The G56 is a 6 speed manual transmission found in 2006+ Dodge trucks behind the 5.9L and 6.7L Cummins turbo diesel. The transmission is manufactured by Getrag, which is a subsidiary of Mercedes Benz. In its factory configuration from Chrysler, the transmission utilizes a dual mass flywheel with a single disk clutch and is filled with ATF+4 automatic transmission fluid.

When adding power to your engine, it is very common to require a clutch upgrade as well. Most aftermarket clutches utilize a standard single mass flywheel due to reliability and performance issues. The only problem with the single mass flywheel is that it now transmits all of the harmonic vibrations from the engine directly into the transmission. This results in gear roll over noise which sounds like a “growling” noise in the transmission under low RPM, high torque situations. This is especially noticeable in 4th and 5th gear.

While trying to remedy this annoying and potentially harmful situation, a lot of research was done into a possible fluid change in the transmission. In this research, it was discovered that Mercedes Benz actually does not recommend or use ATF+4 in this transmission. ATF+4 is something that Chrysler decided was “good enough” to use in the G56 transmission. The reasoning behind this decision is that ATF+4 is already stocked at every dealership and it’s much cheaper than the recommended oil, hence saving Chrysler a lot of money. In this document, Mercedes Benz requires 75w/90 oil that meets their 235.13 specification. This specification references an oil called Vollsynth which is available in Europe, and an oil called MobilTrans SHC DC which is available in North America.

MobilTrans SHC DC is a 50wt manual transmission oil from the Mobil company and is very difficult to obtain because it is not stocked in very many places and must be special ordered. As of now, only one retailer has been identified to stock this oil, EMAC2. This led to more research to find a suitable substitute to use instead of the MobilTrans SHC DC due to availability.

Three potential substitute oils are thought to be the best suitable substitute to the recommended fluid for the G56 transmission. These oils are the Mobil Delvac Synthetic Transmission Fluid 50, Lazarsmith’s Gorilla Juice, and Pennzoil Synchromesh Fluid. There are several other oils that could also be utilized, but these three seem to be the most popular among diesel gear-heads. All of these oils claim to be suitable for use in the G56, but as we all know, all oils are not created equal. This is what led to this oil analysis comparison. These three oils were sent to Blackstone Laboratories for a side-by-side comparison along with the OEM ATF+4 and the elusive MobilTrans SHC DC.
Sample #1

Chrysler OEM ATF+4, MS-9602

Chrysler ATF+4 is produced by Petro-Canada Lubricants Inc. to Chrysler specifications. This is the fluid that comes pre-filled from the factory in the G56 transmission. It is the only fluid authorized for use by Chrysler. It is a standard ATF+4, nothing fancy about it. It can be purchased at numerous retailers everywhere and the OEM stuff can be obtained at any Chrysler dealership. It is bright red and smells just like every other ATF. The Product Data Sheet (PDS) and Material Safety Data Sheet (MSDS) of this oil are attached to the end of this document.

Oil Analysis Report

Product Data Sheet

Material Safety Data Sheet
MobilTrans SHC DC

MobilTrans SHC DC is produced by Exxon Mobil Corporation. This is the fluid required by Mercedes Benz for use in the G56 transmission. It states right on the label “APPROVED AGAINST MERCEDES BENZ 235.13.” It is 50wt GL-4 synthetic gear oil that is generally hard to procure in North America and must be special ordered. This oil is a medium golden brown color and smells almost like engine oil. The only retailer that is known to stock this oil is EMAC2. The MSDS is attached at the end of this document.

Oil Analysis Report

Material Safety Data Sheet
Mobil Delvac Synthetic Transmission Fluid 50

Mobil Delvac STF 50 is produced by Exxon Mobil Corporation and is thought to be the commercial equivalent to the MobilTrans SHC DC. The published specifications and the MSDS nearly mirror that of the MobilTrans SHC DC. It is 50wt GL-4 synthetic gear oil. This oil is a medium golden brown color and smells almost like engine oil. It can be purchased from several industrial supply companies (Grainger) and many semi truck shops that do transmission maintenance. The PDS and MSDS are attached at the end of this document.

Oil Analysis Report

Product Data Sheet

Material Safety Data Sheet
Sample #4

Lazarsmith Gorilla Juice

Gorilla Juice is blended in house by Lazarsmith. This fluid is marketed as being blended specifically for the G56 transmission. It is 80-140W GL-6 synthetic gear oil. This fluid is dark brownish/red and has a very strong gear oil smell. It can be purchased directly from Lazarsmith. There are no published documents available for this fluid.

Oil Analysis Report
Pennzoil Synchromesh Manual Transmission Fluid

Pennzoil Synchromesh is manufactured by SOPUS Products. It is marketed as being specifically formulated for synchromesh transmissions used by General Motors that require specification #9985648 and Chrysler that require specification MS-9224. It is a light golden brown color and has a very faint (almost nonexistent) oil smell. It can be purchased from various local retailers and numerous online stores. The PDS and MSDS are attached to this document.

Oil Analysis Report

Product Data Sheet

Material Safety Data Sheet
All five of these samples were bottled into individual sample packs, put into a single box, and mailed to Blackstone Laboratories. Included in this box were all of the published documentation that could be acquired, which are attached to the end of this document. After a short amount of time, I received 5 sample reports with the technical information that we were seeking.

The next few pages contain the actual sample reports I received from Blackstone Labs. My personal information has been removed, but everything else is unaltered. The column on the far left is the current sample information. The columns to the right just move over one with each corresponding sample. This makes it easy to compare all the numbers.

The oil analysis reports, in order, are:

- **OEM Chrysler ATF+4**
- **MobilTrans SHC DC**
- **Mobil Delvac Synthetic Transmission Fluid 50**
- **LazarSmith Gorilla Juice**
- **Pennzoil Synchronesh Manual Transmission Fluid**
JOHN: Nothing strange to report in this sample of Chrysler ATF+4. Boron, calcium, and phosphorus are the main additives present. No moisture or insolubles showed up and the viscosity is where it should be for Chrysler ATF+4. The TAN was 1.9 showing a little acidity. This is serviceable oil. As for our opinion as to what oil should be used; since Chrysler is paying the warranty and the other oils may be hard to get and/or expensive, we think this is the one to go with.
JOHN: This is the sample of Mobil SHC DC. There certainly is a lot more calcium, phosphorous and zinc in 
this oil. It looks more like what we'd expect from a manual transmission fluid, compared to the previous 
sample, which was obviously ATF, though it is not too uncommon to see ATF used in manual transmissions. 
This sample's viscosity was correct for Mobil SHC DC and in the 75W/90 range. The trace of insolubles is 
likely just additive that's fallen out of suspension. The TAN was 4.1 showing some acidity and that's due to 
the additive present. This is serviceable fluid.
JOHN: This is the sample of Mobil Delvac 50 transmission fluid. As you can see, the additives match up very closely to the Mobil SHC DC fluid. The viscosity is correct and once again in the 75W/90 range. No moisture or insolubles showed up and the TAN was 3.5 showing a little less acidity than the SHC. We don't test for all of the things that are needed to certify an oil, so we can't say for sure that Mobil Trans SCH DC and Mobil Devlac Synthetic 50 are the same, but judging by the things we do test for, they look almost identical.

