



CALFLO™ SYNTHETIC ARCTIC SYNTHETIC HEAT TRANSFER FLUID

Introduction

Petro-Canada CALFLO™ Synthetic Arctic is a synthetic heat transfer fluid specifically formulated for extremely cold climates where ambient temperatures can reach -48°C . CALFLO Synthetic Arctic's unique chemistry is based on synthetic poly-alpha-olefins and specially selected additives that deliver outstanding protection while remaining virtually free of impurities and aromatic compounds that can be hazardous to workplace health and safety.

The result is CALFLO Synthetic Arctic, a heat transfer fluid that provides high thermal stability and excellent cold temperature pumpability in extreme start-up operating conditions as low as -48°C (-55°F). CALFLO Synthetic Arctic's breakthrough chemistry balances low temperature fluidity with outstanding oxidative stability and volatility control. Equally important, the fluid's purity ensures no compromise to the environment or workplace health and safety.

Applications

Petro-Canada CALFLO Synthetic Arctic is recommended for use in non-pressurized, liquid phase, closed heat transfer systems operating continuously at moderate bulk temperatures. CALFLO Synthetic Arctic's low viscosity ensures outstanding heat transfer efficiency even at moderate operating temperatures while its low temperature fluidity ensures excellent pumpability under extreme conditions, eliminating the need for expensive heat tracing and insulation in outdoor applications with ambient temperatures down to -48°C (-55°F).

Features and Benefits

- **High thermal and oxidative stability can help to extend fluid life and lower operating costs.**
- 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 auto-ignition 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
- A fluid's resistance to oxidative breakdown is critical in heat transfer systems where exposure to air is likely or can not be avoided. Strong oxidative resistance can significantly extend fluid life, and may provide operational savings by reducing fluid change-out frequency and down time.
- High resistance to oxidative thickening
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

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.



- **Natural lubricity extends operational savings.**
 - CALFLO Synthetic Arctic's natural lubricating properties can also reduce maintenance costs by extending the service life of circulating pumps and other rotating parts.
- **No compromise to environmental and workplace health and safety.**
 - Unlike synthetic aromatic fluids, CALFLO Synthetic Arctic is virtually odourless and is not considered a toxic* substance according to OSHA (United States), WHMIS (Canada) and DPD (Europe) criteria.
 - Because CALFLO Synthetic Arctic produces no objectionable odours and is not a respiratory or skin irritant, workplace conditions remain pleasant and safe for continuous operations.
 - CALFLO Synthetic Arctic does NOT require special handling.
 - Shipments and storage of CALFO Synthetic Arctic do not normally require special safety permits. Empty drums used to transport CALFLO Synthetic Arctic are readily accepted by drum re-conditioners. In addition, used CALFLO Synthetic Arctic may be responsibly disposed in the following ways**:
 - through re-sale to used oil recycling companies
 - in some jurisdictions, combined with BTU recovery systems

ENVIRONMENT, HEALTH & SAFETY CLASSIFICATION	CALFLO SYNTHETIC ARCTIC
OSHA	✓ Non-Hazardous
WHMIS	✓ Non-Controlled
SARA Extremely Hazardous Substances (EHS) 302	✓ Non-Hazardous

Operational Considerations

While CALFLO Synthetic Arctic's excellent low temperature pumpability allows cold system start-up in extreme temperatures as low as -48°C (-55°F), parameters for systems operating continuously below 5°C (41°F) should be reviewed with Petro-Canada to determine the suitability of the fluid in its specific operating environment.

CALFLO Synthetic Arctic is specially formulated to provide 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

While CALFLO Synthetic Arctic is highly resistant to oxidative breakdown, excessive air and water contamination can reduce thermal efficiency and shorten fluid life. 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.

Although CALFLO Synthetic Arctic 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 cleaning and flushing to remove all contaminants, sludge and varnish prior to recharging a system with CALFLO Synthetic Arctic.

Thermal Data

PROPERTY	TEMPERATURE	
	15°C (59°F)	38°C (100°F)
Density, kg/L (lb/ft ³)	0.799 (49.9)	0.784 (48.9)
Thermal Conductivity, W/m K (BTU/hr.°FFt) ^{***}	0.152 (0.088)	0.15 (0.087)
Heat Capacity, kJ/kg K (BTU/lb. °F) ^{***}	2.28 (0.55)	2.30 (0.55)
Vapour Pressure, kPa (psia) ^{***}	0.00 (0.00)	0.00 (0.00)

