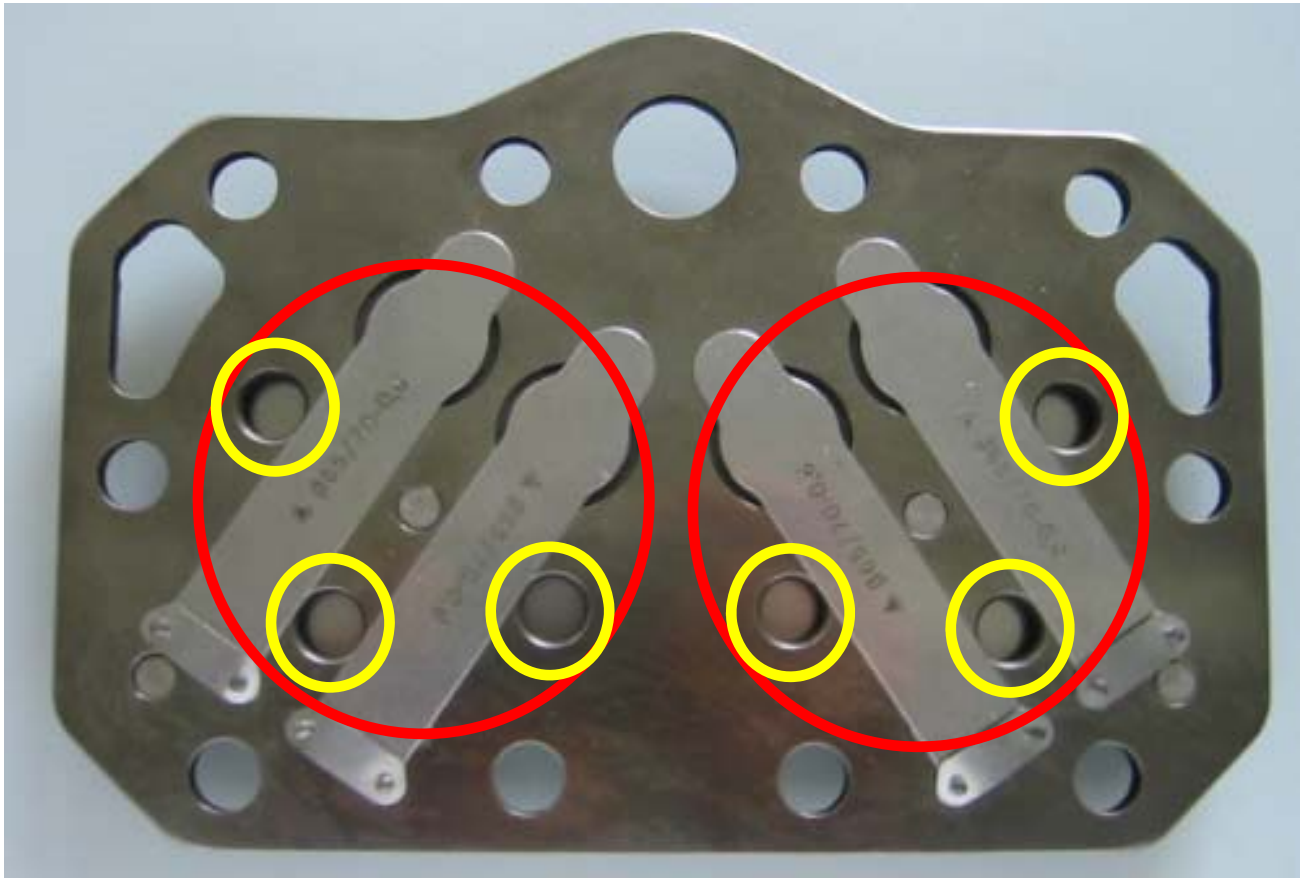
The #1 manufacturing defect in reciprocating piston compressors is pre-mature failure of the connecting rod bolts

This is the type of connecting rod used in Carrier O5G compressors

**The MCI Compressor Eliminates This Failure!**

No Rod Bolts with single piece construction connecting rod. Uses an eccentric crankshaft construction to maintain optimum stroke/bore ratio

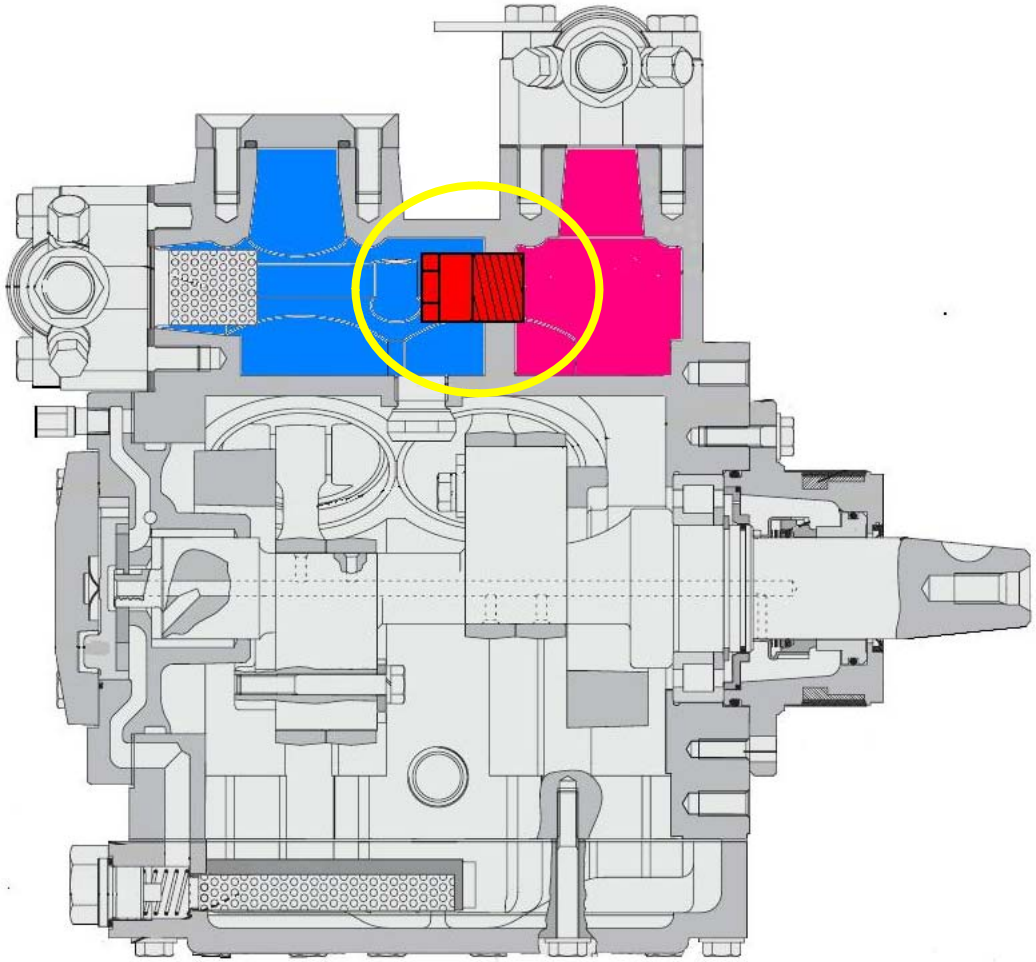
# Compressor Valve Plate Assembly



Valve plates are fully assembled, all dowels, support springs and valve reeds installed on the seat plate from the manufacturer

