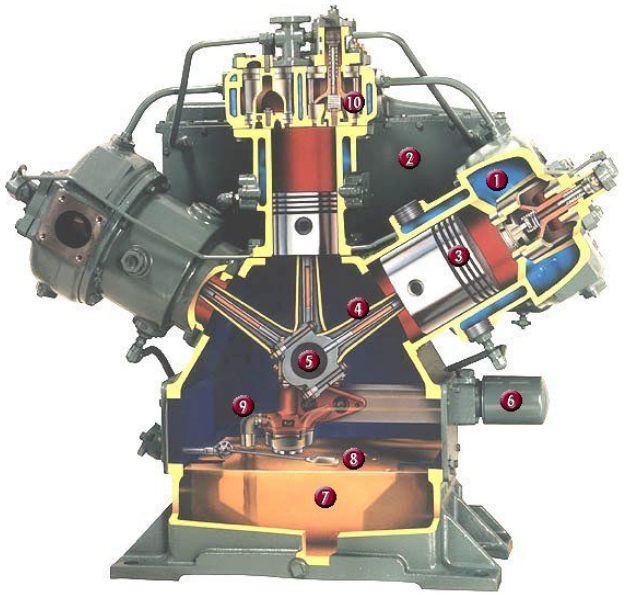
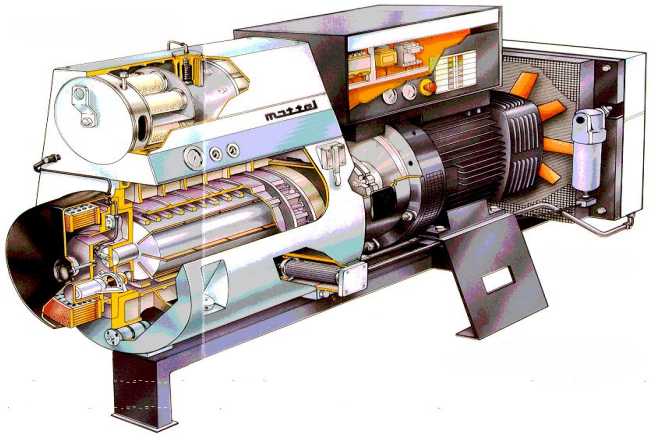
AIR COMPRESSOR LUBRICATION

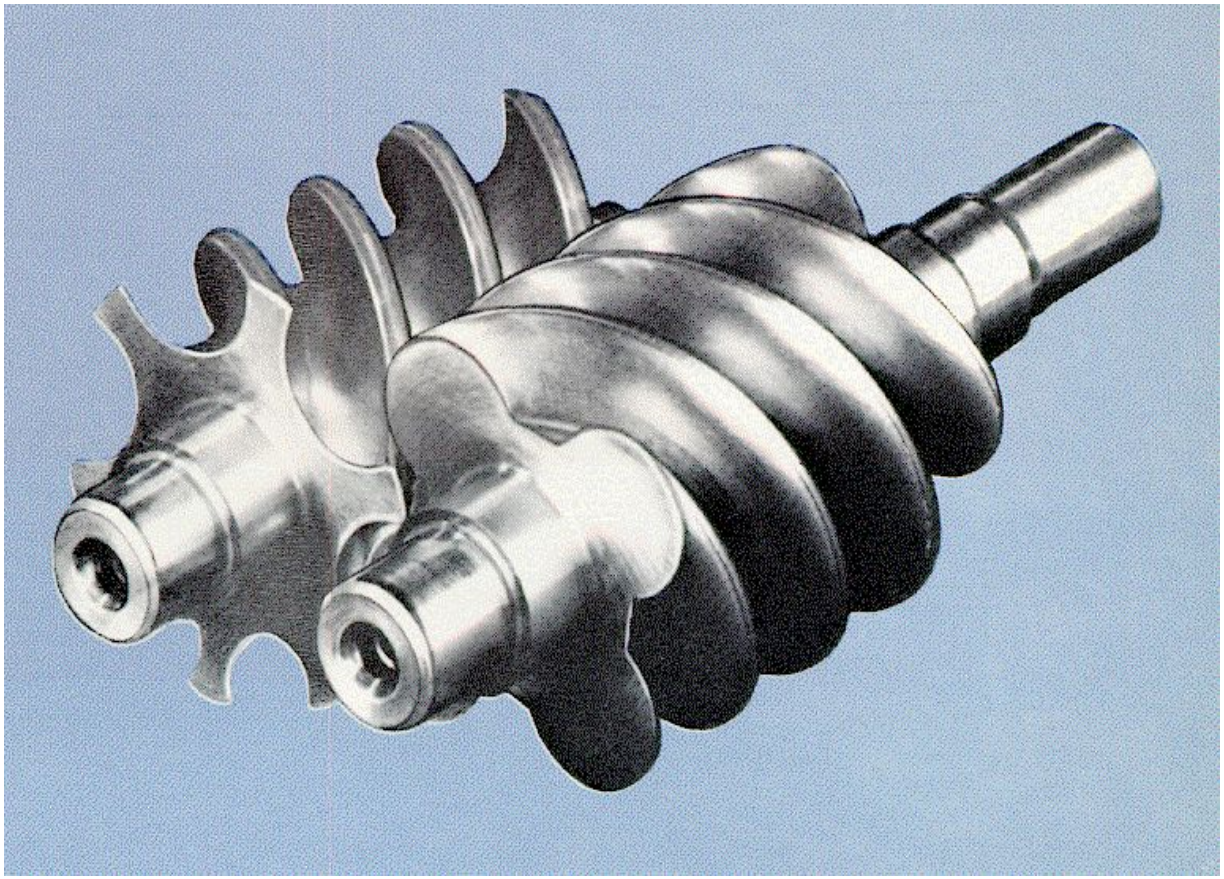




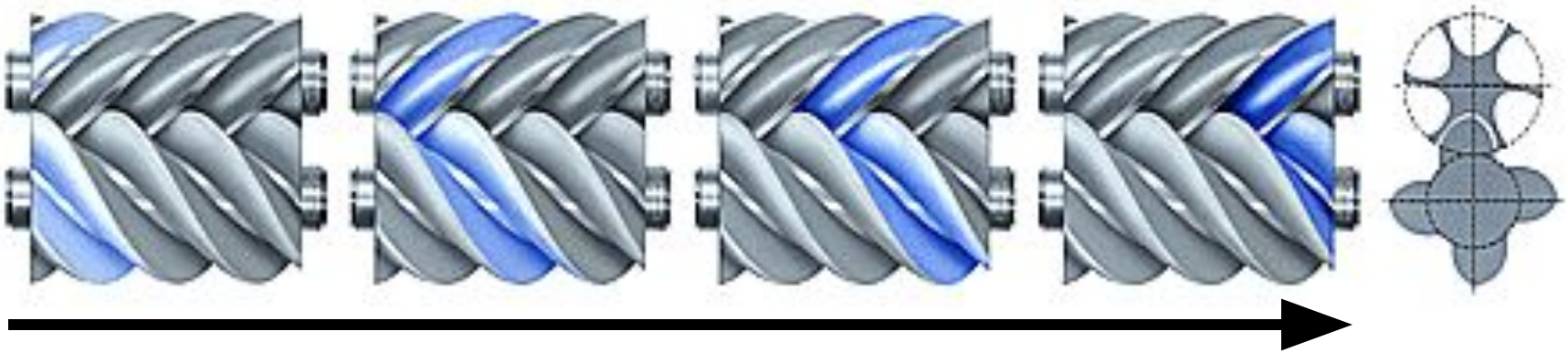
ROTARY SCREW AIR COMPRESSOR

ROTARY SCREW COMPRESSOR AIR END

ROTARY SCREW COMPRESSOR ROTORS



ROTARY SCREW COMPRESSION CYCLE



The ends of the rotors uncover the inlet and air enters the compression chamber.

