

## Compressor Applications Overview

Tuthill is a leading manufacturer of pumps for compressor lubrication services. Larger flows and pressures are addressed with the modular GlobalGear® line of internal gear pumps. The GlobalGear® is a heavy-duty internal gear pump that features an external thrust bearing and heavy-duty bracket for supporting bearings and mechanical seals.

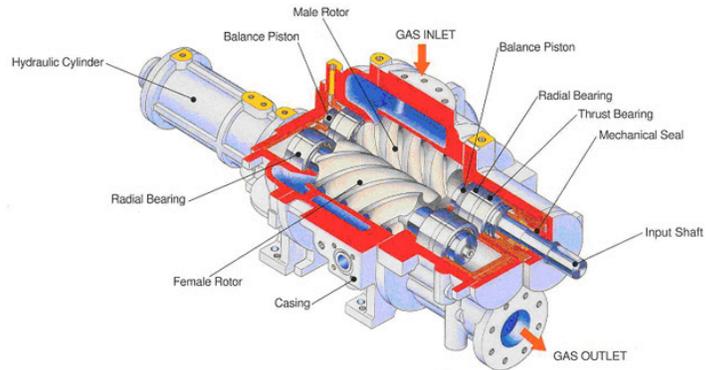
Lower flows are addressed with the L & C series of products that includes a wide range of integral close-coupled pumps and motors, and CC series of flanged-mounted pumps for use with NEMA C faced motors.

Tuthill Pump has been supplying lubrication pumps for seventy-five years and has earned a solid reputation for supplying long-lasting, reliable pumps.

## Compressor Package Systems

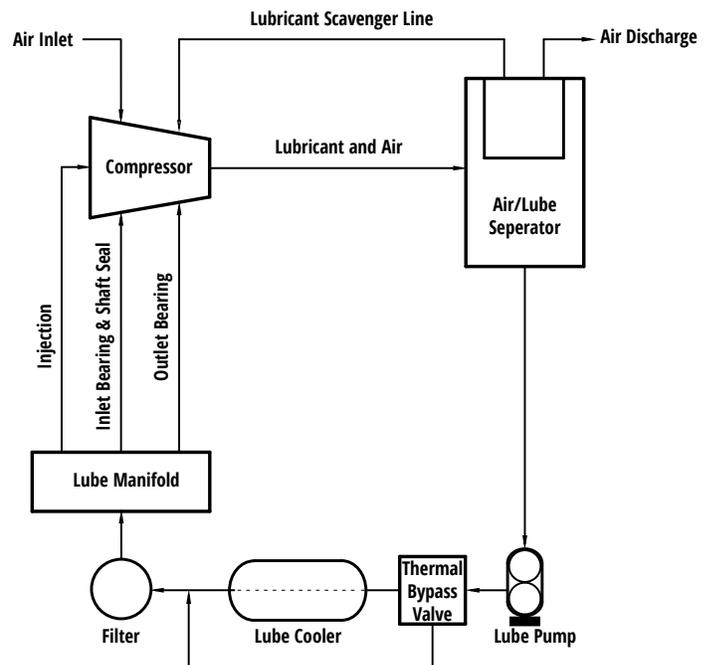
There is a growing market for compressor packages for the oil and gas market and for process refrigeration. Compressors are used for injecting compressed natural gas into wells for better oil extraction, for pipeline transportation of natural gas, and for process cooling. The compressors are very large, being driven by substantial size engines or electric motors.

The compressors themselves are mechanical devices that use rotors in a housing to increase pressure by forcing gas from a larger cavity to a smaller cavity. Lubrication systems are critical for compressors. Bearings and seals must be cooled and lubricated. Compressing gas generates heat, and for many compressor designs and processes, this heat must be removed. Lubrication systems circulate oil for lubricating and cooling the bearings, and in some designs, the oil is used to cool the gas.



**Figure 1: Typical screw compressor.**

The compressor is the major component of an integrated package. The integrated package consists of a driver, that is, an engine or motor, and is sometimes supplied with a gear reducer. Within the package there is lubrication system that consists of a pump, heat exchanger for oil cooling, filter, and oil separator for separating the oil from gas.



**Figure 2: Schematic of a Lubrication System**



**Figure 3: Complete Package System (Toromont)**

The entire package may be quite large, and in many instances, as large as a good size home. Figure 3 is a view of an entire compressor package. Some of the compressor manufacturers offer the entire package. Many of these systems are supplied by package builders that specialize in building large scale compressor systems. The systems are often customized to the application.

These systems are often installed in remote locations where there is very limited availability of maintenance staff. Operating conditions can be severe with extreme hot or cold ambient temperatures, dust, and ever present vibration. GlobalGear® was designed to be a very low maintenance pump. GlobalGear® uses a sealed bearing that requires no lubrication. The leading competitor uses greased bearings that must be lubricated every 500 hours of operation, and the lip seals used to retain the grease have an effective life of approximately 1500 hours of operation.

End clearance is maintained in GlobalGear® by a very robust jack screw arrangement similar to what is commonly used for heavy duty process pumps. The leading competitor, by comparison, relies on a single set screw to retain a threaded bearing cap, where the position of the end cap establishes rotor to pump head end clearance. This set screw can be vulnerable to coming loose in an environment that is vibration intensive. If the set screw comes loose, the high thrust load of this high pressure application can back the rotor in or out, open up the clearances, and/or contacting the cover/(head), and cause a loss of performance or sudden failure.