# Internal Safety Valve

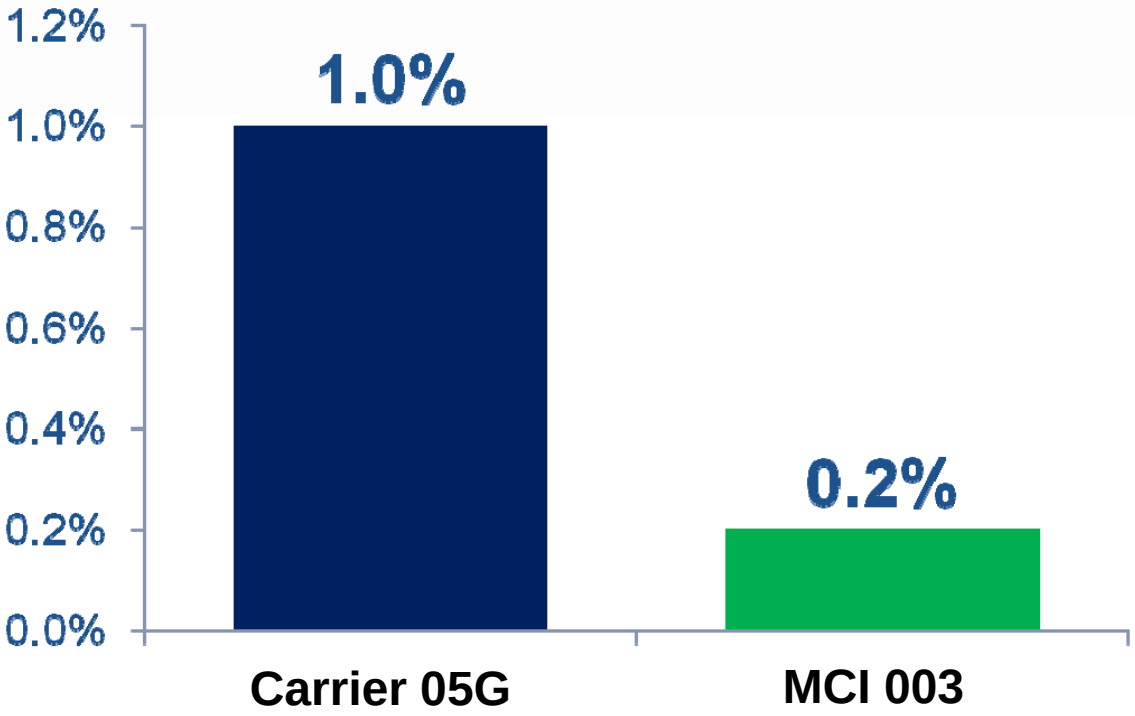
Reduces possibility of damage to compressor if compressor is started with the discharge valve front-seated (closed)



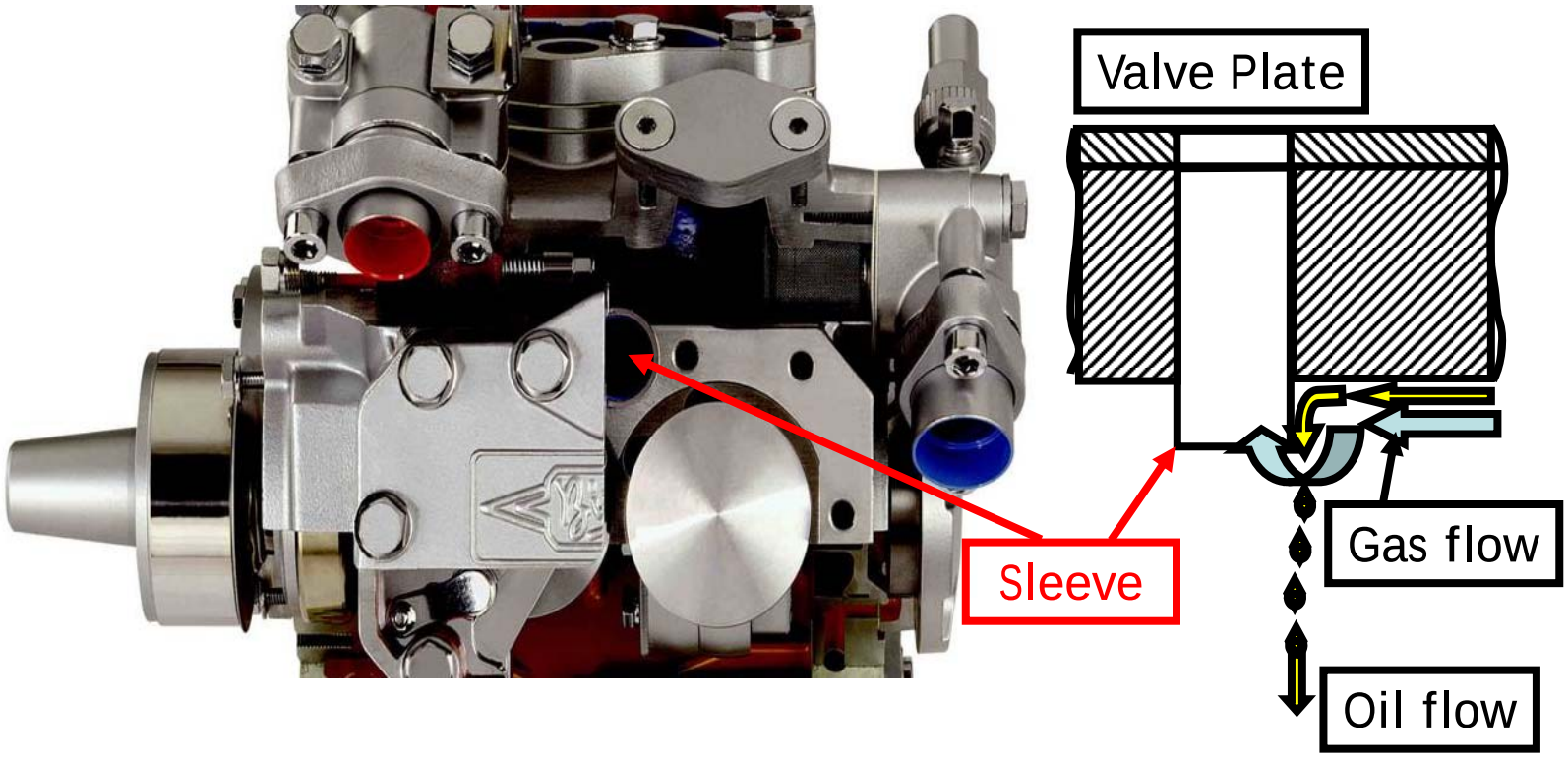
# Reduced Amount of Oil Carryover

## Carryover Oil

The amount of oil that the compressor discharges out into the system during ***normal*** operation. This circulated oil affects the efficiency and reliability of both the condensors and evaporators. It also removes oil from the compressor – which is the ***most important*** location the oil is needed!