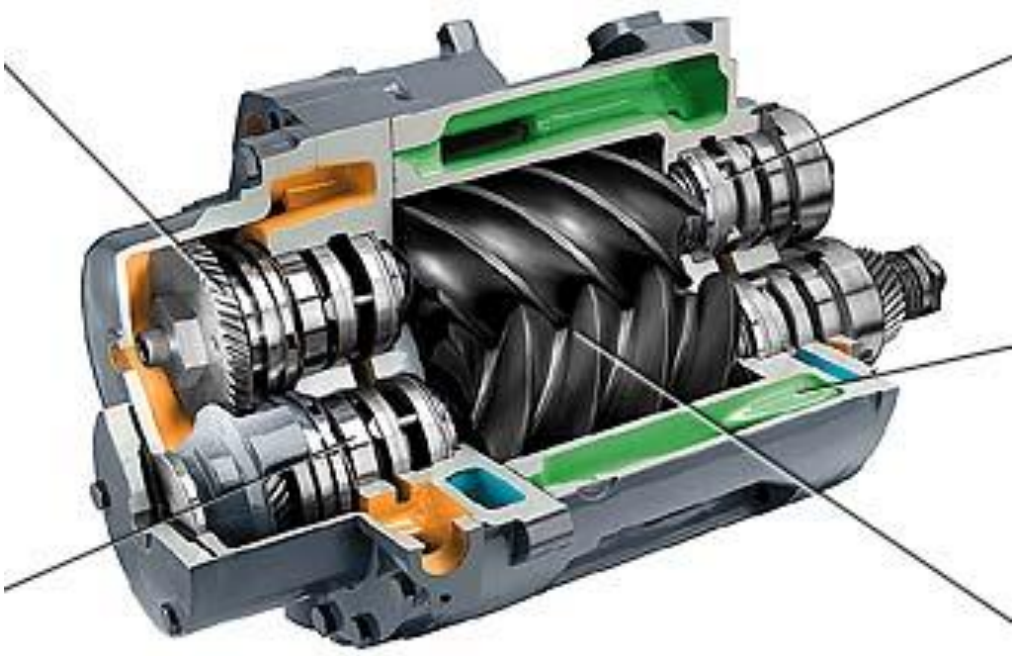
The air is entrapped in the ‘compartment’ formed by a male lobe and a female flute.

As the rotors turn, the compartment becomes progressively smaller thereby compressing the entrapped air.

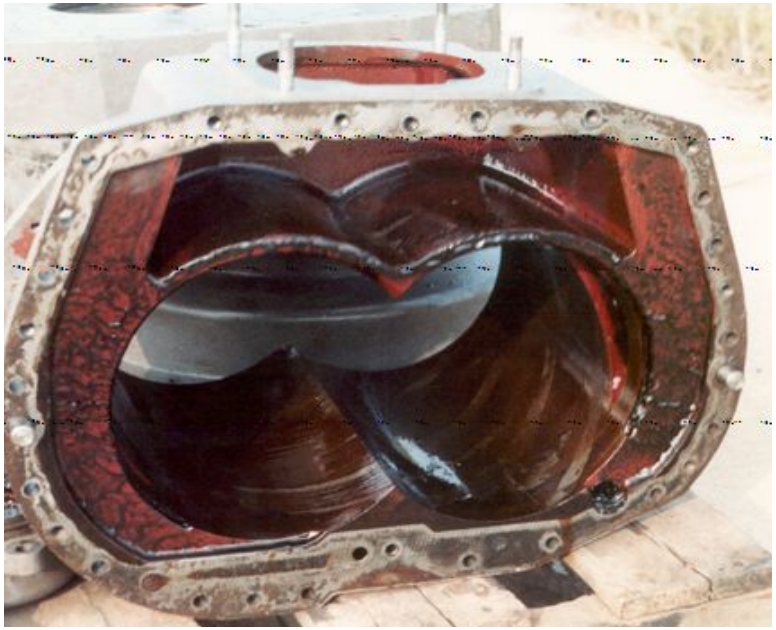
Compressed air leaves through the outlet port.

FRICTION POINTS

What are the main friction points in this compressor ?