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<th>07/20/12</th>
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<th>VALUES</th>
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<tr>
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<td>cST Viscosity @ 100°C</td>
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<tr>
<td>TAN</td>
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<td>4.1</td>
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LIABILITY LIMITED TO COST OF ANALYSIS
JOHN: This is the sample of Gorilla Juice. Aluminum is the only metal present, but it's likely from transportation or storage and therefore not a problem. The additives vary quite a bit from the other samples. The viscosity was thicker than we typically see from 80W/140 and this is by far the thickest oil of the bunch. The TAN was 3.2. There's nothing indicating this oil wouldn't work in your Dodge, but that's the case with all these samples. There's really not anything that stands out above the rest. Of course, you can't go wrong with manufacturer's recommendations.
JOHN: This is the sample of Pennzoil Syncromesh Fluid. A little iron showed up, but that's probably just from the transportation or storage process and isn't harmful. The first thing you notice is the additives. Very little calcium is present, but magnesium read 6,248 ppm. Phosphorus and zinc are reasonably close to the Mobil samples. Silicon could be abrasive dirt, but we're leaning towards an anti-foam additive. No moisture or insolubles here. The TAN was 4.7. There's nothing here showing this oil isn't serviceable.
So now that we have all of this information, it’s time to decode it to figure out exactly what we’re talking about. We’ll start with the basics, viscosity. Viscosity is a measurement of how thick oil is. The higher the viscosity, the thicker the oil is. This directly corresponds with the numeric labeling of oils; 10w-30, 95w-140, 50wt, 90wt, etc. Viscosity numbers between different types of oils (gear vs. engine) are not directly comparable. 30wt engine oil does not have the same viscosity as 30wt gear oil. In a manual transmission, a higher viscosity will always lead to slower/harder shifting in the transmission, especially when cold.

After viscosity, you get into the American Petroleum Institute (API) rating (MT-1, GL-1, GL-4, GL-6, etc.) These are specific standards that transmission/gear oil must meet. Think of it like ATF+4, Dexron/Mercon, Type F, etc. The API sets the standards for these ratings. According to the API, MT-1 is used for non-synchronized transmissions and GL-1, GL-4 and GL-5 are used for synchronized manual transmissions. GL-2, GL-3 and GL-6 are obsolete standards and are no longer in use. This document from the API does a real good job of explaining what they mean.

Now we get into the meat and potatoes of this project. The chemical compounds in the oil. There are many different compounds in the oil but we’re going to focus on four main parts in the oil’s additive pack. They consist of friction modifiers (FM), detergents, anti-wear (AW) additives, and extreme-pressure (EP) additives. Friction modifiers are used to reduce coefficient of friction which helps to lessen heat and increase fuel economy. Detergents are used to clean material buildup off of the surfaces, keep debris suspended so they don’t deposit on the surfaces, prevent oil foaming, and neutralizing any acids that form in the oil. AW additives prevent metal to metal contact within the transmission, which reduces wear. EP additives are used as a higher level AW additive. EP additives only come into play when there are extremely high stress loads between the gears, such as lots of power or heavy loads.

These additives are usually made up of multiple chemical compounds and perform several functions at once. Such a compound would be a Sulphur-Phosphorus-Boron combination which is mainly an EP additive, but also doubles as an AW additive and probably a friction modifier of some sort. Think of it like dish soap. Its primary purpose is a detergent to clean, but it also works as a lubricant for installing rubber seals. For simplicity, I’m only going to list a primary function for each of the main substances posted in the reports above.

As a rough run down we are mainly looking at this:

- Boron is a friction modifier/anti-wear additive.
- Calcium is a detergent.
- Magnesium is also a detergent.
- Phosphorus is an extreme pressure additive.
- Zinc is an anti-wear/extreme pressure additive.

The other chemicals (aluminum, iron, silicon, and sodium) are minimal and are probably left over from the production/packaging/distribution process, but could also be a part of some special additive package.
A few sources that help explain it a little better are:

- Extreme pressure additive - Wikipedia, the free encyclopedia
- AW additive - Wikipedia, the free encyclopedia
- Additive Metals - Boron, Magnesium, Calcium, Barium, Phosphorus, & Zinc

Now that you know a little about what we’re looking at, it’s comparison time. Since we know that the MobilTrans SHC DC is the specified fluid for the G56, we’ll use that as a baseline and compare all of the other samples against it.

We’ll start with the OEM Chrysler ATF+4. Looking at the cSt Viscosity, you’ll notice it’s around 50% of the baseline. It is fair to say that ATF+4 is roughly half as thick as the recommended fluid. It does have more Boron, which means it has a better friction modifier package. However, all of detergents, AW, and EP additives are 1/3 of the baseline, with the exception of Zinc which is almost nonexistent. It’s half as thick and less than 1/3 as protective as MobilTrans SHC DC.

Next we’ll look at the Mobil Delvac Synthetic Transmission Fluid 50. It’s about a point thicker than the baseline and has half of the Boron. However all of the other measurements are almost right on par with MobilTrans SHC DC. Based on the information provided, I believe it’s safe to say that the friction modifier package is less, but other than that it should be a perfectly suitable substitute for the specified requirement.

Now let’s look at the Lazarsmith Gorilla Juice. The cSt viscosity is nearly twice the baseline. This would lead to much harder shifting, especially when cold, compared to ATF+4 or either of the Mobil oils. The Boron content is also twice the baseline, so it appears to have a pretty good friction modifier package in it. Calcium and Zinc are almost nonexistent, phosphorus is roughly half, and magnesium is twice the baseline. Considering that calcium and magnesium are both common detergent chemicals and the combined total is significantly less than the baseline, it can be concluded that the detergent level overall is very low. AW packages are near zero, and EP additives are half. This would seem to lead to oil that provides significantly less protection than the baseline, but still more than the ATF. There is a good friction modifier package, but given the overall viscosity of the oil, I believe the benefit is mitigated.