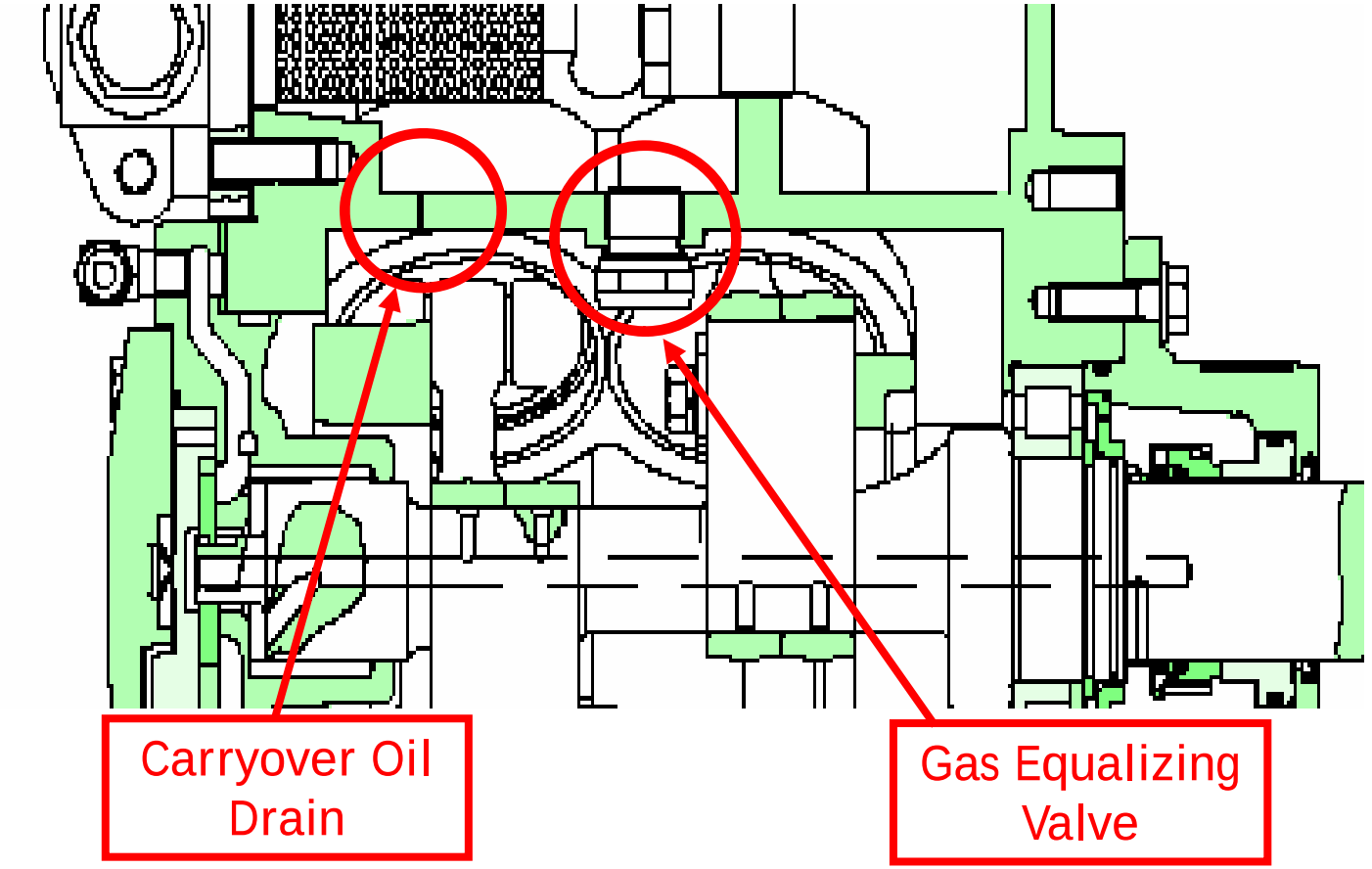
# Integrated Oil Separator Sleeve




Refrigerant flow in suction manifold is forced to make at least one (1) 90º change in direction causing oil to separate from the gas and fall to the bottom of the suction manifold in the compressor

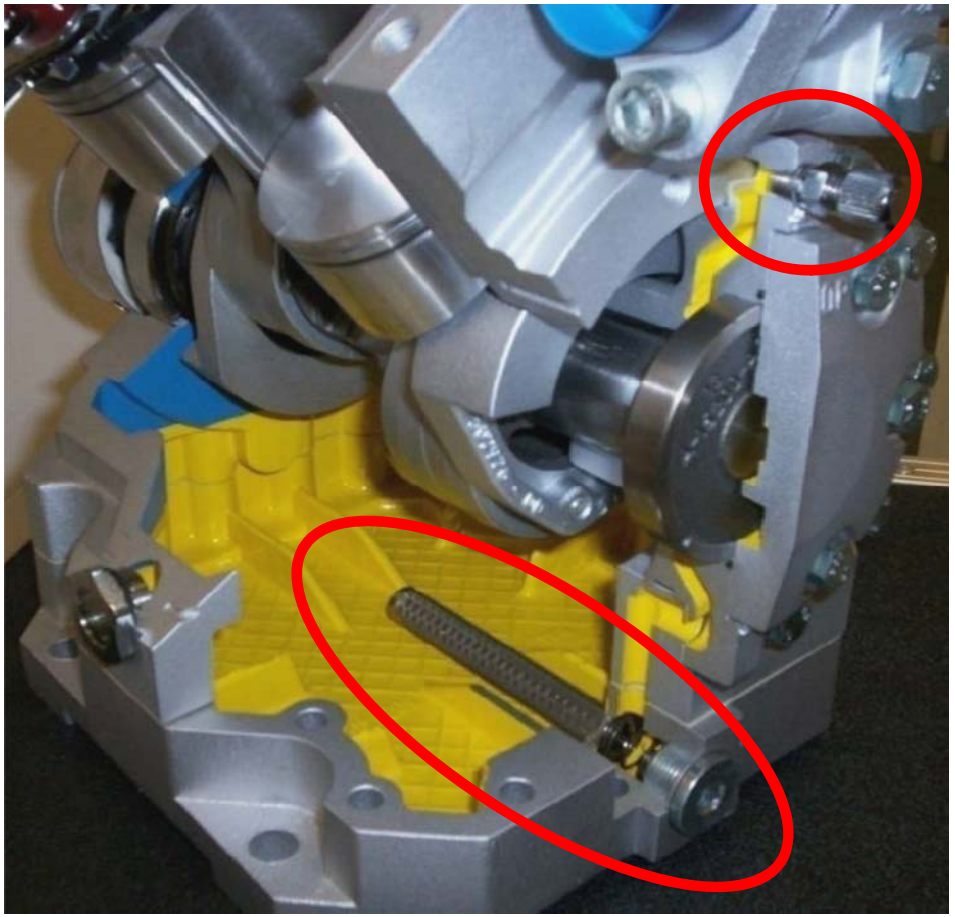
# Carryover Oil Drain & Equalizer Valve

Gas equalizer valve is normally open, closes during compressor start-up to reduce ‘foaming’ of sump oil, reducing amount of carryover oil discharged during start-up