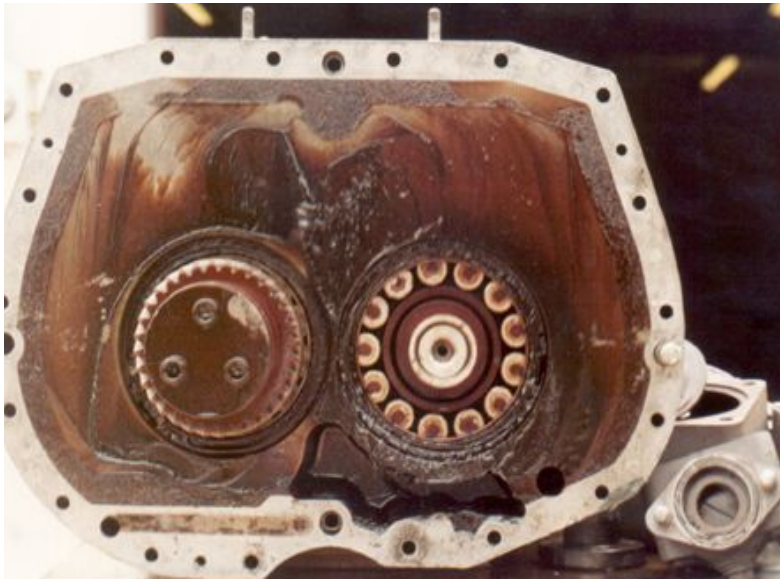


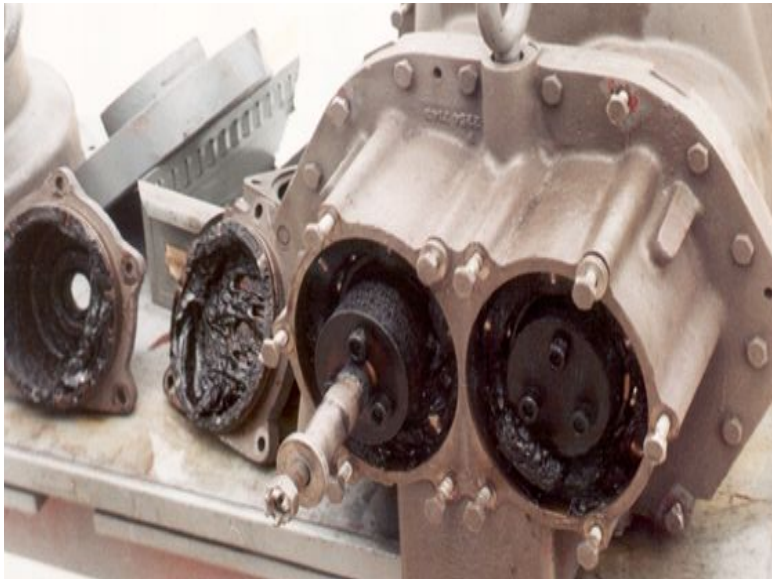
EFFECTS OF OXIDATION IN A ROTARY SCREW AIR COMPRESSOR



Petroleum lubricant used longer than recommended drain interval

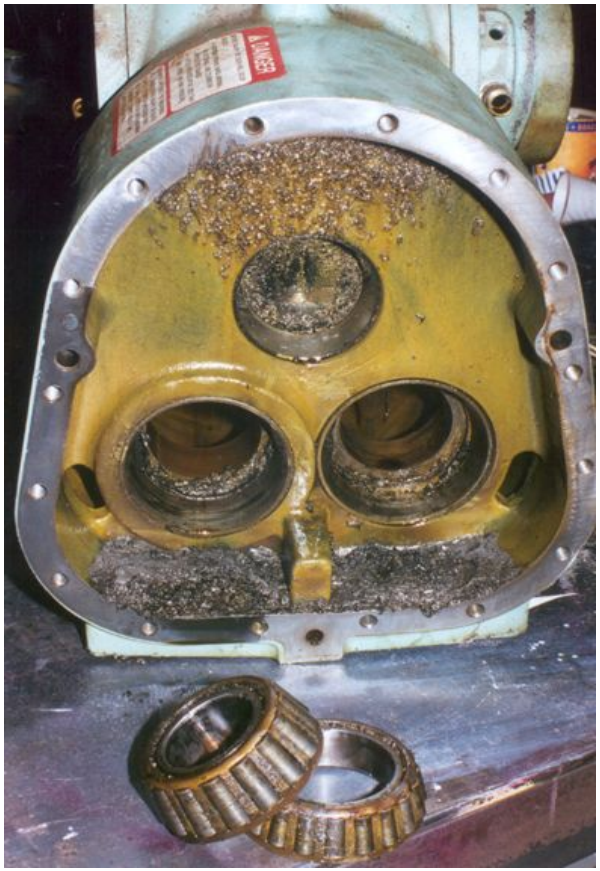
SLUDGE AND OXIDATION BYPRODUCTS





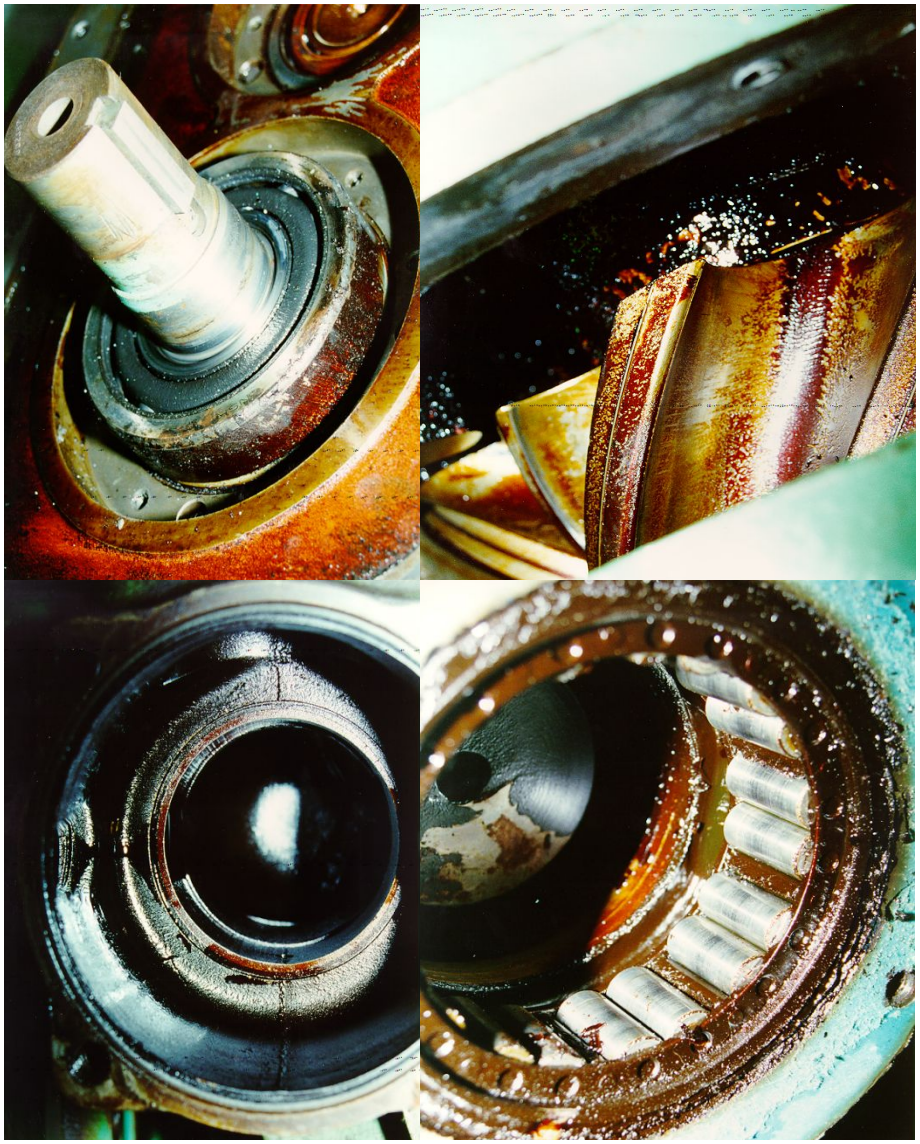
Heavy sludge and deposit formation will cause overheating, efficiency loss, and eventually shut down the compressor