Finally, look at the Pennzoil Synchromesh. Viscosity is better than ATF, but still significantly lower than the baseline. As far as detergents, calcium is very low but holy magnesium batman! The combination of detergents in this sample was off the charts. I have no doubt in my mind that you would have an extremely clean transmission with virtually no debris build up at all. Phosphorus is slightly higher, Zinc is slightly lower. That would indicate a better EP additive, but a weaker AW additive. Overall, I believe this would be good oil for use in a transmission that requires thinner oil, but due to the recommend oil’s viscosity I don’t think this would be a suitable substitute for MobilTrans SHC DC.
So what’s the overall conclusion? Based on the information provided, I believe that the absolute best oil would be the MobilTrans SHC DC with Mobil Synthetic Transmission Fluid 50 being a close second. If you’re still under warranty and would like to keep that warranty, I wouldn’t use anything but ATF+4. Chrysler can, and will deny your warranty for anything possible. Using a non-recommended fluid would definitely be a reason to be denied. As far as the Lazarsmith Gorilla Juice and Pennzoil Synchromesh, I personally wouldn’t recommend either of those fluids. The viscosity is way out of spec for both and the chemical protection is very lacking compared to either of the Mobil oils. But this is your truck and your bill if it breaks. Use the information here and draw your own conclusion. As for me, the only fluid going in my transmission from this point forward is MobilTrans SHC DC.
Introduction

Petro-Canada ATF+4® Automatic Transmission Fluid is the recommended fluid for use in Chrysler group automatic transmissions. It has been extensively tested and approved by Chrysler Group LLC under their Material Specification MS-9602.

Formulated using 100% PURITY™ VHVI Synthetic Base Fluids and an unique additive system, Petro-Canada ATF+4® contributes to the overall performance of the transmission by delivering optimized shift efficiency, improved oxidation and shear stability and extended drain intervals over ATF+3® fluids.

ATF+4® is the recommended top-up and refill automatic transmission fluid for Chrysler, Dodge, Plymouth, Jeep and Eagle vehicles with automatic transmissions where ATF+4® and ATF+3® is recommended. It meets the requirements of current and previous standard for DaimlerChrysler Automatic Transmission Fluids. ATF+4® ensures improved wear protection, smoother cold weather operation and anti-shudder durability.

Features and Benefits

• Tested and approved by Chrysler Group LLC under their Material Specification MS-9602
  • Warranty protection
  • Improved protection and performance over ATF+3® standard

• Superior wear protection and anti-shudder durability
  • Extends transmission life
  • Reduces maintenance costs
  • More consistent viscosity profile for improved shift feel performance

• Improved low temperature flow
  • Smoother shifts in cold weather
  • Reduced wear on transmission components during cold weather operation

• Improved oxidation and thermal stability over previous ATF+3® standard
  • Improved fluid durability
  • Less fluid top-up required
  • Reduced service costs
  • Improved fuel economy

• Extended drain interval over previous ATF+3® standard
  • Extensively tested to exceed 160,000 kilometres (100,000 mile) intervals

Applications

Petro-Canada ATF+4® has been tested and approved by Chrysler Group LLC. It is the recommended transmission fluid for top-up and refill of all automatic transmissions in the Chrysler Group of vehicles where ATF+4® or earlier versions of ATF+®, such as ATF+3®, is recommended.

Petro-Canada offers a complete line of automatic transmission fluids to meet your needs. Always consult your owner’s manual.
## Typical Performance Data

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<th>TEST METHOD</th>
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<tbody>
<tr>
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The values quoted above are typical of normal production. They do not constitute a specification. ATF+4® and ATF+3® are registered trademarks of Chrysler Group LLC.
Material Safety Data Sheet

CHRYSLER 4659920AB MS9602 ATF

1. Product and company identification

Product name: CHRYSLER 4659920AB MS9602 ATF
Synonym: RDL 3258
Code: MS9602; 460-857
Material uses: A shear stable automatic transmission and power steering fluid meeting Chrysler specification MS-9602.
Manufacturer: Petro-Canada Lubricants Inc.
2310 Lakeshore Road West
Mississauga, Ontario
Canada L5J 1K2
In case of emergency: Suncor Energy: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2. Hazards identification

Physical state: Viscous liquid.
Odor: Mild petroleum oil like.
WHMIS (Canada): Not controlled under WHMIS (Canada).
OSHA/HCS status: While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview: No specific hazard.
Routes of entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation: No known significant effects or critical hazards.
Ingestion: No known significant effects or critical hazards.
Skin: Slightly irritating to the skin.
Eyes: Slightly irritating to the eyes.

Potential chronic health effects

Chronic effects: No known significant effects or critical hazards.
Carcinogenicity: Not listed as carcinogenic by OSHA, NTP or IARC.
Mutagenicity: No known significant effects or critical hazards.
Teratogenicity: No known significant effects or critical hazards.
Developmental effects: No known significant effects or critical hazards.
Fertility effects: No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure: Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation.

See toxicological information (Section 11)

3. Composition/information on ingredients

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<tr>
<th>Name</th>
<th>CAS number</th>
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<tbody>
<tr>
<td>Mixture of severely hydrotreated and hydrocracked base oil (petroleum).</td>
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There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Date of issue: 3/23/2011.
Internet: lubricants.petro-canada.ca/msds
Petro-Canada is a Suncor Energy business
TM Trademark of Suncor Energy Inc. Used under licence.
3. Composition/information on ingredients

The base oil may be a mixture of the following CAS#s: 8042-47-5, 64742-46-7, 64742-47-8, 64742-53-6, 64742-54-7, 64742-55-8, 72623-84-8, 72623-85-9, 72623-86-0, 72623-87-1, 178603-64-0, 178603-65-1, 178603-66-2, 445411-73-4

4. First aid measures

Eye contact: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

Flammability of the product: May be combustible at high temperature.

Extinguishing media

Suitable: Use an extinguishing agent suitable for the surrounding fire.

Not suitable: None known.

Special exposure hazards: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Products of combustion: Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards: Low fire hazard. This material must be heated before ignition will occur.

Special remarks on explosion hazards: Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6. Accidental release measures

Personal precautions: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up
6. Accidental release measures

**Small spill**: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

**Large spill**: Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7. Handling and storage

**Handling**: Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

**Storage**: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture of severely hydrotreated and hydrocracked base oil (petroleum).</td>
<td>ACGIH TLV (United States). <strong>Notes</strong>: (Mineral oil) TWA: 5 mg/m³, (Inhalable fraction) 8 hour(s).</td>
</tr>
</tbody>
</table>

Consult local authorities for acceptable exposure limits.