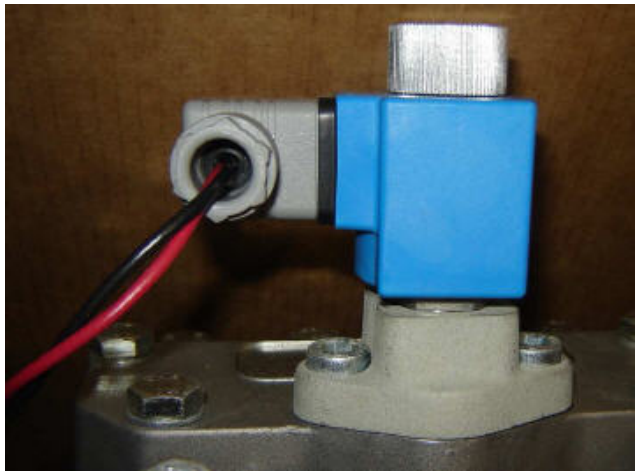
# Serviceable Oil Pump Screen

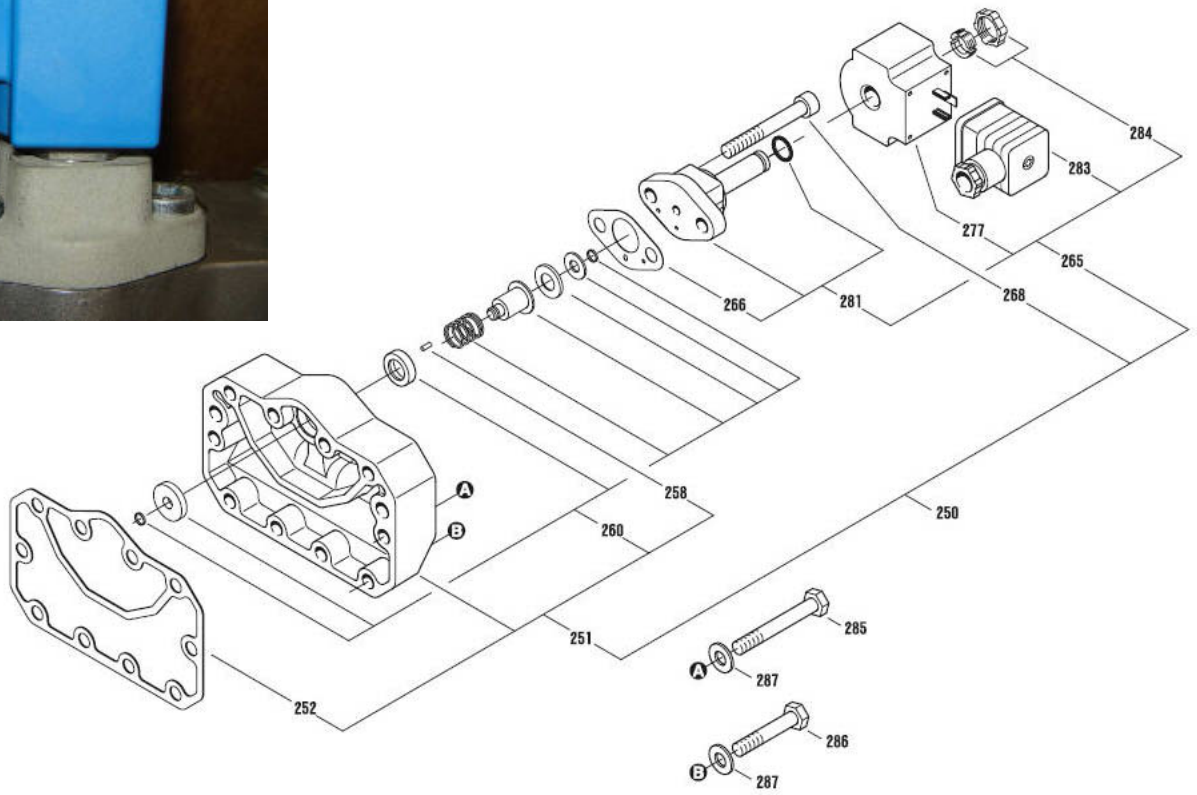
- Easily removable magnetic plug and oil pump screen, compressor ***does not*** require removal
- Recommended interval to replace oil is 3 yrs or 10K-12K hrs of compressor operation
- Test fitting to check lube oil pressure located on rear endplate



# Unloader Configuration

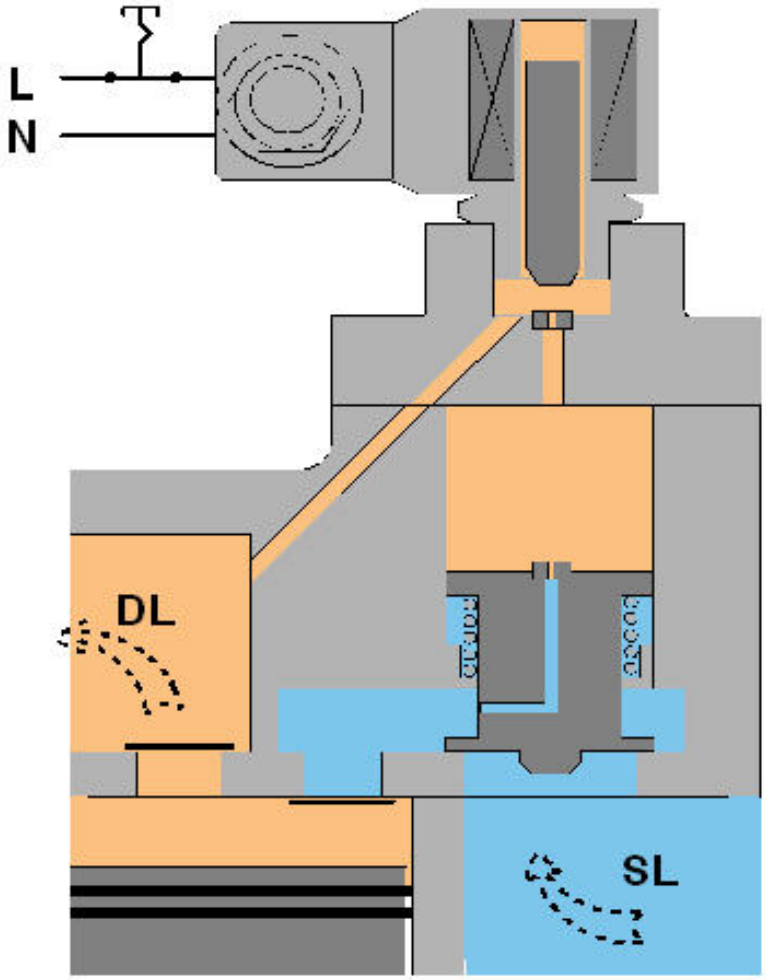
Unloader assembly is installed in one (1) cylinder head only
Capacity control in 100% X 50%



