Petro-Canada

TechData

PURITY* FG
Heat Transfer Fluid

Introduction

Petro-Canada PURITY* FG Heat Transfer Fluid is formulated to lower operating costs by reducing the frequency of fluid change-outs in operations that require a food grade product.

PURITY FG Heat Transfer Fluid's unique chemistry starts with a blend of 99.9% pure base fluids, produced from a patented HT purity process. These crystal-clear fluids are free of impurities that can hinder performance. Utilizing more than 25 years of formulating experience, Petro-Canada fortifies these thermally stable fluids with specially selected additives to provide outstanding protection from oxidative breakdown.

The result is PURITY FG Heat Transfer Fluid, a food grade fluid that provides high thermal efficiency in systems operating up to 326°C (620°F). PURITY FG's breakthrough chemistry can extend fluid life longer than leading competitive fluids, lowering operating costs by reducing the frequency of fluid change-outs.

Applications

Petro-Canada PURITY FG Heat Transfer Fluid is recommended for use in liquid phase heat transfer systems used in food processing or pharmaceutical operations with continuous bulk operating temperatures up to 326°C (620°F). Typical applications include central cooking facilities, drying, edible oil deodorizing and the heating of deep frying oils. PURITY FG may also be used in heating baths where an odourless, non-hazardous fluid is required for worker health and safety.

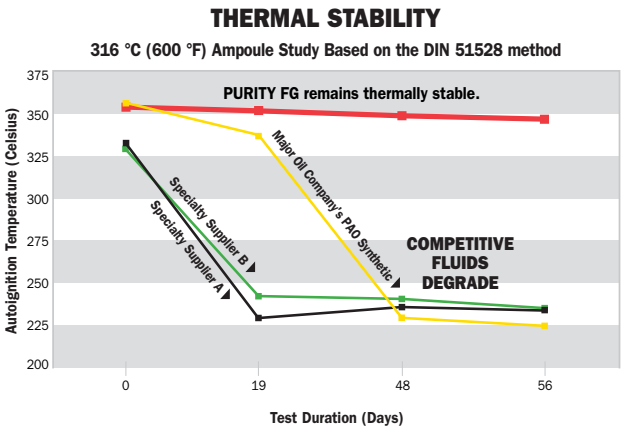
PURITY FG Heat Transfer Fluid's outstanding resistance to oxidative breakdown is also beneficial in food related manufacturing operations where exposure to air can not be avoided, and oxidation is the most likely form of fluid degradation. Common applications include the manufacture of plastic bottles, films and containers for the packaging of food products.

Features and Benefits

- **Higher thermal and oxidative stability than leading competitors can extend fluid life and lower operating costs**
  - More thermally stable than leading competitive fluids, even full synthetics

    Thermal stressing of a heat transfer fluid can cause the formation of light molecular compounds. These compounds can:
    - raise a fluid's vapour pressure, which can cause fluid leakage from control valves and pipe flanges, circulating pump cavitation and vapour locking
    - dramatically reduce a fluid's autoignition temperature, the lowest temperature that a fluid will combust, without flame or spark, in the presence of oxygen
    - lower the operating temperature at which the heat transfer system can safely operate
    - necessitate a costly, premature fluid change-out

In Ampoule studies, conducted at 316°C (600°F), PURITY FG Heat Transfer Fluid remained thermally stable and maintained its autoignition temperature throughout the 56 day test; three times longer than two leading specialty fluids and more than 20% longer than a major oil company's synthetic fluid:



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.

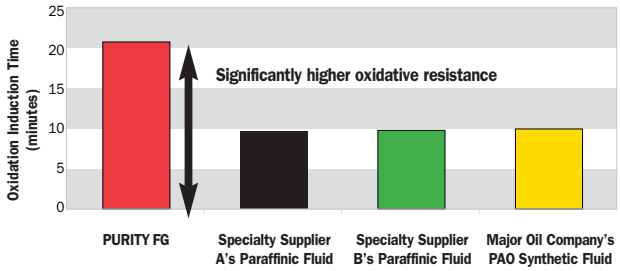
- More resistant to oxidative breakdown than leading competitive fluids

A fluid's resistance to oxidative breakdown is critical in heat transfer systems where exposure to air can not be avoided. Strong oxidative resistance can significantly extend fluid life, providing operational savings by reducing fluid change-out frequency and down time.