^{***} Estimated

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
Colour	ASTM D1500	<0.5
Weight/US gal at 260°C (500°F), lbs		5.3
Pour Point, °C (°F)	ASTM D5950	< -57°C (< -70°F)
Flash Point, COC, °C (°F)	ASTM D92	163 (325)
Fire Point, COC, °C (°F)	ASTM D92	173 (343)
Autoignition Temperature, °C (°F)	ASTM E659	320 (608)
Viscosity, cSt at 40°C (104°F)	ASTM D445	5.25
cSt at 100°C (212°F)		1.75
cSt at 260°C (500°F)		0.55
Average Molecular Weight		264.6
Neutralization Value, TAN, mg KOH/g	ASTM D664	<0.1
Sulfur by XRF, wt%	ASTM D4294	<0.001
Distillation Range, °C (°F)	ASTM D2887	
10%		320 (608)
50%		329 (624)
90%		337 (638)
Coefficient of Thermal Expansion, %/°C (%/°F)		0.1117 (0.0621)

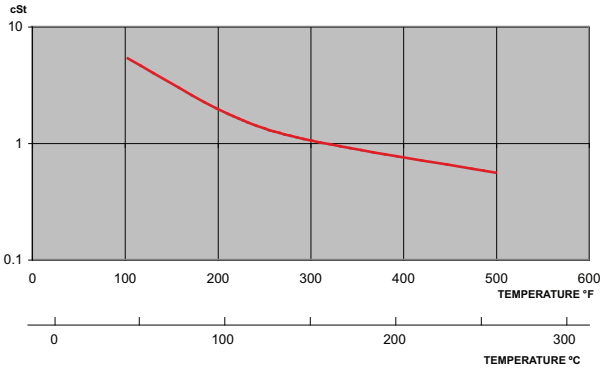
The values quoted above are typical of normal production. They do not constitute a specification.

*non-toxic defines as non-controlled under WHMIS, non-hazardous under OSHA and non-dangerous under DPD.

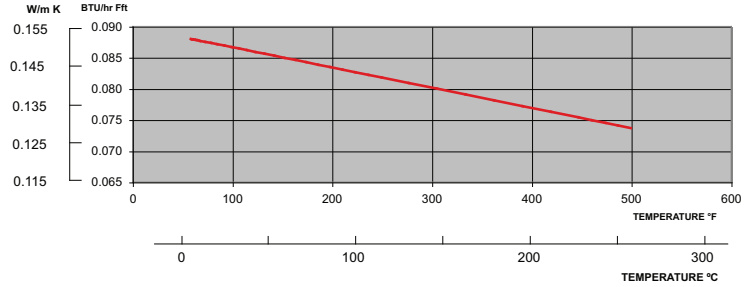
**Any transport and disposal practice must be in compliance with federal, state, provincial and/or local laws and regulations.

^{***} Estimated

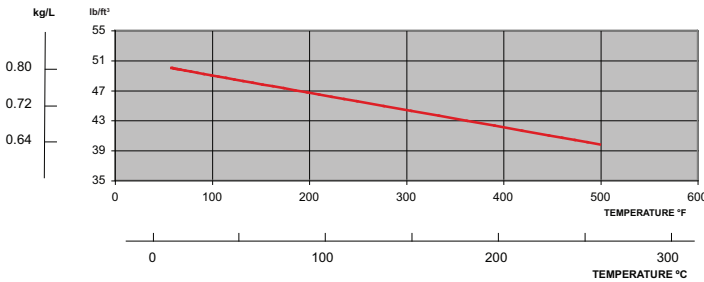
CALFLO Synthetic Arctic VISCOSITY



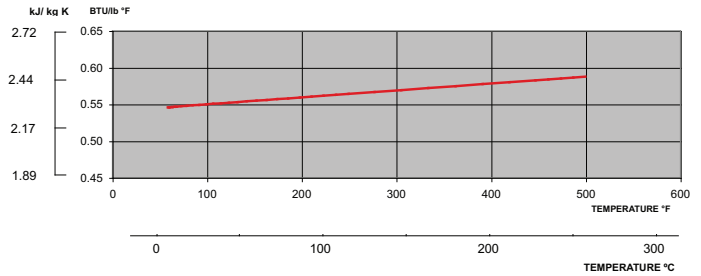
CALFLO Synthetic Arctic THERMAL CONDUCTIVITY***



CALFLO Synthetic Arctic DENSITY



CALFLO Synthetic Arctic HEAT CAPACITY***



*** Estimated

Health and Safety

To obtain Material Safety Data Sheet (MSDS), contact one of Petro-Canada's TechData Info Lines.

TechData Info Lines

TechData sheets for Petro-Canada's Cleaning Fluid and Flushing Fluid and Technical Bulletins regarding guidelines for system cleaning, flushing and change-out also available. If you would like to know more about Petro-Canada's CALFLO Synthetic Arctic Heat Transfer Fluid, or any other product in our complete line of quality lubricants, please contact us at:

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