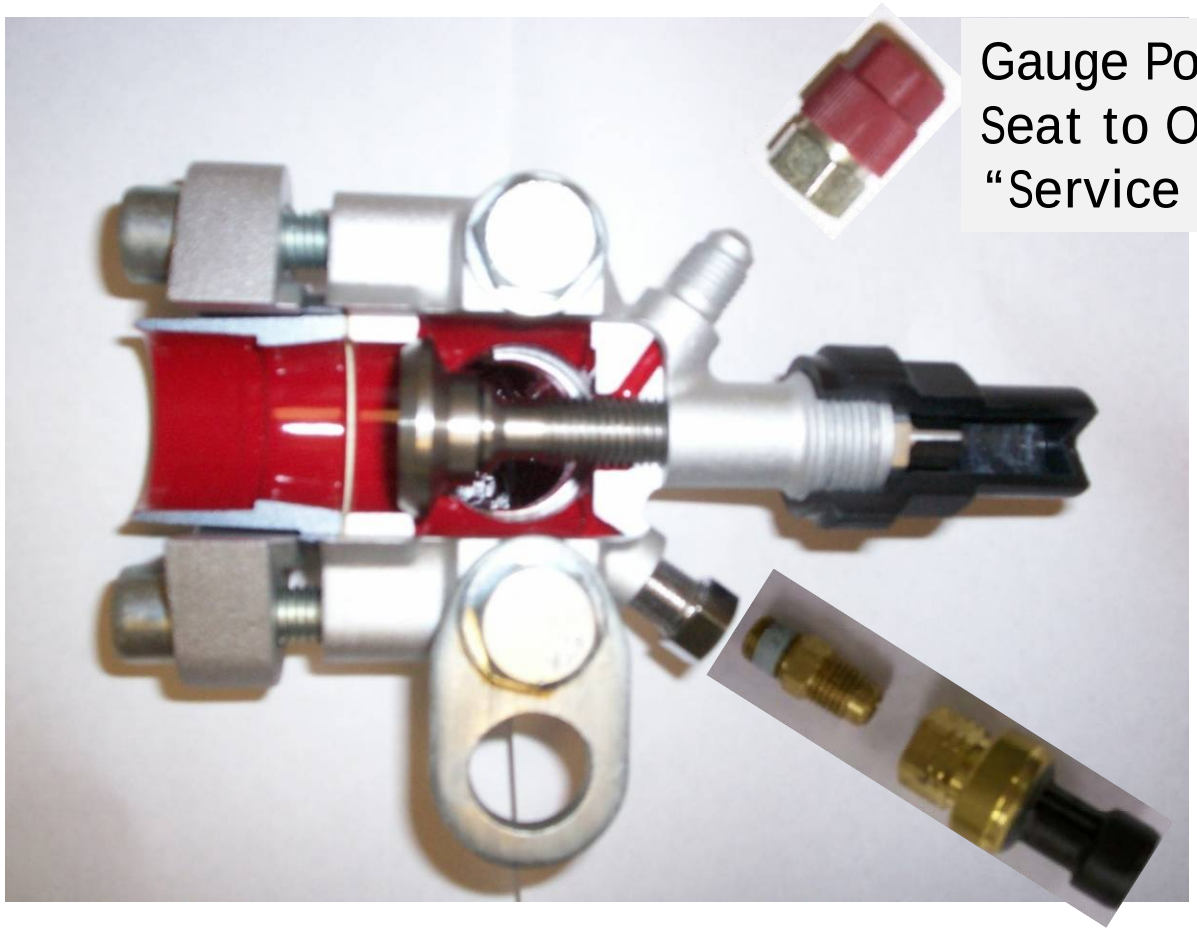


# Unloader Operation of Compressor

- Compressor capacity is controlled using a process called ‘blocked suction’
  - More efficient
  - Less strain on compressor
  - Requires less power from engine while ‘unloaded’
- Diagnosis & Troubleshooting same as a Carrier equipped coach
  - Coil energized-cylinder head ‘unloaded’
  - Coil de-energized-cylinder head is ‘loaded’ and pumping



# Service Valves



Gauge Port – Forward Seat to Open to System "Service Connection"

Suction and Discharge Valves are Identical

Transducer Port – Always Open to System

# Compressor Magnetic Clutch

- Shaft mounted, retaining bolt also acts as removal tool
- No ‘air gap’ to maintain
- No periodic lubrication required
- Bi-directional design

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# Quiz 2

# Answers to Quiz 2

1) The MCI compressor does not have removable connecting rod caps

   **TRUE**

2) The MCI compressor uses ‘Hot Gas By-Pass’ as the capacity control method

   **FALSE**

3) The MCI compressor valve plates must be assembled by the Technician prior to installation