In severe oxidation testing, PURITY FG Heat Transfer Fluid demonstrates significantly stronger resistance to oxidation versus two leading specialty suppliers' food grade fluids and a fully synthetic food grade fluid from a major oil company:

RESISTANCE TO OXIDATION

Pressure Differential Scanning Calorimetry



- **Higher resistance to oxidative thickening versus leading competitive fluids**

  As a fluid oxidizes, it becomes more viscous. This increase in viscosity can:

  – significantly reduce a fluid's thermal efficiency

  – make the fluid more difficult to circulate through the heat transfer system

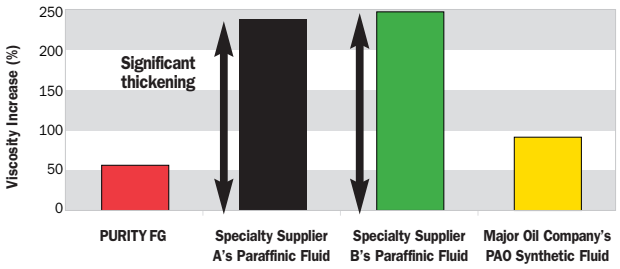
  – result in overheating of the fluid

  – necessitate a costly, premature fluid change-out

In a severe oxidation stability test, PURITY FG Heat Transfer Fluid demonstrates significantly better resistance to viscosity increase versus two specialty food grade fluids, and better resistance than the synthetic food grade fluid of a major oil company supplier:

FLUID THICKENING WITH OXIDATION

IP 48/97(modified) Oxidation Test 200°C (392°F)



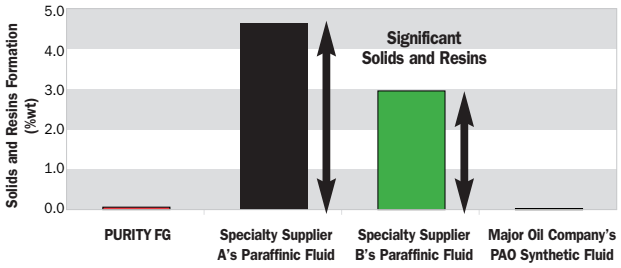
- **Less prone to solids and resins formation versus leading competitive fluids**

  - PURITY FG Heat Transfer Fluid's resistance to oxidative fluid breakdown also minimizes the formation of deposits transfer systems. These deposits can dramatically reduce a system's heat transfer efficiency, increasing operating costs.

In a severe oxidation test, PURITY FG Heat Transfer Fluid demonstrates significantly better resistance to formation of solids and resins versus two leading specialty food grade fluids, and equivalent resistance to a synthetic food grade fluid of a major oil company:

FORMATION OF SOLIDS AND RESINS

IP 48/97 (modified) Oxidation Test 200°C (392°F)



- **Low vapour pressure can save on top-up costs while improving workplace safety**

  - PURITY FG's low vapour pressure can reduce or eliminate fluid leakage from control valves and pipe flanges
  - Reduction or elimination of leaks provides a cleaner and safer operating environment, and results in operational savings by reducing the need for cleaning, maintenance and fluid top-up

- **Natural lubricity extends operational savings**

  - PURITY FG's natural lubricating properties can also reduce maintenance costs by extending the service life of circulating pumps and other rotating parts

- **Fully approved for use in and around food processing areas**

  - PURITY FG also meets the highest industry purity standards and fits perfectly in HACCP (Hazard Analysis Critical Control Point) and GMP (Good Manufacturing Practice) plans:

    – HT-1 registered by NSF

    – Meets the requirements of the U.S. Department of Agriculture (USDA) as an H1 fluid for use in federally inspected meat and poultry plants where incidental food contact may occur

    – All fluid components comply with FDA 21 CFR 178.3570 "Lubricants with incidental food contact"

    – Approved for use in registered food processing plants by the Canadian Food Inspection Agency (CFIA)

    – Certified Kosher and Pareve by Star K

NSF HT-1 REGISTERED

Operational Considerations

PURITY FG Heat Transfer Fluid's high thermal stability provides long service life under normal operating conditions up to its maximum recommended temperature. However, actual fluid life is dependent upon system design and operating practice. Special precautions should be taken to avoid operating conditions that can shorten fluid life. These include:

- thermal shocking resulting from accelerated system temperature increases
- thermal shocking from hot spots on a system's heating coils
- continuously running above the maximum recommended operating temperature

Although PURITY FG Heat Transfer Fluid is highly resistant to oxidative breakdown, excessive air and water contamination can reduce thermal efficiency and shorten fluid life. Where practical, Petro-Canada recommends inert gas blanketing of a system's expansion tank to guard against exposure to air and water and the need to change-out the fluid prematurely. While PURITY FG has been formulated for high resistance to contamination from air and water, contamination with process chemicals or deteriorated residual fluids can shorten fluid life. To maximize system efficiency and fluid life, Petro-Canada highly recommends system flushing prior to recharging with PURITY FG Heat Transfer Fluid.