VARNISH FROM LUBRICANT ADDITIVE BREAKDOWN



7000 hours of operation using competitive PAO based lubricant

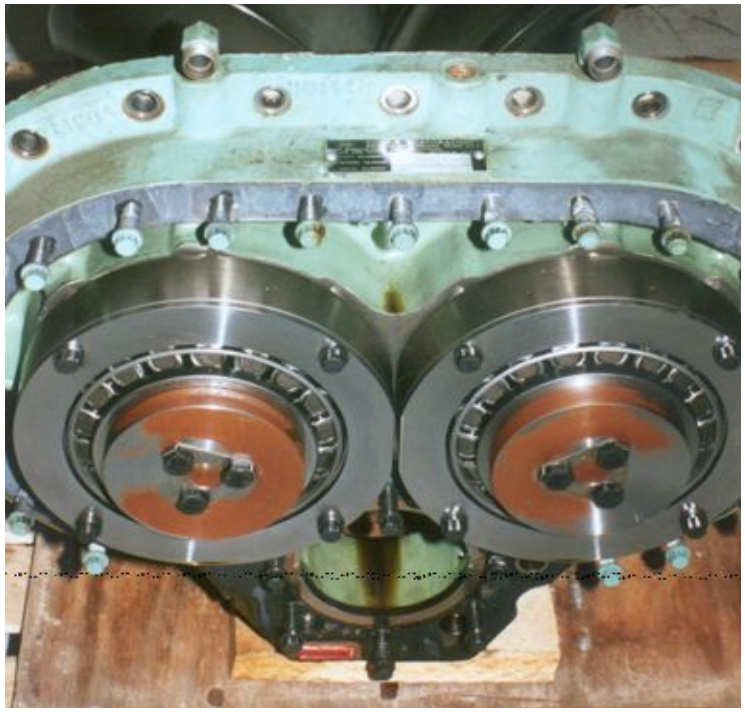
ROTOR SLUDGE
FROM FOOD GRADE PETROLEUM



SEPARATOR PLUGGING

An improperly formulated synthetic compressor lubricant was the cause of this plugged separator

DEPOSIT FREE OPERATION



Sullair compressor after 10,000 hours using Summit SH-32

LONG TERM SYNTHETIC PERFORMANCE

Sullair compressor operating on Summit SH-32 including recommended maintenance for 6+ years with oil changes every 8000 hours

MAJOR BENEFITS OF SYNTHETICS IN A ROTARY SCREW AIR COMPRESSOR

1. Extended oil service life of 8000+ hours
2. Reduced formation of sludge, varnish and carbonaceous deposits
3. Electrical savings of 2-5%
4. Cooler oil temperature
5. Cooler discharge compressed air
6. Lower oil consumption
7. Less oil contamination downstream

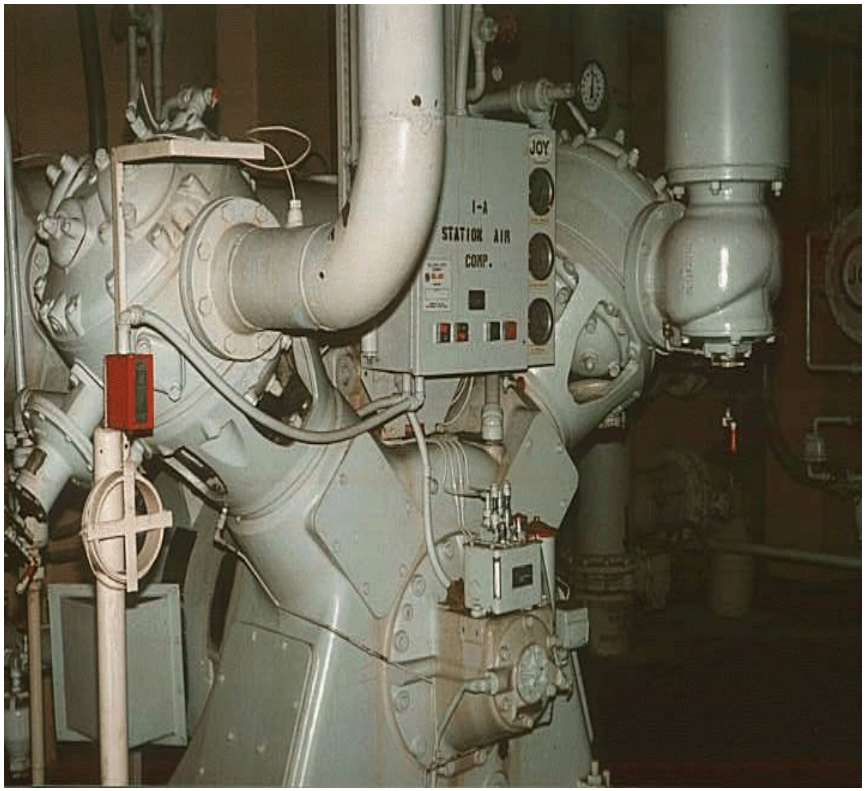
ECONOMICS OF PAO VS MINERAL OIL COMPRESSOR LUBES – 8,000 HOURS

	Mineral Oil		PAO Lube	
Initial fill, gal	60		60	
Oil make-up, gal	25		15	
Fluid for lube changes, gal				
Mineral oil: 7 changes		420		-
PAO lube: 0 changes		-		0
Total lube use, gal	505		75	
Cost per gal, $		6		35
Total cost of lube, $		3030		2625
Labor cost for oil change				
@ $75/change	525		0	
Number of replacement filters		7		1
Total filter cost @ $30/filter		210		30
Total cost, $	3765		2655	
Savings, $	-	1110		
%		29.5%		

WORLDWIDE ROTARY SCREW AIR COMPRESSOR OEMs

Quincy	www.quincycompressor.com
Atlas-Copco	www.atlascopco.com
Ingersoll-Rand	www.air.irco.com
Kaeser	www.kaeser.com
Sullair	www.sullair.com
Gardner-Denver	www.gardner-denver.com
CompAir	www.compair.com
Boge	www.boge.com

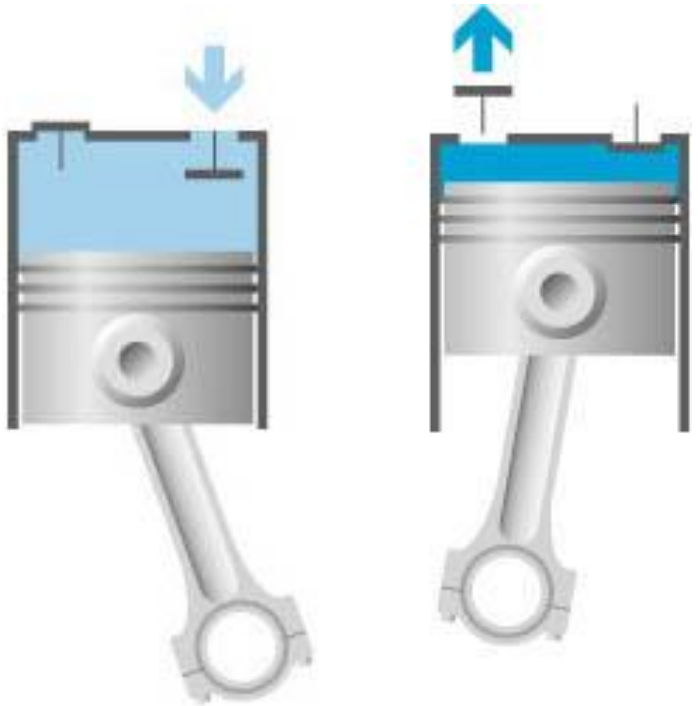
RECIPROCATING AIR COMPRESSORS



RECIPROCATING COMPRESSORS

Compression Principle

A piston compressor is a reciprocating, positive displacement compressor containing a piston which moves inside a cylinder.