   **FALSE**

4) The MCI compressor clutch does not require periodic adjustment or lubrication

   **TRUE**

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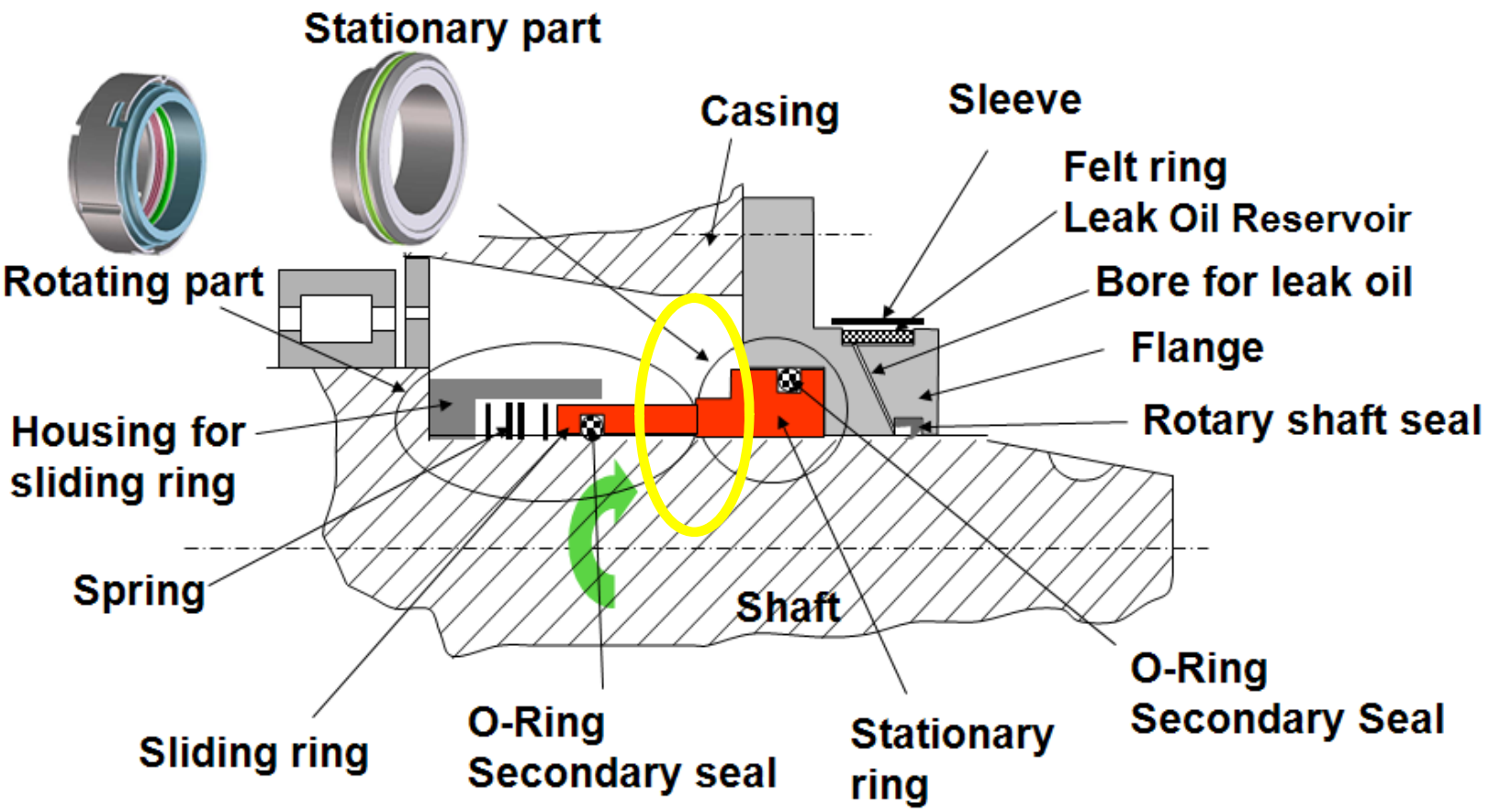
# MCI HVAC Compressor
# Shaft Seal

# Purpose of Lubrication Oil at the Shaft Seal

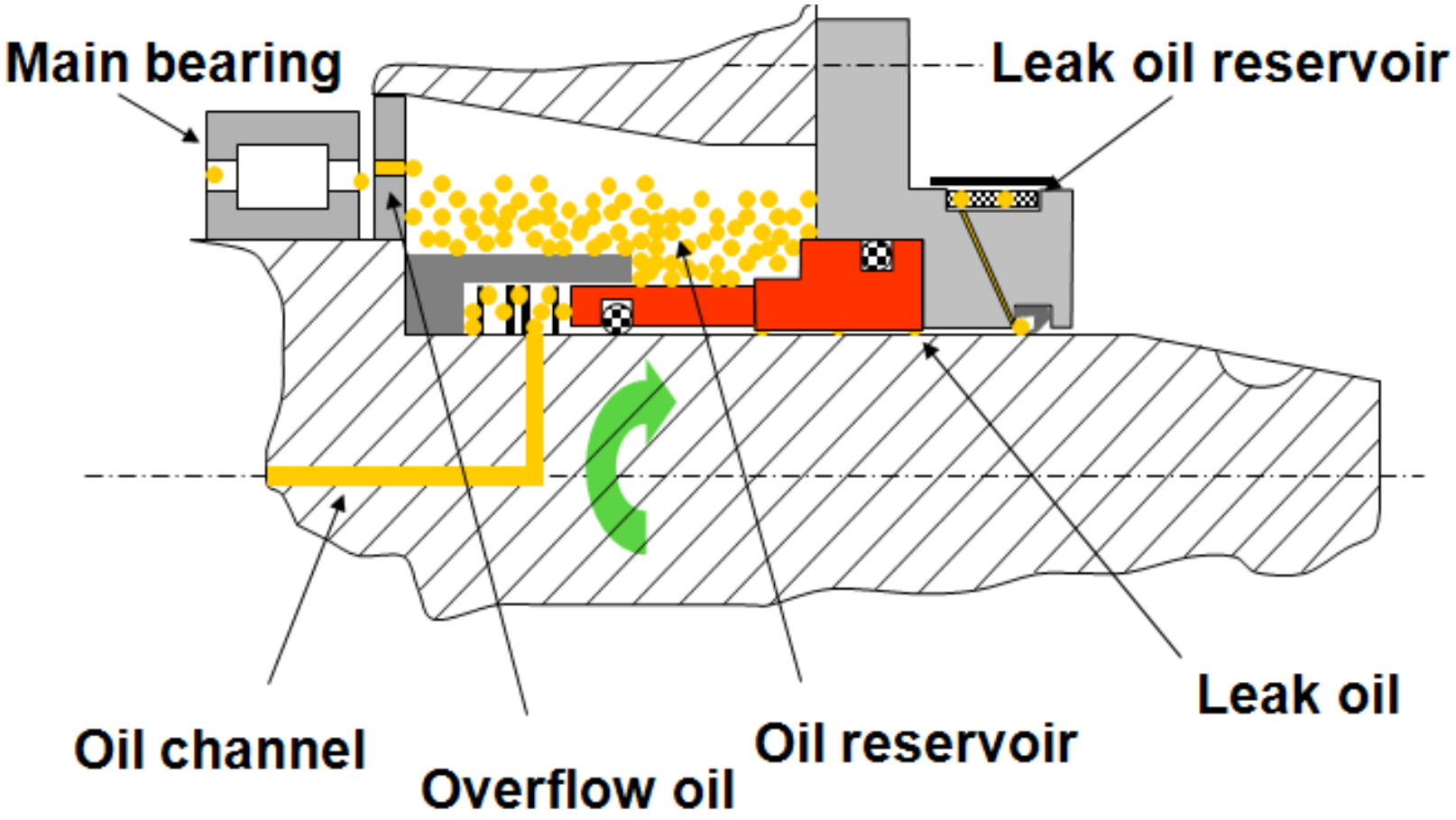
1. Compressor oil is the primary sealing media between the rotating and stationary components of the seal assembly. To ensure sufficient oil at the shaft seal it is recommended to operate the compressor once a month.
2. Lubrication of sliding surfaces
   Shaft seals without any oil leakage may run dry (increased wear).
3. Cooling of the shaft seal, removes heat from the area around the seal assembly

A minimal amount of oil leakage is unavoidable and it is necessary for a reliable operation of the shaft seal!

