

## JOINT SERVICE POLLUTION PREVENTION OPPORTUNITY DATA SHEET

### SUBSTITUTING SYNTHETIC OIL FOR CONVENTIONAL OIL

**Revision:** 5/99  
**Process Code:** Navy and Marine Corps: SR-02; Air Force: PM08; Army: VHM  
**Usage List:** Navy: Medium; Marine Corps: Medium; Army: Medium; Air Force: Low  
**Alternative for:** Conventional Oils  
**Compliance Areas:** Medium  
**Applicable EPCRA Targeted Constituents:** N/A

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**Overview:** When used in place of conventional motor oil, synthetic oil lasts longer thus requiring fewer changeouts. As a result, waste oil generation and consumption of oil is reduced.

Synthetic motor oils are blends of synthesized hydrocarbon fluids (SHF's) and esters derived from petrochemicals. These synthetic oils are manufactured by combining the various organic chemicals together. Other synthetic hydrocarbon compounds are also suitable for lubricating oils, and manufacturers may blend two or more of these compounds together to achieve one desired property. While they appear chemically similar to mineral oils refined from crude, they are pure chemicals that do not contain the impurities or waxes inherent in conventional mineral oils. Conventional mineral oils thicken or thin dramatically with changes in temperature. To compensate for this, manufacturers add thickeners to conventional multigrade oils to slow thinning as engine temperatures rise. Synthetic oils have high resistance to changes in viscosity due to temperature and thus have less of a requirement for thickeners. As a result they provide a heavier, more stable protective oil film for engine bearings and piston rings than is provided by similar SAE-grade mineral oils.

Synthetic oil is superior to petroleum oil because it permits better cold weather performance and longer endurance. Synthesized compounds continue to flow at the low temperatures. Synthetic 10W-30 oils flow at temperatures as low as -54°C (-65°F) and pump at lower temperatures than similar SAE viscosity conventional oils. Synthetic 15W-50 oils flows at -48°C (-55°F) and pumps at temperatures as low as many conventional SAE 5W-30 oils. According to the San Antonio Air Logistics Center (SA-ALC), the primary benefit of synthetic oil is this superior performance at low temperatures.

Synthetics are also more thermally stable. Manufacturers claim that synthetic oils yield increased fuel economy, reductions in friction and wear, decreased oil consumption, better engine performance at lower temperatures, and extended oil change intervals. However, since synthetic oil has improved fluidity, oil loss will occur more quickly through leaks because the thinner fluid will flow through

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a bad seal or worn ring. SA-ALC reports that the use of synthetic oils has not enabled them to reduce oil change intervals.

Some synthetic compounds are not compatible with conventional oils. However if a quart of synthetic oil is added to conventional oil, the resultant compound will be a compatible mixture. Also, the lower friction resulting from the use of a synthetic lubricant makes them unsuitable for break-in.

### **Compliance**

#### **Benefit:**

The substitution of synthetic oil for conventional oil may allow longer intervals between change outs thereby reducing oil consumption and waste disposal. The decrease in the amount of used oil generated will decrease the labor requirement for managing used oil under **40 CFR 279 or 40 CFR 262**. Moreover, since less oil should be stored on site, a facility will decrease the likelihood of reaching reporting thresholds under **40 CFR 355 and EO 12856**. A decrease in oil stored on site may also put a facility below threshold amounts for the requirement to develop and implement a Spill, Prevention, Control and Countermeasure Plan under **40 CFR 112**.

The compliance benefits listed here are only meant to be used as a general guideline and are not meant to be strictly interpreted. Actual compliance benefits will vary depending on the factors involved, e.g. the amount of workload involved.

### **Materials**

#### **Compatibility:**

No material compatibility issues were identified.

### **Safety and**

#### **Health:**

There are minimal safety and health concerns with synthetic oils. Care must be taken when handling hot oil. Proper personal protective equipment is recommended. Consult your local industrial health specialist, your local health and safety personnel, and the appropriate MSDS prior to implementing this technology.

#### **Benefits:**

- Synthetic oil lasts two to five times longer than conventional oil thus waste oil generation can be reduced two to five times if synthetic oil is used
- Synthetic oils have high resistance to changes in viscosity due to temperature. As a result they provide a heavier, more stable protective oil film for engine bearings and piston rings than is provided by similar SAE-grade mineral oils.
- Synthetic oil permits better cold weather performance and longer endurance.

