



Technical Topic

Natural Gas Compressor Lubrication Guidelines

This technical topic discusses the lubrication guidelines for reciprocating compressor cylinders and oil flooded rotary screw compressors used in the natural gas industry. ExxonMobil engineers have many years of application experience with natural gas compressors. This knowledge and experience assists customers to achieve optimal productivity.

The Compression Application Sets the Stage

There are many types of compressor designs (i.e., integral compressors, separable compressors, oil flooded rotary screw compressors) operating at various speeds, different lubrication systems, and a wide range of ambient temperatures (i.e., from arctic to desert conditions). The gas being compressed contains different qualities – clean dry natural gas for transmission, wet gas containing H₂S (Hydrogen Sulfide) in field gathering, and even CO₂ (Carbon Dioxide) used in re-injection for oil production.

Different Compressors Have Different Requirements

The goal of proper compressor lubrication is to lubricate the compressor components to achieve optimal life and equipment reliability. The correct lubricant in the application helps achieve longer component life and increase reliability of the equipment. This results in a reduction of maintenance costs and potentially increases revenue to your operation.

The lubricant requirements vary depending upon the type of compressor being lubricated (ex. reciprocating or oil flooded rotary screw) and upon the specifics of the application. For example, the lubricated components contained in reciprocating compressors are liners, pistons, valves, rings, rider bands, pressure packing and rods (reference Figure 1). The components lubricated in the oil flooded rotary screw are bearings (plain and anti-friction), seals, and screws (reference Figure 2).

Lubricant Selection Depends on Many Factors

To make the proper lubrication selection for a natural gas compressor, certain information must be known about the equipment application:

1. Make and Model of compressor
2. Type of compressor (Reciprocating or Oil Flooded Rotary Screw)



3. Type of gas being compressed (Reference Tables)
4. Suction and discharge pressures for each stage
5. Suction and discharge temperatures for each stage
6. Lubricant delivery system to the compressor to determine proper lubricant and viscosity
 - a. From a separate reservoir
 - b. From the compressor crankcase
 - c. Is there a day tank? What ambient conditions does this tank experience? Are there long lines (piping) from the day tank to compressor lubricant reservoir?

Reference the Lubricant Guidelines

Key information to consider: operating pressures, operating temperatures, type of gas, ambient condition that the lubricant will experience before injection into the compressor components, and the way that the lubricant is delivered to components. After these parameters are determined, you can reference Table 1 for lubricant guidelines to reciprocating compressors and reference Table 2 through Table 10 for oil-flooded rotary screws.

Table 1: Reciprocating Compressor Cylinder Lubrication Guidelines for Clean Dry Natural Gas

Pressure (Psig)	Viscosity @ 210°F	ISO VG	Mobil Products
0 - 1000	55 - 75 SSU	100 - 150	Mobil 40wt Pegasus gas engine oils, Mobil DTE Named Series, Mobil DTE 205, Mobil SHC 600 Series, Mobil DTE 10 Excel Series
1000 - 1500	75 - 95 SSU	150 - 220	Mobil DTE Named Series, Mobil DTE 205, Mobil SHC 600 Series, Mobil DTE 10 Excel 150
1500 - 2000	95 - 115 SSU	220 - 320	Mobil DTE Named Series, Mobil DTE 205, Mobil SHC 600 Series, Mobil 600 W Cylinder Oil, Mobil Glygoyle 220, Mobil Glygoyle 320
2000 - 3500	115 - 150 SSU	320 - 460	Mobil DTE Named Series, Mobil SHC 600 Series, Mobil 600 W Cylinder Oil, Mobil 600 W Super Cylinder Oil, Mobil Glygoyle 320, Mobil Glygoyle 460
3500 - 5000	150 - 180 SSU	460 - 680	Mobil DTE HH, Mobil Super Cylinder Oil, Mobil SHC 600 Series, Mobil Glygoyle 460
5000+	150 - 180 SSU	460	Mobil Glygoyle 460

Notes:

- Clean Dry Natural Gas w/Cylinder Discharge Temperatures < 325°F
- For Saturated Gas use a compounded oil or higher viscosity (DTE 205/Mobil 600 W Cylinder Oil)
- For Liquid Hydrocarbons use Mobil Glygoyle Series or a higher viscosity (1 to 2 ISO VG) paraffinic base mineral oil
- For Chemical Process with catalysts sensitive to additives use Gargoyle Arctic SHC Series
- Ambient conditions will affect viscosity recommendations because of pumpability and storage (Synthetics should be considered)
- Consult the OEM for pressures exceeding 5000 PSIG and/or Temperatures above 325°F - Mobil Glygoyle 220 or 460
- Reference ExxonMobil Product Selection Guide for product name when "Series" is referenced in above table
- Mobil DTE 205, Mobil 600 W Cylinder Oil and Mobil 600 W Super Cylinder Oil are not recommended for use in the compressor crankcase.

For further information on Mobil Compressor Lubricants, contact ExxonMobil at www.mobilindustrial.com or call us at 1-800-MOBIL-25.