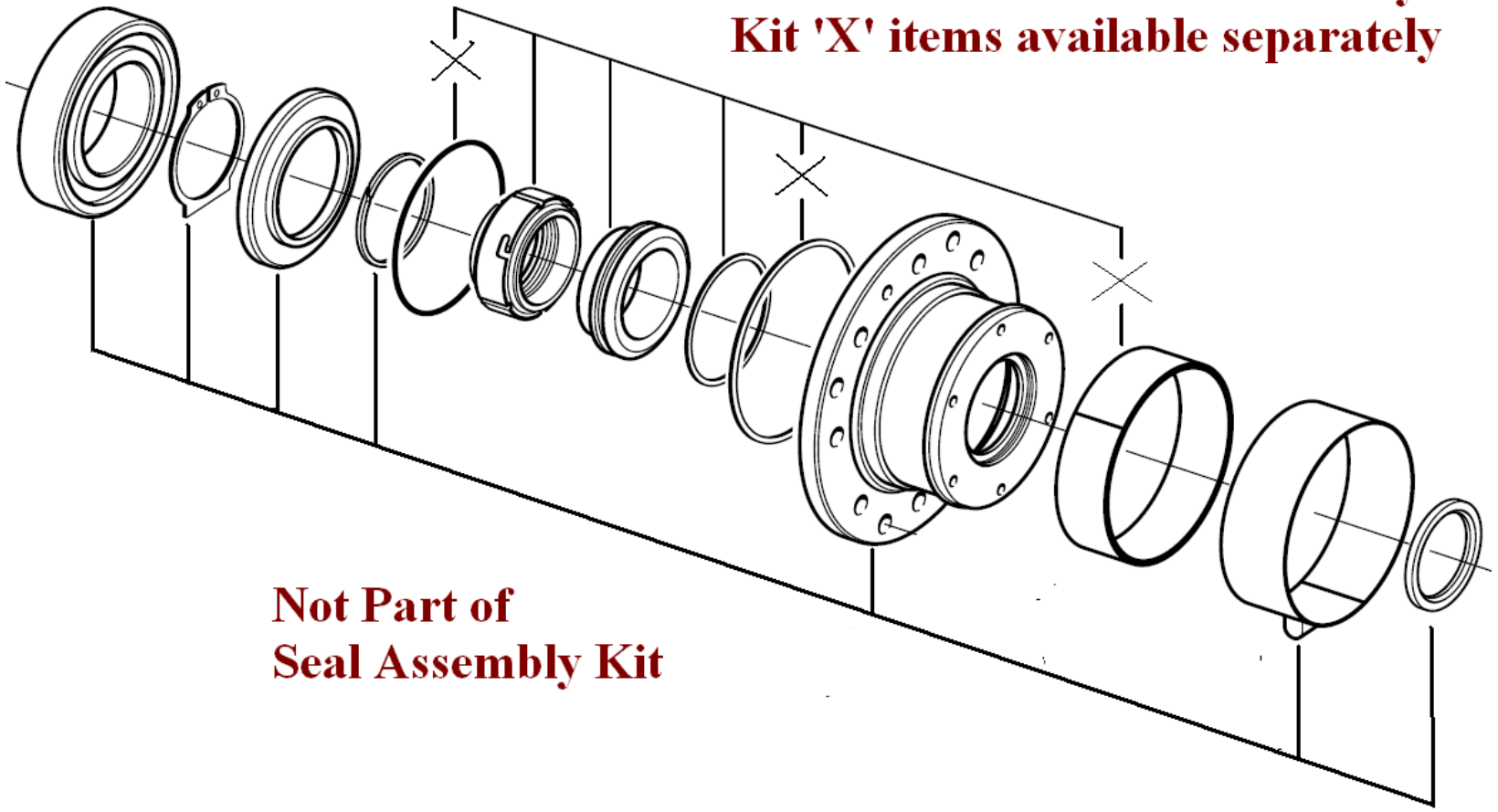
# MCI Compressor Shaft Seal Detail



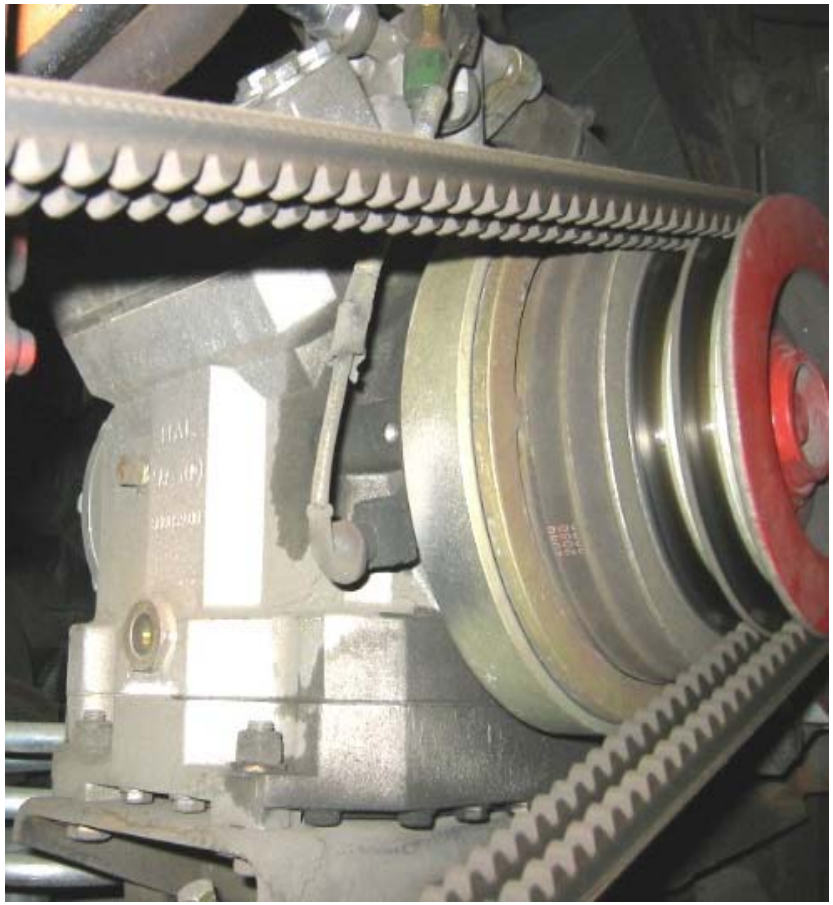
# Detail of Oil Supply to Seal Assembly



# Seal Assembly Replacement Components



# Example of a Shaft Seal 'Weeping'

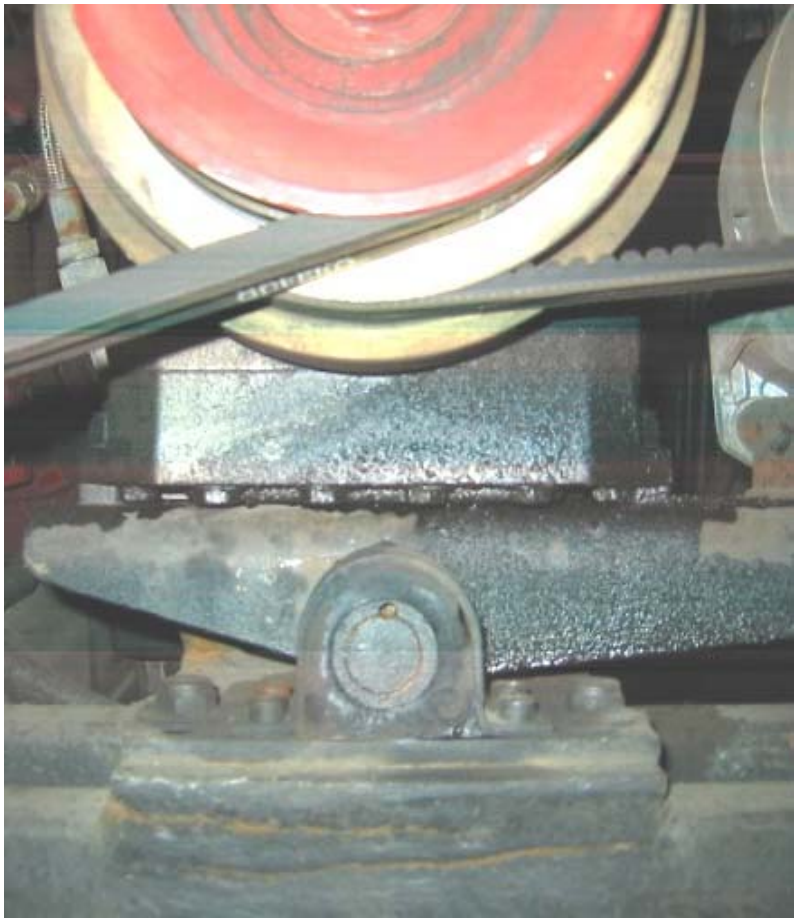


**Compressor exterior dirty, mostly dry, slightly oily under clutch assembly**

Unsightly, but not a significant problem!

Recommendation:
Clean the compressor

# Example of a Shaft Seal ‘Seeping’

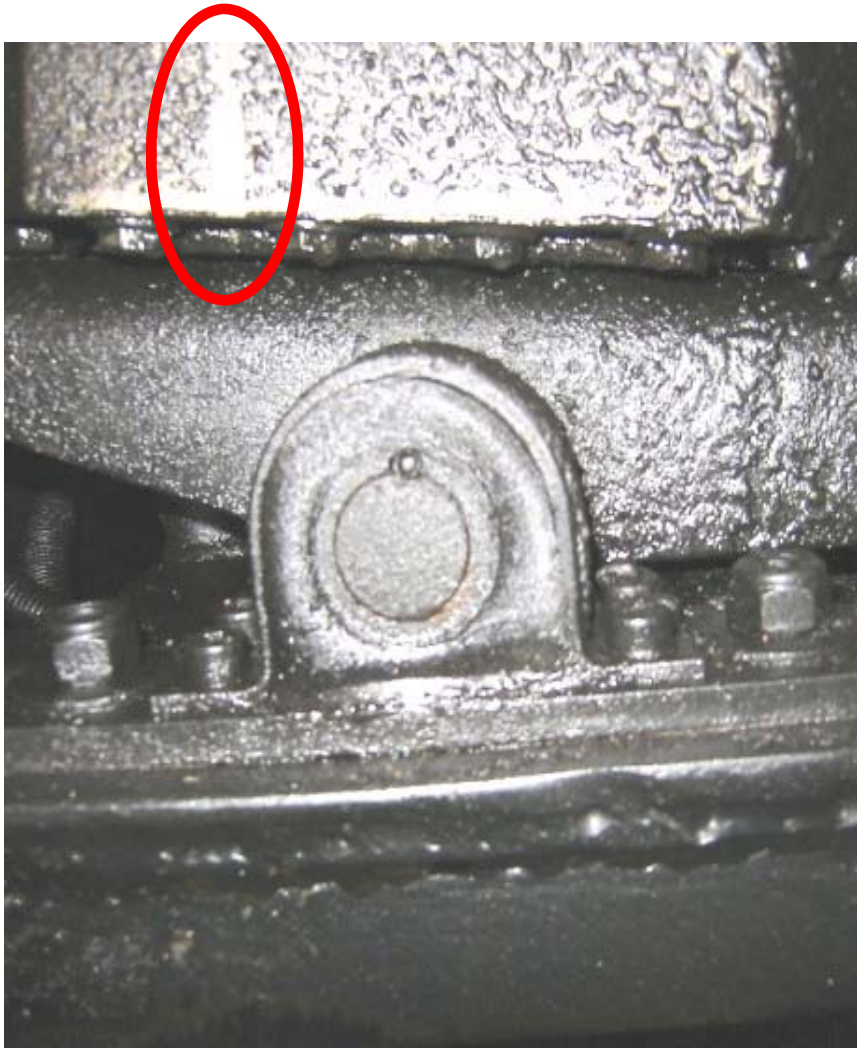


**Compressor exterior is slightly wet with oil residue**

The felt oil reservoir behind the clutch assembly has become saturated and requires cleaning or replacement

Recommendation: Clean the compressor exterior and clean or replace the felt oil reservoir on compressor shaft seal housing

# Example of a Shaft Seal ‘Leak’



**Compressor too wet, obvious leakage of oil**

The oil leakage is or was excessive. To ensure that it was not a temporary higher oil leakage, we would like to recommend the following:
Clean the compressor and change the felt reservoir strip
Monitor the compressor for a certain period of time (6-8 hrs of operation)
In case of no improvements, the shaft seal has to be changed and the root cause must be corrected

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# Quiz 3