**Recommended monitoring procedures**: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

**Engineering measures**: No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

**Hygiene measures**: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal protection**

**Respiratory**: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapor filter

**Hands**: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton®.
8. Exposure controls/personal protection

**Eyes**: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

**Skin**: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Environmental exposure controls**: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. Physical and chemical properties

**Physical state**: Viscous liquid.

**Flash point**: Open cup: 198°C (388.4°F) [Cleveland.]

**Auto-ignition temperature**: Not available.

**Flammable limits**: Not available.

**Color**: Red.

**Odor**: Mild petroleum oil like.

**Odor threshold**: Not available.

**pH**: Not available.

**Boiling/condensation point**: Not available.

**Melting/freezing point**: Not available.

**Relative density**: 0.8476 kg/L @ 15°C (59°F)

**Vapor pressure**: Not available.

**Vapor density**: Not available.

**Volatile**: Not available.

**Evaporation rate**: Not available.

**Viscosity**: 33.24cSt @ 40°C (104°F), 7.51 cSt @ 100°C (212°F), VI=204

**Pour point**: -51°C (-60°F)

**Solubility**: Insoluble in water.

10. Stability and reactivity

**Chemical stability**: The product is stable.

**Hazardous polymerization**: Under normal conditions of storage and use, hazardous polymerization will not occur.

**Materials to avoid**: Reactive with oxidizing agents, reducing agents and acids.

**Hazardous decomposition products**: May release COx, NOx, aldehydes, methacrylate monomers, smoke and irritating vapours when heated to decomposition.

11. Toxicological information

**Acute toxicity**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture of severely hydrotreated and hydrocracked base oil (petroleum).</td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>&gt;2000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>&gt;5000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LC50 Inhalation Dusts and mists</td>
<td>Rat</td>
<td>&gt;5.2 mg/l</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

**Conclusion/Summary**: Not available.

**Chronic toxicity**

**Conclusion/Summary**: Not available.
11. Toxicological information

**Irritation/Corrosion**
- Conclusion/Summary: Not available.

**Sensitizer**
- Conclusion/Summary: Not available.

**Carcinogenicity**
- Conclusion/Summary: Not available.

**Teratogenicity**
- Conclusion/Summary: Not available.

**Reproductive toxicity**
- Conclusion/Summary: Not available.

**Classification**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>EPA</th>
<th>NIOSH</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixture of severely hydrotreated and hydrocracked base oil (petroleum)</td>
<td>A4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Mutagenicity**
- Conclusion/Summary: Not available.

**Teratogenicity**
- Conclusion/Summary: Not available.

**Reproductive toxicity**
- Conclusion/Summary: Not available.

12. Ecological information

**Environmental effects**
- No known significant effects or critical hazards.

**Aquatic ecotoxicity**
- Conclusion/Summary: Not available.

**Biodegradability**
- Conclusion/Summary: Not available.

**Other adverse effects**
- No known significant effects or critical hazards.

13. Disposal considerations

**Waste disposal**
- The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

<table>
<thead>
<tr>
<th>Regulatory information</th>
<th>UN number</th>
<th>Proper shipping name</th>
<th>Classes</th>
<th>PG*</th>
<th>Label</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDG Classification</td>
<td>Not regulated.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DOT Classification</td>
<td>Not available.</td>
<td>Not available.</td>
<td>Not available.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

PG*: Packing group
15. Regulatory information

United States

HCS Classification : Not regulated.

U.S. Federal regulations / State regulations : California Prop. 65: This product contains an ingredient(s) for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : At least one component is not listed in EINECS but all such components are listed in ELINCS.

Please contact your supplier for information on the inventory status of this material.

International lists

Australia inventory (AICS) : All components are listed or exempted.

China inventory (IECSC) : All components are listed or exempted.

Korea inventory : All components are listed or exempted.

Philippines inventory (PICCS) : All components are listed or exempted.

16. Other information

Hazardous Material Information System (U.S.A.)

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Physical hazards</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>B</td>
</tr>
</tbody>
</table>

National Fire Protection Association (U.S.A.)

Flammability

Health

Instability

Special

References : Available upon request.

Trademark of Suncor Energy Inc. Used under licence.

Date of printing : 3/23/2011.

Date of issue : 23 March 2011

Date of previous issue : 12/9/2009.

Responsible name : Product Safety - DSR

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: lubricants.petro-canada.ca/msds

Telephone: 1-800-268-5850; Fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752
16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT
Product Name: MOBILTRANS SHC DC
Product Description: Synthetic Base Stocks and Additives
Product Code: 511956-00, 97S802
Intended Use: Manual transmission fluid

COMPANY IDENTIFICATION
Supplier: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA
24 Hour Health Emergency 609-737-4411
Transportation Emergency Phone 800-424-9300
ExxonMobil Transportation No. 281-834-3296
MSDS Requests 713-613-3661
Product Technical Information 800-662-4525, 800-947-9147

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS
Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

ENVIRONMENTAL HAZARDS
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID: Health: 0 Flammability: 1 Reactivity: 0
HMIS Hazard ID: Health: 0 Flammability: 1 Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION
Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek
immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

**SKIN CONTACT**
If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. Wash contact areas with soap and water.

**EYE CONTACT**
Flush thoroughly with water. If irritation occurs, get medical assistance.

**INGESTION**
First aid is normally not required. Seek medical attention if discomfort occurs.

---

### SECTION 5  
**FIRE FIGHTING MEASURES**

**EXTINGUISHING MEDIA**

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight Streams of Water

**FIRE FIGHTING**

**Fire Fighting Instructions:** Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Unusual Fire Hazards:** Pressurized mists may form a flammable mixture.

**Hazardous Combustion Products:** Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides, Aldehydes

**FLAMMABILITY PROPERTIES**

- **Flash Point [Method]:** >220°C (428°F) [ ASTM D-92]
- **Flammable Limits (Approximate volume % in air):**  
  - LEL: 0.9
  - UEL: 7.0
- **Autoignition Temperature:** N/D

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### SECTION 6  
**ACCIDENTAL RELEASE MEASURES**

**NOTIFICATION PROCEDURES**

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. U.S. regulations require reporting releases of this material to the environment which exceed the reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

**SPILL MANAGEMENT**

**Land Spill:** Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.
Water Spill: Confine the spill immediately with booms. Stop leak if you can do it without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS
Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING
Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE
Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly affect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

**ENVIRONMENTAL CONTROLS**

See Sections 6, 7, 12, 13.

**SECTION 9  PHYSICAL AND CHEMICAL PROPERTIES**

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

**GENERAL INFORMATION**

- **Physical State:** Liquid
- **Color:** Brown
- **Odor:** Characteristic
- **Odor Threshold:** N/D

**IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION**

- **Relative Density (at 15 °C):** 0.873
- **Flash Point [Method]:** >220°C (428°F) [ ASTM D-92]
- **Flammable Limits (Approximate volume % in air):** LEL: 0.9 UEL: 7.0
- **Autoignition Temperature:** N/D
- **Boiling Point / Range:** N/D
- **Vapor Density (Air = 1):** > 2 at 101 kPa
- **Vapor Pressure:** < 0.013 kPa (0.1 mm Hg) at 20°C
- **Evaporation Rate (n-butyl acetate = 1):** N/D
- **pH:** N/A
- **Log Pow (n-Octanol/Water Partition Coefficient):** > 3.5
- **Solubility in Water:** Negligible
- **Viscosity:** 127 cSt (127 mm²/sec) at 40 °C | 17.6 cSt (17.6 mm²/sec) at 100°C

**OXIDIZING PROPERTIES**

See Sections 3, 15, 16.