As the piston descends, increasing the available space, the decrease in pressure causes the inlet valve to open and gas to be drawn into the compressor chamber.	Subsequently, after the piston has passed its turning point corresponding to the maximum volume of the compressor chamber, the inlet valve closes as the gas pressure starts to increase.	As the volume of the compression chamber decreases, the gas pressure increases.	Finally, when the pressure has reached a pre-determined value, the discharge valve opens, and the compressed gas leave the compression chamber.

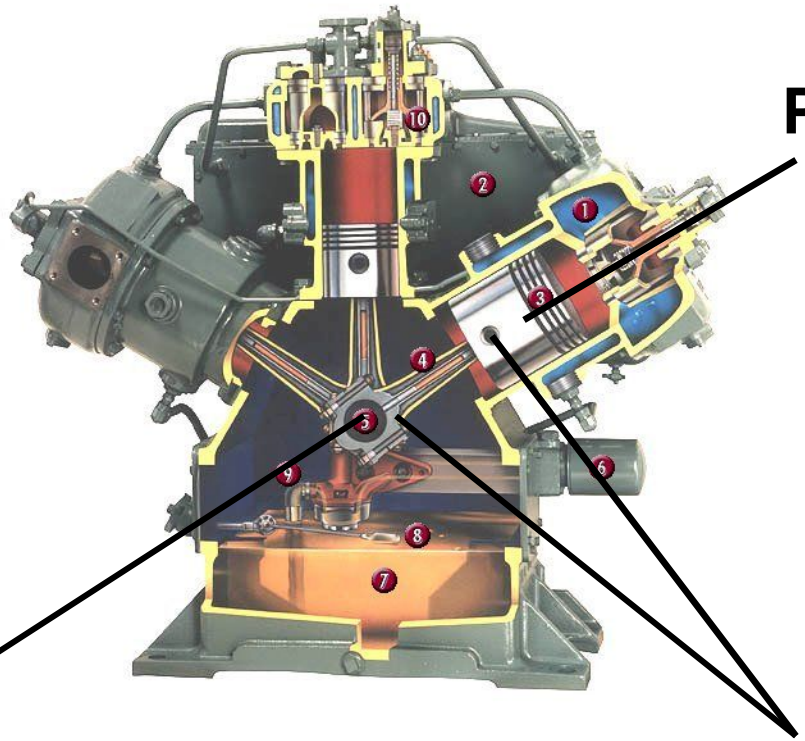
RECIPROCATING COMPRESSOR TYPES

- Single Acting
- Double Acting
- Multi-Stage
- Different Lubrication Methods