# Answers to Quiz 3

1) The oil in the compressor is the primary sealing medium for the compressor shaft seal assembly

**TRUE**

2) A new compressor, or a replacement shaft seal, can be expected to have a higher leakage rate for the first 150-200 hrs of operation

**TRUE**

3) Incorrect drive belt tension or mis-alignment of the compressor drive belt can shorten the life of the shaft seal

**TRUE**

*4)* The MCI compressor has a 'serviceable' felt oil reservoir to help reduce oil residue on the compressor exterior

**TRUE**

# Reference Materials Available

| MCI P/N | Description | Bitzer P/N |
|---|---|---|
| 03-15-7015 | Manual-Operating instructions, Bitzer Open Drive Reciprocating | KB-540-3 |
| 03-15-7016 | Manual-Parts, Bitzer Open Drive Reciprocating Compressor | KE-540-3 |
| 03-15-7017 | Manual-Technical Information, Polyolester oilsBSE32 and BSE55 for Reciprocating Compressors | K-510-4 |
| 03-15-7018 | Manual-Technical Information, HFC refrigerant R134a | KT-620-2 |
| 03-15-7019 | Manual-Maintenance, Bitzer Open Drive Reciprocating Compressors | KW-540-1 |
| 03-15-7020 | Manual-Maintenance, Shaft Seal Replacement, Bitzer Open Drive Reciprocating Compressors | KW-541-1 |

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# Questions and Answers

Press the * on your phone to ask your question

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Thank you for your business!