**OTHER INFORMATION**

- **Freezing Point:** N/D
- **Melting Point:** N/A
**Pour Point:** -45°C (-49°F)  
**DMSO Extract (mineral oil only), IP-346:** < 3 %wt

## SECTION 10  STABILITY AND REACTIVITY

**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Excessive heat. High energy sources of ignition.

**MATERIALS TO AVOID:** Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11  TOXICOLOGICAL INFORMATION

### ACUTE TOXICITY

<table>
<thead>
<tr>
<th>Route of Exposure</th>
<th>Conclusion / Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inhalation</strong></td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LC50 &gt; 5000 mg/m³</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Irritation: Data available.</td>
<td>Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.</td>
</tr>
<tr>
<td><strong>Ingestion</strong></td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rabbit): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Irritation (Rabbit): Data available.</td>
<td>Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td><strong>Eye</strong></td>
<td></td>
</tr>
<tr>
<td>Irritation (Rabbit): Data available.</td>
<td>May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.</td>
</tr>
</tbody>
</table>

### CHRONIC/OTHER EFFECTS

For the product itself: Repeated and/or prolonged exposure may cause irritation to the skin, eyes, or respiratory tract.  
**Contains:**  
Sulfonates: This product contains sulfonates which have been reported to cause skin sensitization.  
Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

Additional information is available by request.

The following ingredients are cited on the lists below: None.
 SECTION 12  ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY
Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY
Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL
Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

 SECTION 13  DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning PRECAUTIONARY LABEL TEXT: Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

 SECTION 14  TRANSPORT INFORMATION
LAND (DOT) : Not Regulated for Land Transport

LAND (TDG) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The Following Ingredients are Cited on the Lists Below:*  

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>List Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIPHENYLAMINE</td>
<td>122-39-4</td>
<td>5, 9, 18</td>
</tr>
</tbody>
</table>

--REGULATORY LISTS SEARCHED--
1 = ACGIH ALL 6 = TSCA 5a2 11 = CA P65 REPRO 16 = MN RTK  
2 = ACGIH A1  7 = TSCA 5e 12 = CA RTK  17 = NJ RTK  
3 = ACGIH A2  8 = TSCA 6  13 = IL RTK  18 = PA RTK  
4 = OSHA Z  9 = TSCA 12b 14 = LA RTK  19 = RI RTK  
5 = TSCA 4  10 = CA P65 CARC 15 = MI 293  

Code key: CARC=Carcinogen; REPRO=Reproductive

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 01: Product Intended Use was modified.
Mobil Delvac Synthetic Transmission Fluid 50

Supreme Performance Transmission Lubricant

Product Description

Mobil Delvac Synthetic Transmission Fluid 50 is a fully synthetic, manual transmission lubricant engineered to meet the most demanding extended drain and OEM warranty requirements. It is recommended for year-round lubrication of manual transmissions in light to severe duty on- and off-highway equipment operating in a wide range of environments. Designed to provide maximum protection and extended operating life to heavy duty transmissions, Mobil Delvac Synthetic Transmission Fluid 50 provides significant advantages over conventional sulphur-phosphorus gear oils, including outstanding high-temperature performance, oxidation stability, wear protection, and corrosion control.

It has the same viscosity as most SAE 50 engine oils and SAE 90 gear lubricants at the high end of the temperature-viscosity scale, and because of its inherently high viscosity index, it provides stronger film strength at higher temperatures than conventional oils. Mobil Delvac Synthetic Transmission Fluid 50 also ensures effective lubrication at below freezing temperatures without channelling.

The outstanding performance of this product is confirmed by its approval for heavy-duty transmissions covered by Eaton Roadranger and Extended Warranties of 750,000 miles, with oil drains of 500,000 miles. It is also approved by Mack against its TO-A Plus 500,000 mile extended service classification. Mobil Delvac Synthetic Transmission Fluid 50 meets or exceeds the requirements of the API service MT-1 EP gear oil service classification and is recommended by ExxonMobil for use in transmissions and gear cases where API Service GL-1 through GL-4 gear protection is required.

Features and Benefits

The performance capabilities of today's heavy-duty on- and off-highway equipment have vastly improved in terms of load, speed, control, and reliability through innovative powertrain designs. These designs have markedly increased the demands on transmission lubricants, requiring them to deliver higher levels of performance while extending drains. For heavy-duty transmissions, friction control, wear protection, thermal stability, shear stability, rust and corrosion protection, and seal protection are features that must be balanced to provide extended gear and synchroniser life, smooth shift control, improved efficiency, and higher load capability over a wide range of applications and operating environments. Mobil Delvac Synthetic Transmission Fluid 50 delivers unequalled performance in today's manual transmissions. The key benefits include:

<table>
<thead>
<tr>
<th>Features</th>
<th>Advantages and Potential Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent load carrying, anti-wear,</td>
<td>Extends transmission life and reduces cost of operation</td>
</tr>
<tr>
<td>and EP performance</td>
<td></td>
</tr>
<tr>
<td>Outstanding protection against</td>
<td>Longer seal life, extended drain and service intervals</td>
</tr>
<tr>
<td>deposit formation</td>
<td></td>
</tr>
<tr>
<td>Maximum protection from corrosion of</td>
<td>Protects and extends the life of synchronizers</td>
</tr>
<tr>
<td>copper and its alloys</td>
<td></td>
</tr>
<tr>
<td>Optimized thermal and oxidation</td>
<td>Extends component life and improves efficiency</td>
</tr>
<tr>
<td>protection</td>
<td></td>
</tr>
<tr>
<td>Exceptional shear stability</td>
<td>Minimizes wear during severe operation</td>
</tr>
<tr>
<td>Outstanding low-temperature fluidity</td>
<td>Reduces wear during cold temperatures and improves shifting with</td>
</tr>
<tr>
<td></td>
<td>quicker starts</td>
</tr>
<tr>
<td>Extended drain and service interval</td>
<td>Provides lower operating costs and higher productivity</td>
</tr>
<tr>
<td>capability</td>
<td></td>
</tr>
<tr>
<td>Improved friction reduction properties</td>
<td>Improves fuel economy and lowers operating costs</td>
</tr>
</tbody>
</table>

Applications

Recommended by ExxonMobil for use in:

