



TURBOFLO™ R&O TURBINE/CIRCULATING OILS

Introduction

Petro-Canada's TURBOFLO™ R&O Oils are high quality lubricants designed for use in steam and gas turbines, as well as the circulating oil systems of a wide range of industrial machinery.

TURBOFLO R&O Oils counteract rust and oxidation with blends of ultra pure Petro-Canada HT Severely Hydrocracked base oils and specially selected additives. These formulations deliver reliable performance and extended service life.

Compared to conventional R&O Oils, TURBOFLO R&O Oils offer:

- Long term resistance to oil breakdown caused by air and high temperatures
- Excellent rust and corrosion protection
- Excellent water separability

Features and Benefits

- **Extended resistance to oil breakdown caused by air and high temperatures**
 - Minimizes harmful sludge and varnish deposits, ensuring unrestricted lubricant flow and long component life
 - Extends intervals between oil changes
 - Reduces operating and maintenance costs
- **Superior rust and corrosion protection**
 - Iron and other metal components protected against water damage
- **Excellent water separability and hydrolytic stability**
 - Oil separates readily from water, without loss of performance additives
 - Separated water meets environmental guidelines
 - Reduces operating and maintenance costs

- **Improved foam and air entrainment performance**

- Ensures a lubricant film continues to protect metal surfaces
- Prevents overflowing of oil reservoirs
- Eliminates cavitation damage to circulating oil pumps
- Improves equipment reliability

Applications

Petro-Canada TURBOFLO R&O Oils are designed to meet the demanding service requirements of steam and gas turbine applications. They also provide extended, corrosion-free lubrication of bearings and gears in a wide range of industrial machinery.

Turbines

TURBOFLO R&O Oils 32, 46, 68 and Premium R&O 77 are recommended for use in many types of steam and gas turbines. These oils show an effective resistance to oxidation and will give long periods of trouble-free operation. With Turbine Oil Oxidation Stability Test (TOST) values in excess of 4000 hours and Rotating Pressure Vessel Oxidation Test (RPVOT) values of 400 minutes, TURBOFLO R&O 32, 46, 68 and Premium R&O 77 are suitable for use in steam and gas turbines requiring the following manufacturer and industry specifications:

- General Electric GEK28143A
. GEK 46506D
- Westinghouse 1500 00 20
- Siemens TLV 9013 04 (non-EP)
- ALSTOM (ABB) K110812101
. HTGD 90117
- Solar ES 9224
- Cooper SE 1144
- ASTM D4304 Type I (non-EP)

What is the HT difference?

Petro-Canada starts with the patented HT purity process to produce water-white, 99.9% pure base oils. The result is a range of lubricants, specialty fluids and greases that deliver maximum performance for our customers.



In addition, Premium R&O 77 meets Canadian General Standards Board (CGSB) specification for turbine oils, 3-GP-357.

For turbine bearings operating above 260°C (500°F), or where a greatly extended lubricant life is desired, **Petro-Canada TURBOFLO fluids** are recommended.

Bearings

TURBOFLO R&O Oils are recommended for use in circulating oil systems and other bearing lubrication applications. The correct viscosity grades for various **plain bearing** rotation speeds and operating temperatures are shown below:

PLAIN BEARING LUBRICATION

This table is only a guide. Consideration should be given to manufacturers' recommendations and specific operating conditions to determine the correct oil type and viscosity grade required for optimum lubrication.

OPER. TEMP	BEARING SPEED (RPM)		
	Below 300	300 - 2000	Above 2000
Below 0	TURBOFLO R&O 32	TURBOFLO R&O 32	TURBOFLO R&O 32
0 - 60	TURBOFLO R&O 46	TURBOFLO R&O 46	TURBOFLO R&O 32
60 - 93	TURBOFLO R&O 100 TURBOFLO R&O 150	TURBOFLO R&O 68 TURBOFLO R&O 100	TURBOFLO R&O 46 TURBOFLO R&O 46
Above 93	TURBOFLO R&O 320	TURBOFLO R&O 220	TURBOFLO R&O 220

The correct viscosity grades for various anti-friction bearing speed factors (bore diameter in inches x rpm) and operating temperatures are shown below:

ANTI-FRICTION BEARING LUBRICATION

OPER. TEMP	SPEED FACTOR (BORE IN INCHES X RPM)		
	Below 3000	3000 - 6000	Above 6000
Below 0	TURBOFLO R&O 32	TURBOFLO R&O 22	TURBOFLO R&O 10
0 - 60	TURBOFLO R&O 32	TURBOFLO R&O 22	TURBOFLO R&O 10
60 - 93	TURBOFLO R&O 150	TURBOFLO R&O 68	TURBOFLO R&O 46
Above 93	TURBOFLO R&O 320	TURBOFLO R&O 220	TURBOFLO R&O 150

When an assembly contains bearings of different speed factors that are lubricated in a common system, use the average of the various speed factors to select the viscosity grade.