Figure 1: Reciprocating Compressor

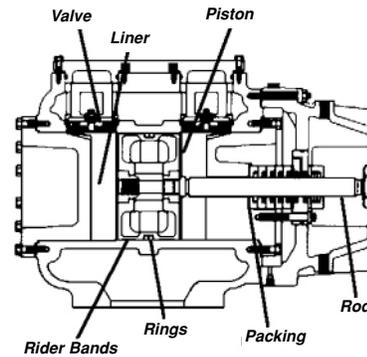
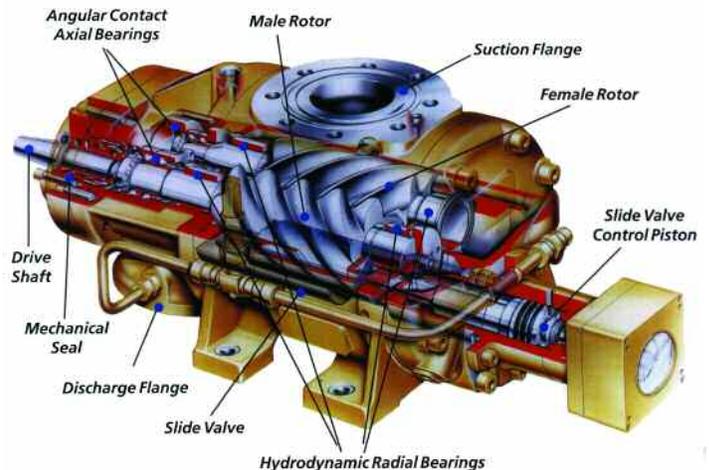


Figure 2: Oil Flooded Rotary Screw



Courtesy of Ariel Compressor Corp.



For more information, contact

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Mobil lubricants for Oil-flooded Rotary Screw in field gathering applications (Tables 2 - 10)

Table 2: Natural Gas (Clean/Dry)					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 68	68	Mineral Oil	150 - 170	< 350	-10 - 120
Mobil DTE 10 Excel 100	100	Mineral Oil	171 - 190	< 350	0 - 120
Mobil SHC 626	68	Synthesized Hydrocarbon	150 - 190	< 350	-45 - 120

Table 3: Natural Gas w/Liquid Hydrocarbons & Saturated Water					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 100	100	Mineral Oil	150 - 170	< 350	0 - 120
Mobil DTE 10 Excel 150	150	Mineral Oil	150 - 190	< 350	5 - 120
Mobil SHC 627	100	Synthesized Hydrocarbon	150 - 170	< 350	-40 - 120
Mobil SHC 629	150	Synthesized Hydrocarbon	150 - 190	< 350	-30 - 120

Note: Based on 10% dilution of liquid hydrocarbons. Higher levels of liquid hydrocarbons will result in shorter drain intervals.

Table 4: Natural Gas w/ Liquid Hydrocarbons & Propane					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil Glygoyle 68 or 100	68 - 100	Polyglycol	150 - 190	< 350	-10 - 120
Mobil Glygoyle 22	68 - 100	Polyglycol	150 - 190	< 350	-10 - 120

Note: Propane and liquid hydrocarbons have low miscibility in Glygoyle Series. This is a preferred product over mineral oils and synthesized hydrocarbons.

Table 5: Sour Gas w/ Saturated Water					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 68	68	Mineral Oil	150 - 170	< 350	-10 - 120
Mobil DTE 10 Excel 100	100	Mineral Oil	150 - 190	< 350	0 - 120
Mobil SHC 626	68	Synthesized Hydrocarbon	150 - 190	< 350	-45 - 120

Note: Optimum drain interval is dependant on the levels of H2S and water. Higher levels of H2S and water will result in shorter drain intervals.

Table 6: Natural Gas w/ < 10% CO ₂					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 100	100	Mineral Oil	150 - 190	< 150	0 - 120
Mobil DTE 10 Excel 150	150	Mineral Oil	150 - 190	151 - 350	5 - 120
Mobil SHC 627	100	Synthesized Hydrocarbon	150 - 190	< 150	-40 - 120
Mobil SHC 629	150	Synthesized Hydrocarbon	150 - 190	151 - 350	-30 - 120

Note: Based on dew points -35°F or lower. Higher dew points will result in shorter drain intervals.

Table 7: CO ₂ w/Dew Points below -35°F					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 150	150	Mineral Oil	150 - 190	< 350	5 - 120
Mobil SHC 629	150	Synthesized Hydrocarbon	171 - 190	< 350	-30 - 120

Note: Based on dew points -35°F or lower. Higher dew points will result in shorter drain intervals.

Table 8: Nitrogen (Dry)					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil DTE 10 Excel 68	68	Mineral Oil	150 - 170	< 350	-10 - 120
Mobil DTE 10 Excel 100	100	Mineral Oil	171 - 190	< 350	0 - 120
Mobil SHC 626	68	Synthesized Hydrocarbon	150 - 190	< 350	-45 - 120

Table 9: Landfill Gas					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil SHC 627	100	Synthesized Hydrocarbon	150 - 190	< 350	-40 - 120

Table 10: Propane					
Product	ISO VG	Classification	Oil Temperature After Cooler (°F)	Discharge Pressure (PSIG)	Ambient Temperature (°F)
Mobil Glygoyle 68 or 100	68 - 100	Polyglycol	150 - 190	< 350	-10 - 120
Mobil Glygoyle 22	68 - 100	Polyglycol	150 - 190	< 350	-10 - 120

Note: Propane has low miscibility in Glygoyle Series. This is a preferred product over mineral oils and synthesized hydrocarbons.