- Heavy-duty manual transmissions where extended service intervals and warranties are required
- On-highway, commercial light and heavy duty trucking, buses, and vans
- Off-highway industries including construction, mining, and agriculture
Use as a companion with Mobil Delvac Synthetic Gear Oils in rear axles for maximum component life, service efficiency, and fuel economy improvement

- NOT suitable for hypoid gear applications in differentials and final drives, either for topping-off or refills, where API service GL-5 or MIL-PRF-2105E lubricants are specified

Specifications and Approvals

Mobil Delvac Synthetic Transmission Fluid 50 meets or exceeds the requirements of the following industry and builder specifications:

- API MT-1

Mobil Delvac Synthetic Transmission Fluid 50 has the following builder approvals:

- Eaton PS-164 Rev 7
- Mack TO-A PLUS
- International TMS-6816
- ZF FreedomLine

Typical Properties

Mobil Delvac Synthetic Transmission Fluid 50

- SAE Grade: 50
- Viscosity, ASTM D 445:
  - cSt @ 40ºC: 132
  - cSt @ 100ºC: 17.5
- Viscosity Index, ASTM D 2270: 146
- Pour Point, ºC, ASTM D 97: -45
- Flash Point, ºC, ASTM D 92: 221
- Density @ 15ºC kg/l, ASTM D 4052: 0.86

Health and Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

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7-2011

Exxon Mobil Corporation
3225 Gallows Road
Fairfax, VA 22037

1-800-ASK MOBIL (275-6624)
Typical Properties are typical of those obtained with normal production tolerance and do not constitute a specification. Variations that do not affect product performance are to be expected during normal manufacture and at different blending locations. The information contained herein is subject to change without notice. All products may not be available locally. For more information, contact your local ExxonMobil contact or visit www.exxonmobil.com

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MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT
Product Name: MOBIL DELVAC SYNTHETIC TRANSMISSION FLUID 50
Product Description: Synthetic Base Stocks and Additives
Product Code: 20152010E010, 511600-00, 97AC48
Intended Use: Manual transmission fluid

COMPANY IDENTIFICATION
Supplier: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA
24 Hour Health Emergency 609-737-4411
Transportation Emergency Phone 800-424-9300
ExxonMobil Transportation No. 281-834-3296
Product Technical Information 800-662-4525, 800-947-9147

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS#</th>
<th>Concentration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMINES, C11-14 BRANCHED ALKYL MONOHEXYL AND DIHEXYL PHOSPHATES</td>
<td>80939-62-4</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>DIISODECYL ADIPATE</td>
<td>27178-16-1</td>
<td>20 - 30%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3: HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POSSIBLE HEALTH EFFECTS
Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

ENVIRONMENTAL HAZARDS
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID: Health: 0 Flammability: 1 Reactivity: 0
HMIS Hazard ID: Health: 0 Flammability: 1 Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.
SECTION 4  FIRST AID MEASURES

Inhalation
Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT
Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT
Flush thoroughly with water. If irritation occurs, get medical assistance.

Ingestion
First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5  FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING
Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulfur Oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES
Flash Point [Method]: >190°C (374°F) [ ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9  UEL: 7.0
Autoignition Temperature: N/D

SECTION 6  ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES
In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

**SPILL MANAGEMENT**

- **Land Spill:** Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

- **Water Spill:** Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

**ENVIRONMENTAL PRECAUTIONS**

- **Large Spills:** Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

---

**SECTION 7**

**HANDLING AND STORAGE**

**HANDLING**

Avoid all personal contact. Prevent small spills and leakage to avoid slip hazard.

- **Static Accumulator:** This material is a static accumulator.

**STORAGE**

Do not store in open or unlabelled containers.

---

**SECTION 8**

**EXPOSURE CONTROLS / PERSONAL PROTECTION**

**EXPOSURE LIMIT VALUES**

Exposure limits/standards (Note: Exposure limits are not additive)

<table>
<thead>
<tr>
<th>Source</th>
<th>Form</th>
<th>Limit / Standard</th>
<th>NOTE</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIISODECYL ADIPATE</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>N/A</td>
<td>ExxonMobil</td>
</tr>
</tbody>
</table>

**Exposure limits/standards for materials that can be formed when handling this product:** When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

**ENGINEERING CONTROLS**

The level of protection and types of controls necessary will vary depending upon potential exposure conditions.
Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS
See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION
Physical State: Liquid
Color: Amber
Odor: Characteristic
Odor Threshold: N/D
Important Health, Safety, and Environmental Information

Relative Density (at 15°C): 0.86
Flash Point [Method]: >190°C (374°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (N-Butyl Acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 132 cSt (132 mm²/sec) at 40°C  17.8 cSt (17.8 mm²/sec) at 100°C
Oxidizing Properties: See Hazards Identification Section.

Other Information
Freezing Point: N/D
Melting Point: N/A
Pour Point: -40°C (-40°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

Section 10 Stability and Reactivity

Stability: Material is stable under normal conditions.

Conditions to Avoid: Excessive heat. High energy sources of ignition.

Materials to Avoid: Strong oxidizers

Hazardous Decomposition Products: Material does not decompose at ambient temperatures.

Hazardous Polymerization: Will not occur.

Section 11 Toxicological Information

Acute Toxicity

<table>
<thead>
<tr>
<th>Route of Exposure</th>
<th>Conclusion / Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LC50 &gt; 5000 mg/m³</td>
<td>Minimally Toxic. Based on assessment of the components.</td>
</tr>
<tr>
<td>Irritation: No end point data.</td>
<td>Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.</td>
</tr>
<tr>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rat): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Skin</td>
<td></td>
</tr>
<tr>
<td>Toxicity (Rabbit): LD50 &gt; 2000 mg/kg</td>
<td>Minimally Toxic. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Irritation (Rabbit): Data available.</td>
<td>Mildly irritating to skin with prolonged exposure. Based on test data for structurally similar materials.</td>
</tr>
<tr>
<td>Eye</td>
<td></td>
</tr>
</tbody>
</table>
Irritation (Rabbit): Data available. May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

Contains:
Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.
Phenyl-alpha-naphthylamine (PAN): Undiluted PAN is a skin sensitizer. Human testing with lubricants containing 1.0% PAN caused no reactions indicative of sensitization.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--
1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12  ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY
Material -- Expected to be harmful to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY
Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