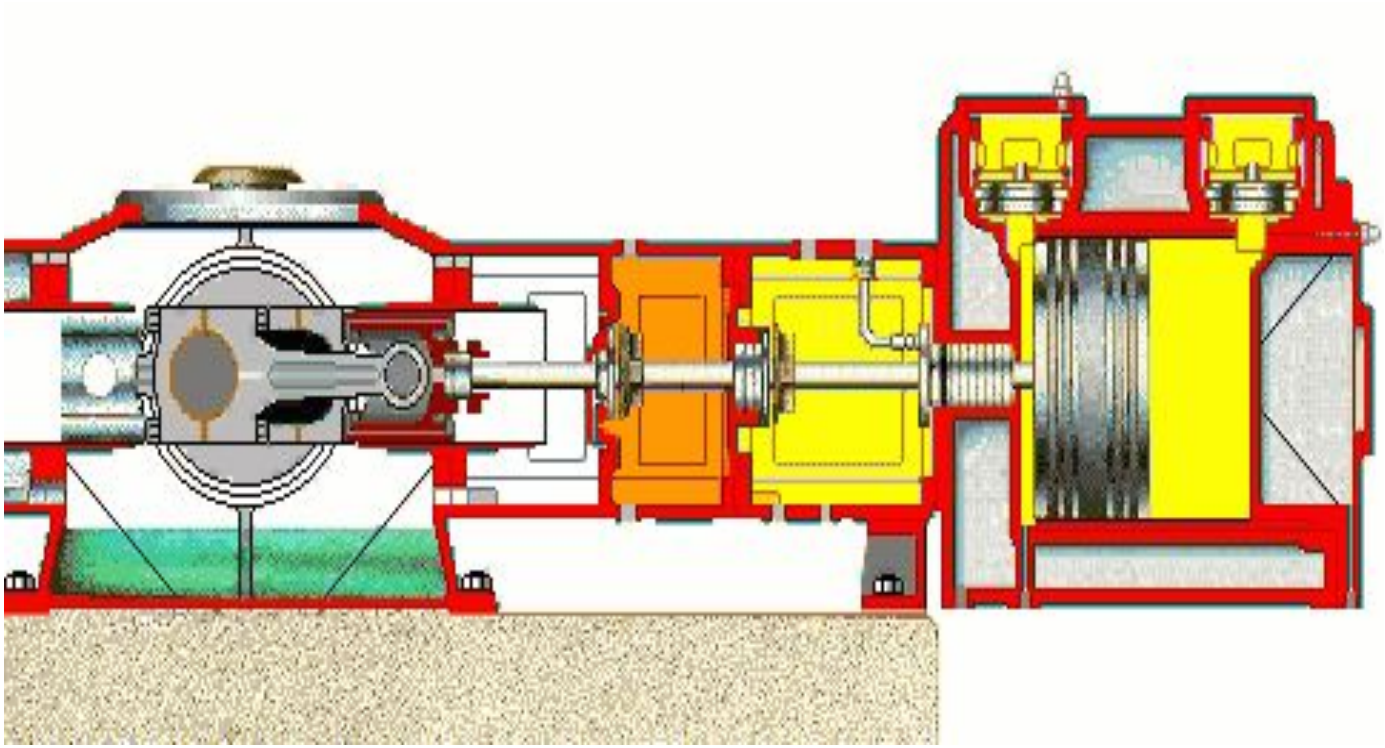
SINGLE ACTING RECIPROCATING COMPRESSOR

Friction points

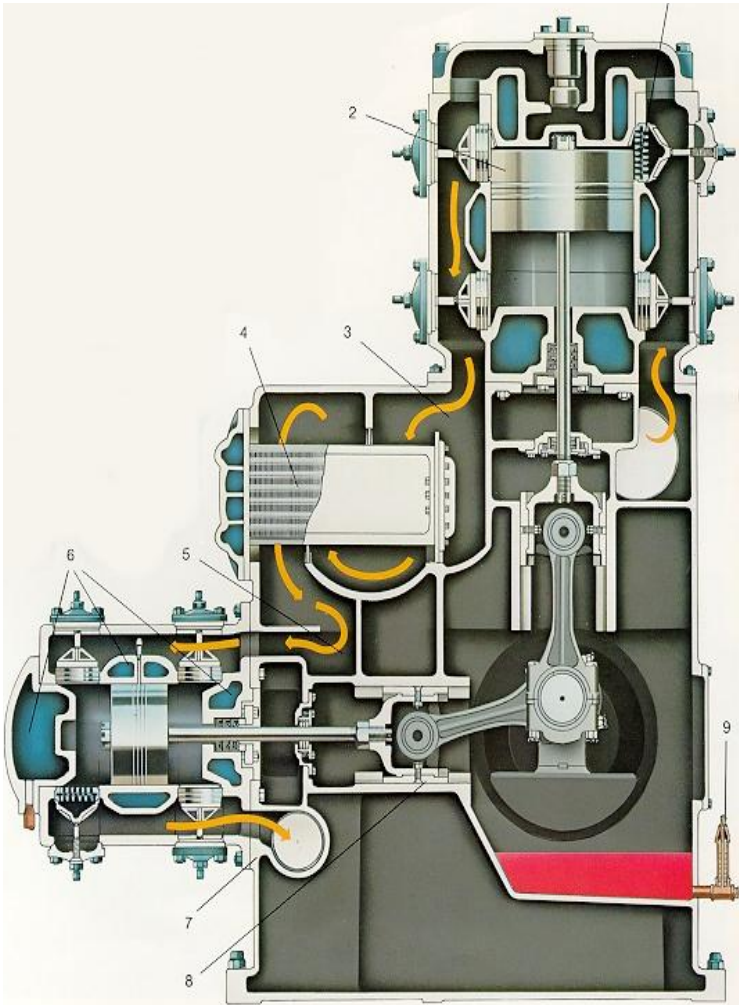
What are the main friction points in this compressor ?



DOUBLE ACTING RECIPROCATING COMPRESSOR



MULTI-STAGE DOUBLE ACTING RECIPROCATING COMPRESSOR

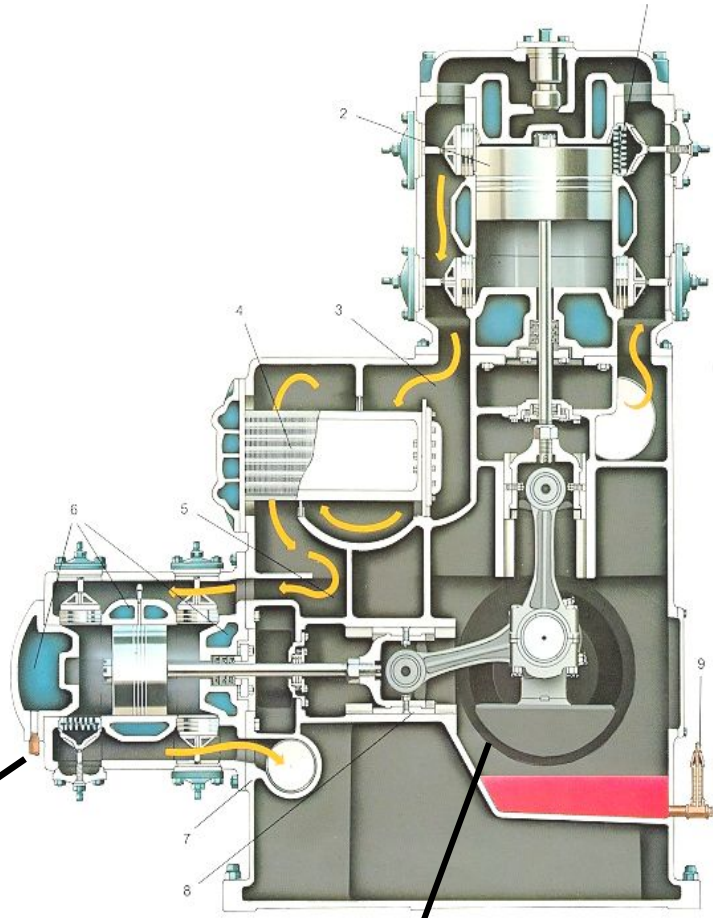


LUBRICATION METHODS – DRY PISTON

Types

“Dry piston” means that the piston is lubricated “dry”, with PTFE-rings (oil-free)

Advantage:
Oil-free compressed air



Piston with PTFE-rings

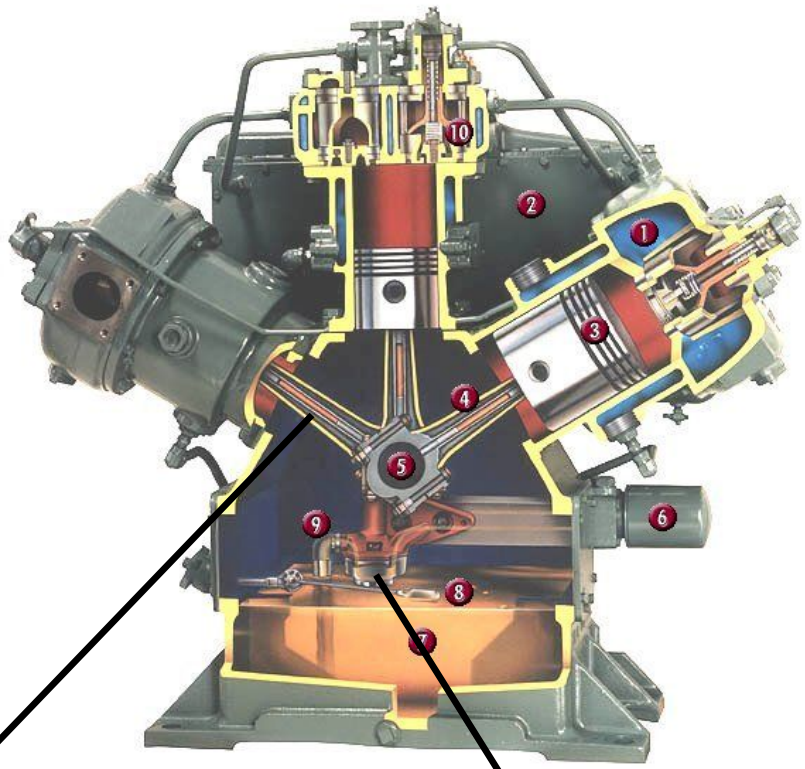
Only crankshaft lubricated with oil

LUBRICATION METHODS – OIL CIRCULATION

Types

“Oil circulation” means that the entire compressor is being lubricated by one oil pump