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- Manufacturers claim that synthetic oil yields better fuel economy, reductions in friction and wear, decreased oil consumption, improved performance, and extended drain intervals.

### **Disadvantages:**

- Synthetic oil costs more than conventional oil (the higher cost is typically offset by reduced waste generation however)
- Since synthetic oil has improved fluidity, oil loss will occur more quickly through leaks because the thinner fluid will flow through a bad seal or worn ring.
- Some synthetic compounds are not compatible with conventional oils.
- The lower friction resulting from the use of a synthetic lubricant makes them unsuitable for break-in.

### **Economic Analysis:**

An economic analysis assuming synthetic oil lasts three times as long as conventional oil is presented below for a 12-quart capacity vehicle. Oil and filter disposal information was based on estimates from the San Antonio Air Logistics Center. Lubricant and filter price information was provided by the vendors.

#### **Assumptions:**

- 30 vehicles in fleet
- Labor Cost: \$20/hour  
Labor: 0.5 hour per oil change
- Oil Disposal: oils are recycled at no cost to the facility
- Oil Cost: Synthetic - \$14.51/gallon, Conventional - \$4.42/gallon
- Conventional Oil is changed three times per year, synthetic oil is changed once per year.
- Filters cost \$6.00 each
- Filter Disposal: Estimated at \$100 per drum, 100 filter per drum
- Oil capacity of vehicle is an average of 12 quarts (or 3 gallons)

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- ◆ Capital Cost for Diversion Equipment/Process: N/A
- ◆ Payback Period for Investment in Equipment/Process: Immediate

[Click Here](#) to View an Active Spreadsheet for this Economic Analysis and Enter Your Own Values. To return from the Active Spreadsheet, click the *reverse arrow* in the Tool Bar.

### NSN/MSDS:

Product	NSN	Unit Size	Cost
None Identified			

### Points of Contact:

**Navy:**  
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**Vendors:** N/A

*Source:* *Shelf-life Management Chart from Hazardous Material Control & Management/HMIS CD-ROM System.*  
*Shelf-life Specifications for Hazardous Materials, Final Report, NFESC, Pollution Prevention Division,*  
*Port Hueneme, CA 93043-4328*

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Annual Operating Cost Comparison for  
Synthetic Oil Versus Conventional Oil Use

	<u>Synthetic</u>	<u>Conventional</u>
<b>Operational Costs:</b>		
Labor:	\$300	\$900
Oil Costs	\$1,305	\$1,193
Filter Cost	\$180	\$540
Filter Disposal	\$30	\$90
<b>Total Costs:</b>	\$1,816	\$2,723
<b>Total Income:</b>	\$0	\$0
<b>Annual Benefit:</b>	-\$1,816	-\$2,723

**Economic Analysis Summary**

- ◆ Annual Savings for Synthetic Oils: \$908
- ◆ Capital Cost for Diversion Equipment/Process: \$0
- ◆ Payback Period for Investment in Equipment/Process: N/A

**Note:** There is no payback period because there is no capital cost.

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**NSN/MSDS:**

<b>Product</b>	<b>NSN</b>	<b>Unit Size</b>	<b>Cost</b>
None Identified			

**Approval Authority:**

Approval is controlled locally and should be implemented only after engineering approval has been granted. Major claimant approval is not required.

**Points of Contact:**

**Air Force:**  
Mr. Michael Schleider  
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Support Equipment and Vehicle Management Directorate  
WR-ALC/LER  
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**Vendors:** Most oil suppliers have a synthetic brand of motor oil. Some are listed below.

Chevron Corp.  
575 Market St.  
San Francisco, CA 94105  
Phone: (415) 894-7700  
Fax: (415) 894-0583

Castrol Industrial North America, Inc.  
1001 W. 31<sup>st</sup>.  
Downers Grove, IL 60515  
Phone: (800) 621-2661  
Fax: (630) 241-1957

Mobil Corporation  
3225 Gallows Road  
Fairfax, VA 22037  
Phone: 800-662-4525  
Fax: 703-849-6065

*Source(s):* Mr. Michael Schleider, Robins Air Force Base, January 1999.  
Mr. David Elliot, San Antonio Air Logistics Center, January 1999.