SECTION 13  DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with
contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL 6 = TSCA 5a2 11 = CA P65 REPRO 16 = MN RTK
2 = ACGIH A1 7 = TSCA 5e 12 = CA RTK 17 = NJ RTK
3 = ACGIH A2 8 = TSCA 6 13 = IL RTK 18 = PA RTK
4 = OSHA Z 9 = TSCA 12b 14 = LA RTK 19 = RI RTK
5 = TSCA 4 10 = CA P65 CARC 15 = MI 293
SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 04: First Aid Inhalation - Header was modified.
Section 04: First Aid Skin was modified.
Section 04: First Aid Ingestion - Header was modified.
Section 06: Notification Procedures - Header was modified.
Section 11: Skin Irritation Conclusion was modified.
Section 10 Stability and Reactivity - Header was modified.
Section 13: Disposal Recommendations - Note was modified.
Section 09: Evaporation Rate - Header was modified.
Section 08: Personal Protection was modified.
Section 07: Handling and Storage - Handling was modified.
Section 11: Inhalation Lethality Test Data was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release - Spill Management - Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Viscosity was modified.
Section 08: Hand Protection was modified.
Section 08: Skin and Body Protection was modified.
Section 14: Sea (IMDG) - Header was modified.
Section 14: Air (IATA) - Header was modified.
Section 14: LAND (TDG) - Header was modified.
Section 14: LAND (DOT) - Header was modified.
Section 15: List Citation Table - Header was modified.
Section 14: LAND (DOT) - Default was modified.
Section 14: LAND (TDG) Default was modified.
Section 14: Sea (IMDG) - Default was modified.
Section 14: Air (IATA) - Default was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 16: Code to MHCs was modified.
Section 16: Code to PPEs was modified.
Section 08: Exposure limits/standards was modified.
Hazard Identification: OSHA - May be Hazardous Statement was modified.
Section 06: Notification Procedures was modified.
Section 11: Chronic Tox - Component was modified.
Section 09: Oxidizing Properties was modified.
Section 08: OEL Table - Notation Column - Header was modified.
Section 08: Exposure Limit Values - Header was modified.
Section 01: Company Contact Methods Sorted by Priority was modified.

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Internal Use Only

MHC: 0, 0, 0, 0, 2, 0  PPEC: C

DGN: 7053375XUS (1011317)

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SYNCHROMESH FLUID

PRODUCT DESCRIPTION
PENNZOIL® SYNCHROMESH FLUID is a synchromesh transmission fluid designed for certain manual transaxles and manual transmissions used by General Motors or Chrysler. PENNZOIL® SYNCHROMESH FLUID is formulated with high quality paraffinic base stocks, a fluidity modifier, multifunctional performance additives, corrosion inhibitors, a foam suppressor and a shear stable viscosity index improver additive. It provides excellent oxidation stability, low temperature performance, excellent synchronizer performance and compatibility with yellow metals, such as bronze, brass and copper components found in manual transaxles and transmissions. This product will satisfactorily lubricate General Motors or Chrysler manual transaxles and transmissions from -40°C to +150°C.

APPLICATION
PENNZOIL® SYNCHROMESH FLUID is specifically formulated for synchromesh transmissions used by General Motors requiring General Motors Part No. 12345349 (Specification No. 9985648) Synchromesh Transmission Fluid or Chrysler transmissions requiring Part No. 4874464 (Specification MS-9224). It is also recommended for use in General Motor transmissions requiring General Motors Part No. 12345577. It is listed in the Pennzoil Lubrication Recommendation And Capacities Guide as “GLS.” PENNZOIL® SYNCHROMESH FLUID is NOT intended for all GLS applications. You must verify the manufacturer’s part number, indicated by a superscript number and found at the end of the vehicle application listing.

BENEFITS
- Exhibits excellent low temperature performance
- Meets GM Specification 9985648
- Suitable for use in GM manual transaxles and transmissions requiring GM Part No. 12345349 or 12345577
- Meets Chrysler specification MS-9224
- Suitable for use in Chrysler transaxles and transmissions requiring Part No. 4874464
- Excellent synchronizer performance
- Excellent yellow metal compatibility

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>TEST</th>
<th>METHOD</th>
<th>TYPICAL RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>API Gravity</td>
<td>ASTM D-1298</td>
<td>27.3</td>
</tr>
<tr>
<td>Flash Point, °F</td>
<td>ASTM D-92</td>
<td>385</td>
</tr>
<tr>
<td>Pour Point, °F</td>
<td>ASTM D-97</td>
<td>-50</td>
</tr>
<tr>
<td>Viscosity</td>
<td>ASTM D-445</td>
<td></td>
</tr>
<tr>
<td>@ 40°C, cSt</td>
<td></td>
<td>41.6</td>
</tr>
<tr>
<td>@ 100°C, cSt</td>
<td></td>
<td>9.08</td>
</tr>
<tr>
<td>@ 100°F, SUS</td>
<td></td>
<td>209.4</td>
</tr>
<tr>
<td>@ 210°F, SUS</td>
<td></td>
<td>56.7</td>
</tr>
<tr>
<td>Viscosity Index</td>
<td>ASTM D-2270</td>
<td>208</td>
</tr>
<tr>
<td>Material Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Gallon Pail</td>
<td></td>
<td>3378</td>
</tr>
<tr>
<td>12/1 Quart</td>
<td></td>
<td>3501</td>
</tr>
</tbody>
</table>
1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : Pennzoil Synchromesh Fluid

Manufacturer/Supplier : SOPUS Products
PO BOX 4427
Houston, TX  77210-4427
USA

MSDS Request : 877-276-7285

Emergency Telephone Number
Spill Information : 877-242-7400
Health Information : 877-504-9351

2. COMPOSITION/INFORMATION ON INGREDIENTS

Highly refined mineral oils and additives.
The highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346.

3. HAZARDS IDENTIFICATION

<table>
<thead>
<tr>
<th>Emergency Overview</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance and Odour</td>
<td>May be dyed. Liquid at room temperature. Slight hydrocarbon.</td>
</tr>
</tbody>
</table>

Health Hazards: Not classified as dangerous for supply or conveyance.
Safety Hazards: Not classified as flammable but will burn.
Environmental Hazards: Not classified as dangerous for the environment.

Health Hazards: Not expected to be a health hazard when used under normal conditions.

Health Hazards
Inhalation: Under normal conditions of use, this is not expected to be a primary route of exposure.
Skin Contact: Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.

Eye Contact
Ingestion: May cause slight irritation to eyes.
Other Information: Low toxicity if swallowed.

Signs and Symptoms
Used oil may contain harmful impurities.

Aggravated Medical Condition
Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Skin.

Environmental Hazards: Not classified as dangerous for the environment.

Additional Information: Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous
4. FIRST AID MEASURES

General Information: Not expected to be a health hazard when used under normal conditions.
Inhalation: No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.
Skin Contact: Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention.
Eye Contact: Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
Ingestion: In general no treatment is necessary unless large quantities are swallowed, however, get medical advice.
Advice to Physician: Treat symptomatically.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point: > 176.67 °C / 350.01 °F (COC)
Upper / lower Flammability or Explosion limits: Typical 1 - 10 %(V)(based on mineral oil)
Auto ignition temperature: > 320 °C / 608 °F

Specific Hazards: Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds.

