This symbol enables the general public to identify oils which meet the warranty requirements of Chrysler, Ford and General Motors, as well as the Japanese automakers.

The latest ILSAC specification (October 2010) is identified as ILSAC GF-5. The API "Starburst" symbol only applies to 0W-XX, 5W-XX and 10W-XX viscosity oils that not only meet the GF-5 specification, but also meet API SN and the Resource Conserving classification.

The "Starburst" symbol must be displayed on the front of a motor oil container.

USED OIL ANALYSIS

Used Oil Analysis programs for engine oils, such as Petro-Canada's "LUBRI-TEST" provide several customer benefits:

- Reduce unscheduled vehicle downtime
- Improve vehicle reliability
- Help organize effective maintenance schedules
- Extend engine life
- Optimize oil change intervals
- Reduce cost of vehicle maintenance

Used engine oil analyses are carried out principally to determine the overall condition of an oil. Monitoring an oil's condition at successive intervals, over a relatively long time period, can be used to establish:

- Presence of Undesirable Contaminants, such as:
  - Excess Wear Metals
  - Gasoline or Diesel Fuel
  - Coolant
  - Road Salt
  - Dirt, Sand or Dust
- Optimum Oil Change Interval

The following items are tested to determine the condition of an engine oil :

- **Viscosity** - is the measure of an oil's resistance to flow. An oil can "thicken-up" due to oxidation, the presence of contaminants, or evaporation of light components. It can "thin-down" due to oil shearing or fuel dilution.
  Reported as cSt @ 40°C and cSt @ 100°C
- **Coolant** - ethylene glycol is the major component of antifreeze coolant systems, so the presence of glycol is determined. A positive test result indicates a defective gasket or a cracked head/block. Detection of glycol requires immediate attention, as it reacts quickly in a hot engine to form
  varnish and sludge.
- **Water** - presence due to condensation from low temperature engine operation or from a leak in the cooling system.
- **Dilution** - the amount of gasoline or diesel present in an oil.
- **Insolubles** - suspended material present in the oil, due to presence of soot from diesel fuel combustion and contamination from airborne dust, dirt or sand.
- **Total Acid Number** - expresses the quantity of base required to neutralize all the acidic constituents present in the oil. Often an indicator of how oxidized an oil has become.
- **Total Base Number** - measures the reserve alkalinity of an oil, which is the ability of an alkali to neutralize the effect of acid formation.
- **Wear or Additive Metals** - The presence of the following elements is

USED OIL ANALYSIS TESTS

CONTAMINANT WARNING LEVELS

TEST	WARNING LIMIT
Viscosity	
- cSt @ 40°C	25% change versus the new oil viscosity
- cSt @ 100°C	15% change versus the new oil viscosity
Coolant	Any positive identification
Water	Greater than 0.1%
Dilution	Greater than 5%
Insolubles	0.5% or more
Total Acid Number	More than 5 units (motor oil) or 1 unit (industrial oil)
Total Base Number	No lower than 3 to 4 units

AUTOMOTIVE WEAR METALS WARNING LEVELS

ELEMENT	WARNING LIMITS	COMMENTS
Iron (Fe)	Greater than 100 ppm	High levels indicate worn crankshafts, valves, cylinder--liners, bearings
Chromium (Cr)	Greater than 10 ppm	High levels indicate worn piston rings, bearings or contamination by antifreeze
Copper (Cu)	Greater than 20 ppm	High levels indicate worn bearings and bushings
Tin (Sn)	Greater than 10 ppm	High levels indicate worn bearings and bushings
Aluminum (Al)	Greater than 20 ppm (>80 ppm Aluminum Block Engines)	High levels indicate worn pistons or engine block
Lead (Pb)	Greater than 25 ppm	High levels indicate worn bearings. Where leaded gasoline used, results are meaningless
Boron (B)	Greater than 20 ppm	High levels indicate anti-freeze leak. Some engine oils contain a boron dispersant additive. Check sample of new oil
Silicon (Si)	Greater than 20 ppm	High levels indicate presence of dust or sand. May also be due to high level of silicone anti-foam. Check sample of new oil
Magnesium (Mg), Calcium (Ca) Barium (Ba), Sodium (Na) Phosphorus (P), Zinc (Zn)		These elements may be part of the additive package. They remain in the oil and do not deplete