**Figure 4: Vent-Suction Feature**

The latest advancements in pump design for reliability are incorporated into GlobalGear®. These advancements include a unique patented idler bushing lubrication system that delivers positive lubrication to the idler bushing, thereby extending the bushing life. Also unique to GlobalGear® is a vent-to-suction API Plan 13, internal flush that circulates fluid through the seal chamber to cool and lubricate the seal faces, and reduce pressure in the seal chamber. The vent-to-suction path serves to extend mechanical seal life (Figure 4).

Down time is unacceptable for compressor packages because they are mission critical for high value production processes. Reliability is essential. Tuthill GlobalGear® has established a reputation for reliability and durability and has become the pump of choice for several of the major compressor package suppliers. GlobalGear® is a heavier, more robust pump that is better-suited to a vibration intensive environment. GlobalGear® shafts are up to 22% larger in diameter. Deflection is reduced and bearing and seal life is increased exponentially.

A real value differentiator is that GlobalGear® uses ductile iron for rotor and idler construction as standard. The ductile iron is much stronger than the cast iron rotor construction of the major competitor, and this extra strength is important for withstanding the forces of cold start conditions. It is also noteworthy that when the competition offers a steel rotor to match the strength of GlobalGear® ductile iron rotors, the cost of the pump may nearly double.

Tuthill has designed specific pumps to serve this growing market. While differential pressures are 200 psi or less the system pressure may be as high as 400 psi. To accomplish the 400 psi system pressure rating, O-rings are used instead of gaskets for all housing mating connections, and 250# ANSI compatible flanges are supplied. Tuthill's O-ring design is tested and proven for this market.

Also, to reliably adapt to the high pressure requirements for this market, a high pressure cartridge seal is used with silicon carbide on silicon carbide faces. The John Crane 5600 series seal that is used has essentially the same chasis and internals as the 5600 series seals that have been qualified for API 682 compliant category 1 designs. Figure 5 shows a view of the rugged gland and heavy duty construction of the mechanical seal.

Viton O-rings are commonly used for secondary seals in compressor package lubrication pumps. Viton is compatible with most synthetic lubricants that are commonly used in these systems. However, there are critical exceptions. Large concentrations of hydrogen sulfide may be present in some of the systems used to support oil extraction. Exposure to hydrogen sulfide requires the use of perfluoroelastomer or EPR secondary seals.

Also, it is uncommon, but there are instances where EPR or perfluoroelastomer is recommended over Viton by the manufacturer of the synthetic lubricant. Best practice is to verify O-ring compatibility with the intended lubricant manufacturer. Where requested, to address concerns with hazards associated with hydrogen sulfide, dual mechanical seals have been furnished.

As an extra step to assure leak-free performance from the start, every pump for high pressure compressor package applications is hydrostatically tested with mechanical seals installed at the factory.

Users in the compressor package market report that they find it very useful that complete product documentation including curves, technical data, and instruction manuals for GlobalGear are all available 24/7 on the Tuthill Pump website. None of this data is available on the website of the leading competitor.

It is also noteworthy that users and distributors report that even with special high pressure features for the compressor package market, Tuthill GlobalGear® deliveries are typically in the range of 3-4 weeks, compared to 6-8 weeks for the competitor.

To sum it up, when it comes to tough, low maintenance, long-lasting pumps for demanding applications, the clear choice is Tuthill GlobalGear®.

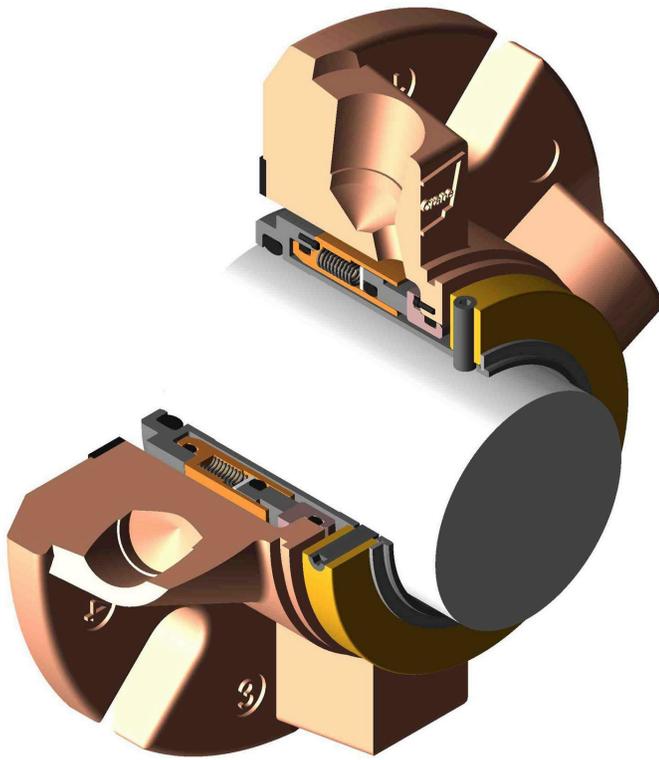


Figure: 5 High Pressure Cartridge Seal