Suitable Extinguishing Media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media: Do not use water in a jet.

Protective Equipment for Firefighters: Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations.

Protective measures: Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.

Clean Up Methods: Slippery when split. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay,
Material Safety Data Sheet

Additional Advice
sand or other suitable material and dispose of properly.
Local authorities should be advised if significant spillages cannot be contained.

7. HANDLING AND STORAGE

General Precautions
Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

Handling
Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used.

Storage
Keep container tightly closed and in a cool, well-ventilated place. Use properly labelled and closeable containers. Storage Temperature: 0 - 50 °C / 32 - 122 °F

Recommended Materials
For containers or container linings, use mild steel or high density polyethylene.

Unsuitable Materials
PVC.

Additional Information
Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Material</th>
<th>Source</th>
<th>Type</th>
<th>ppm</th>
<th>mg/m3</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil mist, mineral</td>
<td>ACGIH</td>
<td>TWA(Inhalable fraction.)</td>
<td>5</td>
<td>mg/m3</td>
<td></td>
</tr>
<tr>
<td>Oil mist, mineral</td>
<td>OSHA Z1</td>
<td>PEL(Mist.)</td>
<td>5</td>
<td>mg/m3</td>
<td></td>
</tr>
<tr>
<td>Oil mist, mineral</td>
<td>OSHA Z1A</td>
<td>TWA(Mist.)</td>
<td>5</td>
<td>mg/m3</td>
<td></td>
</tr>
</tbody>
</table>

Additional Information
Shell has adopted as Interim Standards the OSHA Z1A values that were established in 1989 and later rescinded.

Exposure Controls
The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

Personal Protective Equipment
Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection
No respiratory protection is ordinarily required under normal conditions.
conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65°C(149 °F)].

**Hand Protection**
- Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.

**Eye Protection**
- Wear safety glasses or full face shield if splashes are likely to occur.

**Protective Clothing**
- Skin protection not ordinarily required beyond standard issue work clothes.

**Monitoring Methods**
- Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.

**Environmental Exposure Controls**
- Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

- **Appearance**: May be dyed. Liquid at room temperature.
- **Odour**: Slight hydrocarbon.
- **pH**: Not applicable.
- **Initial Boiling Point and Boiling Range**: > 280 °C / 536 °F estimated value(s)
- **Flash point**: > 176.67 °C / 350.01 °F (COC)
- **Upper / lower Flammability or Explosion limits**: Typical 1 - 10 % (V) (based on mineral oil)
- **Auto-ignition temperature**: > 320 °C / 608 °F
- **Vapour pressure**: < 0.5 Pa at 20 °C / 68 °F (estimated value(s))
- **Water solubility**: Negligible.
- **n-octanol/water partition coefficient (log Pow)**: > 6 (based on information on similar products)
- **Kinematic viscosity**: > 40 mm²/s
Material Safety Data Sheet

Vapour density (air=1) : > 1 (estimated value(s))
Evaporation rate (nBuAc=1) : Data not available

10. STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Stability</th>
<th>Stable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions to Avoid</td>
<td>Extremes of temperature and direct sunlight.</td>
</tr>
<tr>
<td>Materials to Avoid</td>
<td>Strong oxidising agents.</td>
</tr>
<tr>
<td>Hazardous Decomposition</td>
<td>Hazardous decomposition products are not expected to form during normal storage.</td>
</tr>
</tbody>
</table>

11. TOXICOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Basis for Assessment</th>
<th>Information given is based on data on the components and the toxicology of similar products.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Oral Toxicity</td>
<td>Expected to be of low toxicity: LD50 &gt; 5000 mg/kg , Rat</td>
</tr>
<tr>
<td>Acute Dermal Toxicity</td>
<td>Expected to be of low toxicity: LD50 &gt; 5000 mg/kg , Rabbit</td>
</tr>
<tr>
<td>Acute Inhalation Toxicity</td>
<td>Not considered to be an inhalation hazard under normal conditions of use.</td>
</tr>
<tr>
<td>Skin Irritation</td>
<td>Expected to be slightly irritating.</td>
</tr>
<tr>
<td>Eye Irritation</td>
<td>Expected to be slightly irritating.</td>
</tr>
<tr>
<td>Respiratory Irritation</td>
<td>Inhalation of vapours or mists may cause irritation.</td>
</tr>
<tr>
<td>Sensitisation</td>
<td>Not expected to be a skin sensitiser.</td>
</tr>
<tr>
<td>Repeated Dose Toxicity</td>
<td>Not expected to be a hazard.</td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>Not considered a mutagenic hazard.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC). Other components are not known to be associated with carcinogenic effects.</td>
</tr>
<tr>
<td>Reproductive and Developmental Toxicity</td>
<td>Not expected to be a hazard.</td>
</tr>
<tr>
<td>Additional Information</td>
<td>Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible.</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

| Acute Toxicity | Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract). Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentrations less than 1 mg/l. |
Mobility: Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.

Persistence/degradability: Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.

Bioaccumulation: Contains components with the potential to bioaccumulate.

Other Adverse Effects: Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential.

13. DISPOSAL CONSIDERATIONS

Material Disposal: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.

Container Disposal: Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Local Legislation: Disposal should be in accordance with applicable regional, national, and local laws and regulations.

14. TRANSPORT INFORMATION

US Department of Transportation Classification (49CFR)
This material is not subject to DOT regulations under 49 CFR Parts 171-180.

IMDG
This material is not classified as dangerous under IMDG regulations.

IATA (Country variations may apply)
This material is not classified as dangerous under IATA regulations.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Federal Regulatory Status

<table>
<thead>
<tr>
<th>Notification Status</th>
<th>All components listed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EINECS</td>
<td>All components listed.</td>
</tr>
<tr>
<td>TSCA</td>
<td>All components listed.</td>
</tr>
<tr>
<td>DSL</td>
<td>All components listed.</td>
</tr>
</tbody>
</table>
Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

**SARA Hazard Categories (311/312)**
No SARA 311/312 Hazards.

**State Regulatory Status**

**California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)**
This material does not contain any chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

16. **OTHER INFORMATION**

| NFPA Rating (Health, Fire, Reactivity) | : 0, 1, 0 |
| MSDS Version Number                  | : 3.1    |
| MSDS Effective Date                  | : 11/17/2010 |
| MSDS Revisions                       | : A vertical bar (|) in the left margin indicates an amendment from the previous version. |
| MSDS Regulation                      | : The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200. |
| MSDS Distribution                    | : The information in this document should be made available to all who may handle the product. |

**Disclaimer**

The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.