Thermal Data

PROPERTY	TEMPERATURE			
	15°C (60°F)	38°C (100°F)	260°C (500°F)	316°C (600°F)
Density, kg/m^3 (lb./ft^3)	853 (53.3)	838 (52.3)	688 (43.0)	651 (40.6)
Thermal Conductivity, W/m K (BTU/hr.°F·Ft)	0.138 (0.080)	0.136 (0.079)	0.124 (0.072)	0.121 (0.070)
Heat Capacity, kJ/kg K (BTU/lb. °F)	1.87 (0.446)	1.94 (0.463)	2.69 (0.642)	2.88 (0.688)
Vapour Pressure, kPa (psia)	0.00 (0.00)	0.00 (0.00)	3.01 (0.437)	14.27 (2.070)

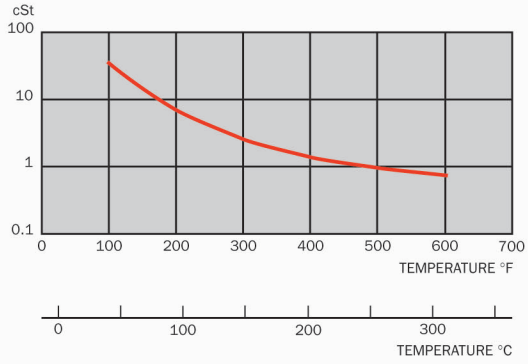
For detailed heat transfer calculations please refer to our Engineering Assistant software which is available at no cost from your Petro-Canada representative.

Typical Performance Data

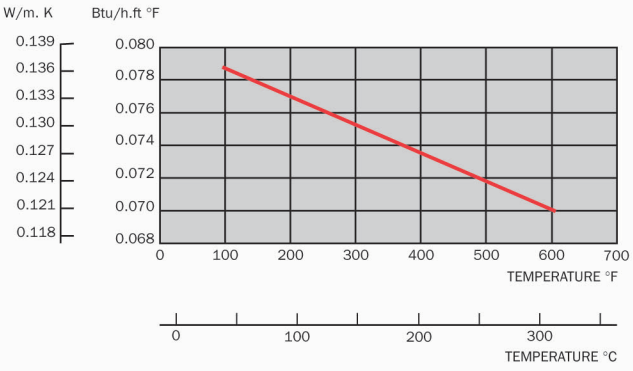
PROPERTY	TEST METHOD	RESULTS
Appearance		Crystal Clear
Maximum Film Temperature		343 (650)
Pour Point, °C (°F)	ASTM D97	-18 (0)
Flash Point,° C (°F)	ASTM D92	209 (408)
Fire Point, °C (°F)	ASTM D92	236 (457)
Autoignition Temperature, °C (°F)	ASTM E659	354 (669)
Viscosity, cSt at 40° C (104°F) cSt at 100°C (212°F) cSt at 316°C (600°F)	ASTM D445	35.6 6.0 0.72
Distillation Range, °C (°F) 10% 90%	ASTM D2887	 382 (720) 498 (928)
Coefficient of Thermal Expansion, %/°C (%/°F)		0.0919 (0.0511)

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

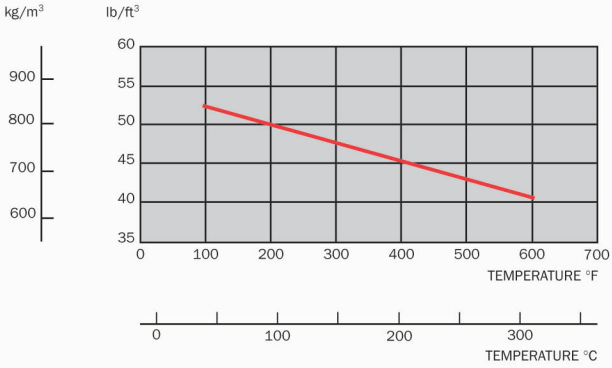
VISCOSITY



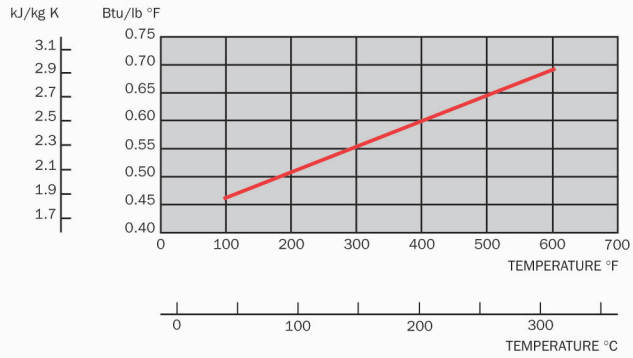
THERMAL CONDUCTIVITY



DENSITY



HEAT CAPACITY



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