TURBOFLO R&O 46 is GM LS2 LB-04-01-00, (general purpose oil) approved.

Gears

The American Gear Manufacturers Association (AGMA) has developed gear lubricant standards for industrial machinery. TURBOFLO R&O Oils are recommended where the AGMA specifies **Non-EP** Oils. If EP oil is specified or if FZG Passing load stage >6 required, **Petro-Canada TURBOFLO EP fluids** are recommended.

GEAR LUBRICATION

AGMA LUBRICANT NUMBER	TURBOFLO R&O
1	46
2	68
3	100
4	150
5	220
6	320
7	460

Gears sometimes require a heavier oil viscosity than bearings. Where oil-lubricated bearings are used in conjunction with gears, the whole assembly should be lubricated with the heavier oil recommended for the gears.

Typical Performance Data

PROPERTY	TURBOFLO R&O OILS											
	TEST METHOD	R&O 10	R&O 22	R&O 32	R&O 46	R&O 68	Premium R&O 77	R&O 100	R&O 150	R&O 220	R&O 320	R&O 460
ISO Grade		10	22	32	46	68	-	100	150	220	320	460
Colour	D1500	1.0	1.0	1.0	1.0	0.5	0.5	1.0	3.0	4.0	5.0	5.0
Viscosity, cSt @ 40°C cSt @ 100°C SUS @ 100°F SUS @ 210°F	D445	10.2	21.8	31.1	44.8	66.1	76.7	94.6	139.7	206.5	305.4	437
		2.7	4.3	5.3	6.6	8.3	9.4	10.7	14.2	18.6	24.4	29.3
		62	114	161	231	343	398	494	732	1089	1620	2341
		35	40	44	48	54	58	62	76	94	120	143
Viscosity Index	D2270	102	98	100	99	100	97	97	96	96	96	95
Flash Point, °C (°F)	D92	185 (365)	195 (383)	210 (410)	214 (417)	232 (450)	240 (464)	259 (498)	262 (504)	268 (514)	274 (525)	310 (590)
Pour Point, °C (°F)	D97	-57 (-71)	-39 (-38)	-36 (-33)	-33 (-27)	-30 (-22)	-27 (-17)	-18 (0)	-12 (10)	-12 (10)	-9 (16)	-9 (16)
Oxidation Stability hours	D943	5000+	5000+	4500+	4000+	4000+	4000+	4000+	2000	2000	2000	1600
RPVOT, mins	D2272	NA	NA	400+	400+	400+	400+	400+	300+	300+	250+	400+
Rust Test Procedure A&B, 48 hours	D665	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Water Separability, 54°C 82°C	D1401	40-40-0(10)	42-38-0(5)	41-39-0(5)	42-38-0(10)	42-38-0(10)	42-38-0(10)					
								41-39-0(10)	41-39-0(10)	42-38-0(10)	42-38-0(10)	40-40-0(20)
Total Acid No (TAN)	D664	0.16	0.10	0.10	0.11	0.12	0.11	0.10	0.20	0.20	0.20	0.21
Bearing & Gear Operating Temperature Range °C °F	-	-40 to 30	-32 to 54	-23 to 63	-20 to 74	-17 to 84	-15 to 90	-9 to 94	-4 to 105	0 to 114	5 to 123	12 to 130
	-	-40 to 86	-26 to 129	-9 to 145	-4 to 165	1 to 183	5 to 194	16 to 201	25 to 221	32 to 237	41 to 253	54 to 266

The values quoted above are typical of normal production. They do not constitute a specification.

Health and Safety

To obtain Health and Safety Data Sheets, contact one of Petro-Canada's TechData Info Lines.

TechData Info Lines

If you would like to know more about Petro-Canada TURBOFLO R&O oils, or any other product in our complete line of quality lubricants, please contact us at:

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