Tech Data

Cutting Oils

PETRO-CANADA LUBRICANTS

Introduction

Petro-Canada Cutting Oils are specially formulated to provide maximum performance over a wide range of metal removing operations.

Petro-Canada Cutting Oils are available in two distinct families, namely:

- Soluble Cutting Oils - **Cutsol™** and **Cutsol HD™**
- Neat Cutting Oils - **Transicut™,** and **Supercut™**

Cutsol™ and **Cutsol HD™** Soluble Cutting Oils are used where rapid heat removal is the main criteria. When diluted with water, they produce stable emulsions which have excellent cooling ability and the necessary balance of lubricity and extreme pressure characteristics required for proper machining conditions.

Transicut™ and **Supercut™** Neat Cutting Oils are designed for use as they are received and are non-miscible in water. They have excellent lubricity and anti-wear characteristics, assist in extending tool life and produce a quality finish on machined parts.

Primary Functions of a Cutting Oil

The main functions of a cutting oil are to lubricate or reduce the friction between the cutting tool and the workpiece and act as a coolant by rapidly removing the heat generated at the tool and workpiece interface.

Lubricating Properties

To perform satisfactorily as a lubricant, a cutting oil must greatly reduce friction at or near the tool tip, where the highest temperatures occur and between the moving tip and the rake face of the cutting tool. Special additives are often included in the formulation to provide the needed lubricity under severe boundary lubrication conditions:

For moderate pressures and temperatures, up to approximately 150˚C, fatty oils when blended into mineral oils make good boundary lubricants.

For extreme pressures and temperatures, additives such as chlorine and/or sulphur are surface reactive and form metallic reaction product films on the tool surface, thereby acting much like a solid lubricant at the metal-tool surface.

- **Proper lubrication reduces friction, thus:**
  - Less coolant is required to absorb the heat, since there is less friction to be dissipated
  - Less cutting energy is required, which results in lower power consumption and/or higher production rates.
  - Less cutting tool wear
  - Improved surface finishes

Cooling Properties

A coolant's main function is to remove heat from the cutting tool, chip and workpiece. To perform the cooling function properly in a given operation, the viscosity of a finished cutting oil should be low enough to clear the chips and not insulate the heat from the operation, but high enough to control oil misting.

As water has the highest thermal conductivity, water-soluble oils and synthetics are the best coolants for grinding operations involving high rates of metal removal. At the other end of the scale, high viscosity mineral oils have low thermal conductivity and are most suited to slow-speed cutting operations involving high contact pressures.

Cooling is also related to flowrate. Thus by increasing the flowrate of a cutting oil over the tool/workpiece area, the cooling action of the oil can be improved.

Anti-Wear Properties

Extreme temperatures and pressures at the cutting interface may cause the metal to weld to the tool face. Effective anti-wear characteristics may be imparted to cutting oils by incorporating appropriate additives.

The most common additives are chlorinated, or sulfurized additives that are active or inactive. These materials react chemically with metals, under the temperatures and pressures encountered at the chip/tool interface, to form a surface film of low shear-strength thus creating higher lubricity.

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.

Features and Benefits

Soluble Oils

- **Outstanding emulsifying properties**
  - Forms fine, highly stable emulsions even in hard water
  - Resists oil separation
  - Long oil service life
- **Low foaming tendency**
  - Eliminates formation of undesirable foams
  - Facilitates easy settling of swarf
- **High lubricity**
  - Improves surface finish
  - Extends tool life
  - Lowers power consumption and/or increases production rates
- **Superior resistance to rust and corrosion**
  - Delivers excellent protection to both tools and workpieces against rust and corrosion

Neat Cutting Oils

- **Low viscosity**
  - Accelerates heat removal from tool and workpiece
  - Facilitates rapid settling of chips and swarf
  - Improves clarity of re-circulated oil
  - Prevents excessive wear at contact surfaces
  - Produces better surface finish
- **Contain friction reducing compounds**
  - Prevents welding and “built-up edge” on cutting tools
  - Reduces friction and heat between tool and workpiece
  - Lowers power consumption
  - Improves surface finish
- **Light in colour**
  - Permits easy viewing of the workpiece

Applications

Soluble Oils

Petro-Canada Soluble Oils are used where rapid heat removal is the major requirement. Petro-Canada Soluble Oils are blended from mineral oils, emulsifiers, rust inhibitors, extreme pressure additives and other coupling agents.The products are mixed with water in normal starting proportions of 3% to 10% for most operations.

Petro-Canada Soluble Oils produce highly stable emulsions, which have excellent cooling ability and the necessary lubricity and extreme pressure characteristics for proper machining.

Cutsol™ is specially designed for general machining operations. Applications include cutting, drilling, milling and grinding, where a general purpose coolant is required. Cutsol™ is recommended for all machining operations, where cooling and rust protection are of prime importance. The product contains a biocide (anti-microbial agent).

Cutsol HD™ a heavy duty oil which contains extreme pressure additives for use in metal removal operations, where a high degree of surface finish and long tool life are desired. Cutsol™ HD is intended for difficult machining operations. The product provides good rust protection and contains a biocide (anti-microbial agent).

Neat Cutting Oils

Petro-Canada Neat Cutting Oils are either mixtures of ultra pure HT Hydrocracked base oils, or blends of these base oils with varying amounts of extreme pressure additives, such as sulphur and chlorine and/or lubricity agents. They are designed to meet specific applications.

Petro-Canada Neat Cutting Oils have excellent lubricity and anti-wear characteristics, and assist in extending tool life and produce a quality finish on machined parts.

Transicut™ Oils are non-staining, transparent cutting oils intended for high-speed automatic screw machining and simple turning.

They are primarily recommended for machining low carbon steels and non-ferrous metals such as copper, aluminium and magnesium.

Supercut™ Oils are designed for use in heavy duty cutting and grinding operations on high strength ferrous alloys and tough-to-machine nickel/cobalt alloys. These operations include: tapping, threading, broaching and conventional turning.

- Supercut™ 13 is a low viscosity oil, specially suited for use in thread cutting and deep-hole drilling.

Typical Performance Data

PROPERTY	SOLUBLE CUTTING OILS	
	CUTSOL	CUTSOL HD
Viscosity cSt @ 40ºC	38	34.5
Oil Appearance	Clear Amber	Clear Amber
Sulphur, % wt	0.79	1.4
Chlorine, % wt	Nil	10.4
Water to Oil Mix Ratio	10:1/ 30:1	10:1/20:1
Emulsion Appearance	Milky White	Milky White
pH Emulsion (5% in tap water)	8.9	9.5

PROPERTY	NEAT CUTTING OILS				
	TRANSICUT 25	TRANSICUT 32	SUPERCUT 13	SUPERCUT 25	SUPERCUT 45
Viscosity cSt @ 40ºC	25.3	31.6	13.5	24.1	45.1
cSt @ 100ºC	4.7	5.5	3.2	4.6	7.0
SUS @ 100ºF	131	163	76	126	232
SUS @ 210ºF	42	44	37	41	49
Flash Point, COC, ºC/ºF	213/415	221/430	177/351	191/376	215/419
Colour, ASTM	<1.0	5.5	7.0	7.0	7.0
Sulphur, % wt	0.30	0.44	2.3	2.3	2.4
Chlorine, % wt	2.0	1.0	1.1	2.7	2.6
Fatty Ester, % wt	0.5	3.0	5.0	5.0	5.0

To order product or to learn more about how Petro-Canada Lubricants can help your business visit: **lubricants.petro-canada.com**
or contact us at: **lubecsr@petrocanadalsp.com**

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