



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. The R&O 10 and 22 grades are also suitable for use as spindle oils.

TURBOFLO R&O Oils are formulated with Petro-Canada's ultra-pure HT Severely Hydrocracked base oils and specially selected additives that counteract rust and oxidation. 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

- **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 5000 hours, 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 GEK 46506E (ISO 32)
- Siemens/ 1500-00-20 (ISO 32)
Westinghouse
- Siemens TLV 9013 04 (non-EP)
(ISO 32 and 46)
- ALSTOM HTGD 90 117
V0001X (ISO 32, 46)
- Solar ES 9-224W
(ISO 32, 46)
- ASTM D4304 Type I (non-EP)
(ISO 32, 46, 68, 100)
- JIS K 2213 Type 2

What is the HT difference?

Petro-Canada Lubricants starts with the 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 Naval Steam Turbine and Main Gearing Lubricant Specification: C-82-001-000/SF-001.

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

For geared heavy duty turbines with common gear and bearing lubrication systems, TURBOFLO EP 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.

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-Antiscuff** Oils. If an antiscuff lubricant is specified or if FZG fail stage minimum of 10 is required, Petro-Canada Enduraterx EP oils are recommended.

GEAR LUBRICATION

ISO Viscosity Grade	Former AGMA Grade Equivalent	TURBOFLO R&O
ISO VG 46	1	46
ISO VG 68	2	68
ISO VG 100	3	100
ISO VG 150	4	150
ISO VG 220	5	220
ISO VG 320	6	320

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
ISO Grade	10	22	32	46	68	-	100	150	220	320	
Colour	D1500	0.5	0.5	0.5	0.5	0.5	0.5	0.5	<2.0	2.5	3.0
Viscosity, cSt @ 40°C	D445	9.8	22.1	32.0	44.4	65.0	78.0	94.3	138.7	203.4	297.5
cSt @ 100°C		2.7	4.3	5.4	6.7	8.6	9.7	11.1	14.3	18.3	23.4
Viscosity Index	D2270	105	95	103	104	104	102	103	101	99	98
Flash Point, COC, °C/°F	D92	182/360	204/399	220/428	224/435	234/453	240/464	262/504	282/540	282/540	268/514
Pour Point, °C/°F	D5950	-54/-65	-39/-38	-39/-38	-36/-33	-30/-22	-30/-22	-24/-11	-24/-11	-15/5	-18/0
Oxidation Stability hours to 2.0 TAN	D943	5,900+	5,900+	5,000+	5,000+	5,300+	5,000+	6300+	3,500+	3,500+	2,700+
Rust Test Procedure B, 24 hours	D665	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Water Separability, 54°C 82°C	D1401	41-39-0(5)	41-39-0(10)	41-39-0(10)	41-39-0(15)	41-39-0(20)	40-40-0(25)	41-39-0(10)	41-39-0(15)	41-39-0(20)	41-39-0(20)
Acid Number, mg KOH/g	D664	0.14	0.10	0.15	0.12	0.11	0.09	0.09	0.18	0.18	0.18
Bearing & Gear Operating Temperature Range °C	-	-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
°F	-	-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

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

To order product or to learn more about how Petro-Canada Lubricants
can help your business visit: lubricants.petro-canada.com
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