Advantage:
Compact and robust design



Oil connection to piston

Oil pump

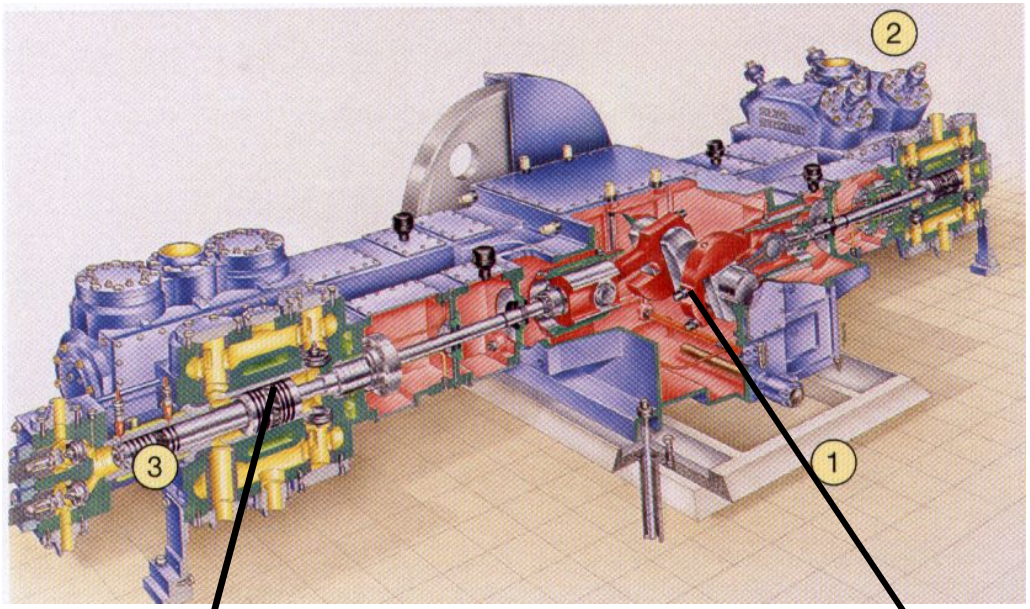
LUBRICATION METHODS – CYLINDER AND FRAME LUBE SYSTEMS

Types

"Separated cylinder and frame lube systems":

1. **Cylinder lubricated by separate pump (total loss)**
2. **Frame lubricated by oil circulation (closed loop)**

Application:
For high pressure applications



Cylinder **Frame**

COMPRESSOR VALVES
AFTER 1500 HOURS OF OPERATION

DIESTER SYNTHETIC LUBRICANT

PETROLEUM LUBRICANT

HYDROGEN COMPRESSOR VALVE USING PETROLEUM LUBRICANT

VALVE PROBLEMS?
WE DON'T HAVE ANY VALVE PROBLEMS!

BENEFITS OF USING SYNTHETICS IN RECIPROCATING AIR COMPRESSORS

- Reduced carbon deposits on compressor valves resulting in lower maintenance costs and increased productivity

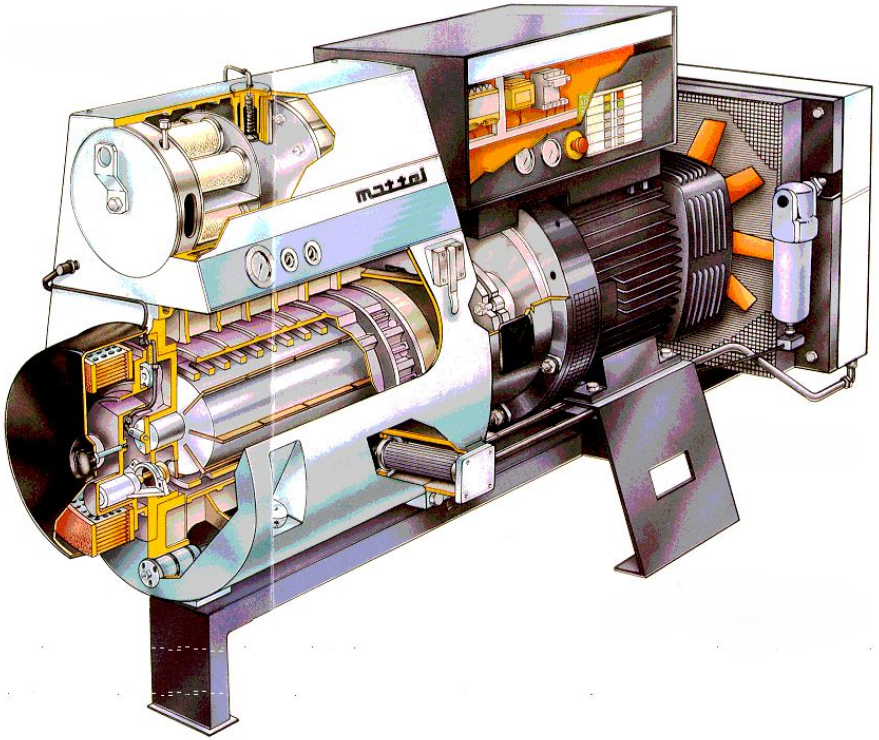
- Reduced oil feed rates, typically 20 to 30% lower, in dpm (drops per minute) to compressor cylinders

- Higher Flash Points and Fire Points, typically 100ºF higher, versus mineral oils for greater safety

- Higher Auto-Ignition Temperatures, typically 130ºF higher versus mineral oils for greater safety at all pressures

- Reduced wear of piston rings and packing resulting in longer parts life

ROTARY VANE COMPRESSORS



ROTARY VANES

ADVANTAGES OF SYNTHETICS IN ROTARY VANE COMPRESSORS

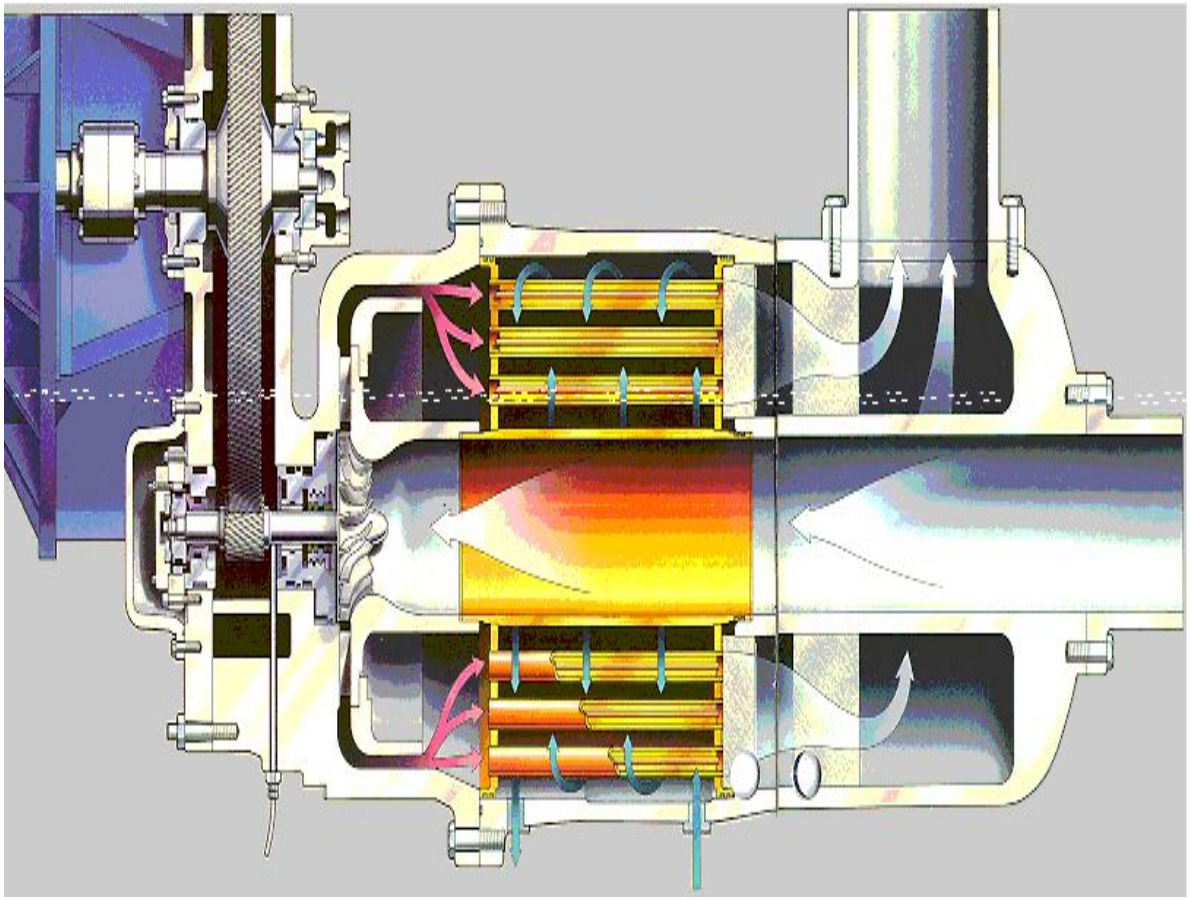
1. Reduction of wear and formation of gums and sludge on vanes and slots permitting free movement

2. Increases in oil drain interval where the lubricating system is a circulatory system

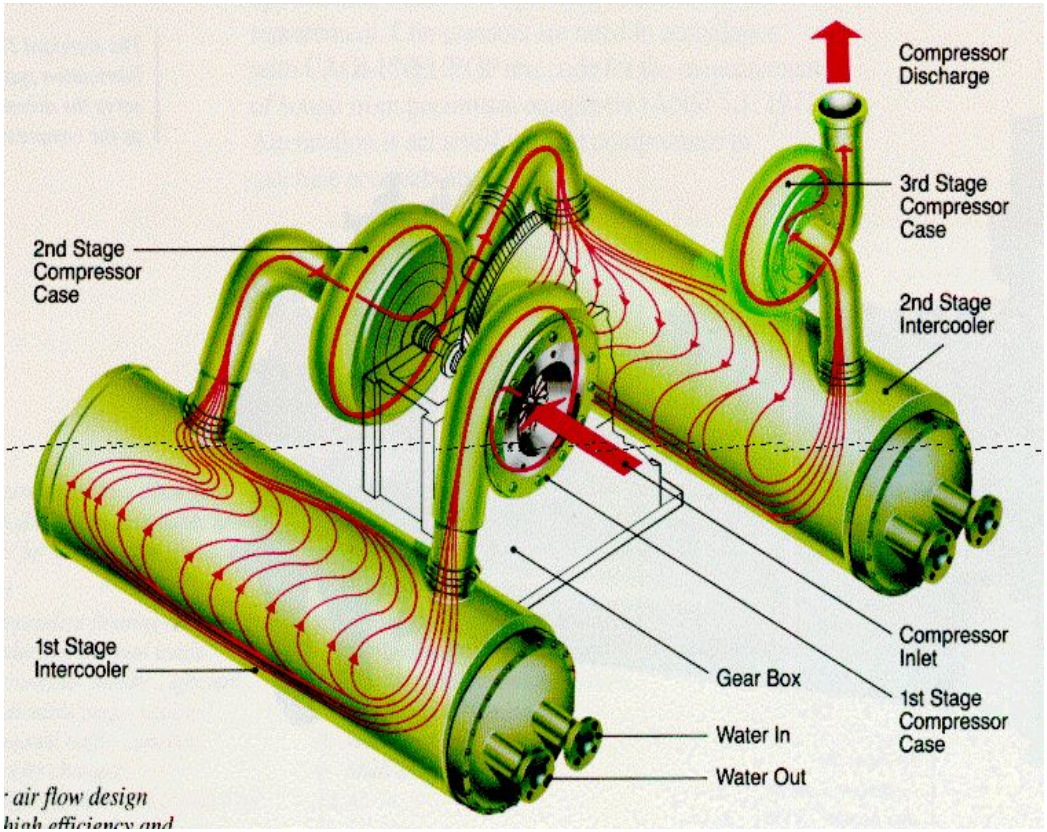
3. Reductions in oil feed rates in dpm in total loss (non-circulatory) systems

CENTRIFUGAL COMPRESSORS

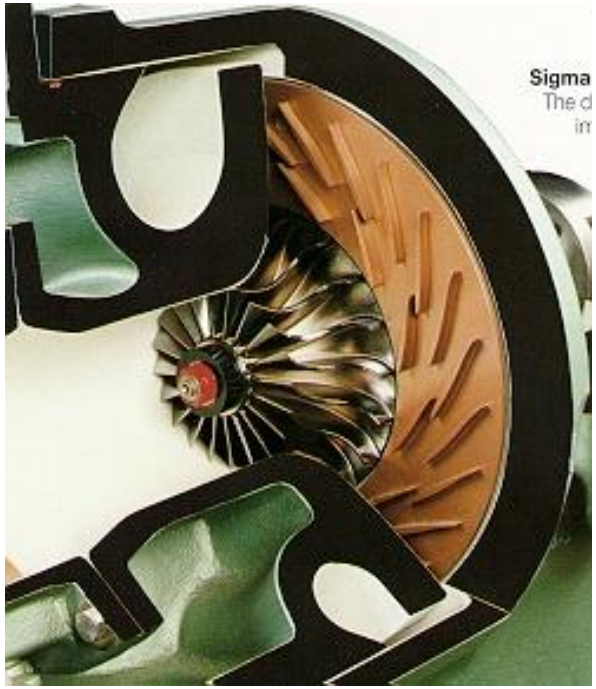
CENTRIFUGAL COMPRESSION CYCLE



MULTI-STAGE CENTRIFUGAL COMPRESSORS



CENTRIFUGAL COMPRESSOR PARTS



BENEFITS OF SYNTHETIC LUBRICANTS IN CENTRIFUGAL COMPRESSORS

- Energy efficiency
- Bearing life

The lubricant does not contact the compressed air. Extended life is not the primary advantage.

QUESTIONS / DISCUSSION

?