



Technical Service Bulletin

Date: 07/30/09

Product Description: AMSOIL Premium API CJ-4 Diesel Oils (DEO, DME)

Subject: Fuel dilution issues in 2007–2009 on-highway Caterpillar C13 and C15 engines.

OBJECTIVE:

Communicate a fuel dilution issue in 2007–2009 on-highway Caterpillar C13 and C15 engines and the resultant reduction in the drain interval recommendation for AMSOIL Premium Diesel Oils in these applications.

ISSUES:

AMSOIL has documented increasing fuel dilution levels in 2007–2009 Caterpillar C13 and C15 on-highway engines and identified mechanical deficiencies (i.e. leaking seals on the body or sleeve of unit injector, cracked body of unit injector, leakage from the drive shaft seal on the fuel transfer pump, etc...) as possible causes.

Diesel fuel is a natural solvent, so high fuel dilution in motor oil causes a decrease in viscosity and can cause an increase in equipment wear rates.

TECHNICAL DISCUSSION:

Through examination of oil analysis reports, AMSOIL identified a trend of increasing fuel dilution in Caterpillar on-highway 2007-2009 C13 and C15 engines. A tolerable level of fuel dilution was present in 2007 engines; however, 2008 engines exhibit excessively high fuel dilution.

Fuel dilution in motor oil can be detrimental to an engine and its components. All of the following can occur if fuel enters the crankcase and contaminates the oil:

- Reduced oil viscosity
- Reduced oil film strength
- Increased engine wear (particularly in the cylinder/ring area)
- Increased volatility
- Weakened lubricant detergency
- Accelerated lubricant oxidation
- Varnish formation
- Acid formation/corrosion
- Low oil pressure

The most notable concern with increased fuel contamination is reduced viscosity and the corresponding effect it has on oil performance. There is a direct relationship between fuel dilution and viscosity loss. As little as 4 percent fuel dilution is generally enough to reduce an oil's viscosity to less than the specified viscosity grade. For example, in order to qualify for an SAE 15W-40 viscosity rating, a motor oil's viscosity must measure between 12.5 cSt and 16.3 cSt. Typically, a 15W-40 oil contaminated with 4 percent fuel will have a viscosity measurement of less than 12.5 cSt.

The following excerpts from oil analysis reports demonstrate the effect fuel dilution has on motor oil.

Manufacturer/Model	Caterpillar C13
Lube Time (miles)	26486
Fuel	4.5%
Soot	0.6%
Water	<0.1
Visc. 100C	10.8
Oxidation26
Wear Metals (PPM)	
Iron	58
Lead	1
Tin	1

Sample 1

Sample 1 was collected from a 2008 Caterpillar C13 engine. AMSOIL Premium API CJ-4 Synthetic 5W-40 Diesel Oil (DEO) had accumulated 26,486 miles when sampled. The high level of fuel contamination (4.5%) reduced engine oil viscosity to 10.8 cSt. AMSOIL 5W-40 Diesel Oil did, however, maintain good overall lubrication as evidenced by the relatively low level of wear metals detected. Oxidation increased, but not to a critical level.

Submitted By: MB

Reviewed By: DP

Approved By: AA

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Manufacturer/Model Caterpillar C13	
Lube Time (miles)27313	
Fuel	6.6%
Soot	0.4%
Water	<0.1
Visc. 100C	9.9
Oxidation29
Wear Metals (PPM)	
Iron	44
Lead	2
Tin	3

Sample 2

Sample 2 was collected from a 2008 Caterpillar C13 engine, with 27,313 miles accumulated on the oil. Fuel dilution was excessively high at 6.6% and consequently, the viscosity dropped to 9.9 cSt. Even with this high fuel dilution level, AMSOIL Premium 5W-40 Diesel Oil kept wear metals and oxidation levels below condemning limits.

For reference, the following sample was collected from a Caterpillar C13 engine that pre-dates 2007. The oil analysis results are typical of diesel engines without mechanical problems.

Manufacturer/Model Caterpillar C13	
Lube Time (miles)30000	
Fuel	<1%
Soot	0.1%
Water	<0.1
Visc. 100C	14.5
Oxidation	7
Wear Metals (PPM)	
Iron	34
Lead	13
Tin	1

Sample 3

Sample 3 was collected from a 2006 Caterpillar C13 engine that had accumulated 30,000 miles on the oil and had less than 1 percent fuel dilution. Without fuel contamination, the oil maintained viscosity at near-new levels, oxidation remained well within normal limits and there was no sign of any abnormal wear metal development.

Research revealed a high level of fuel dilution in many 2007–2009 Caterpillar C13 and C15 on-highway engines. This information is being communicated to AMSOIL Dealers and customers to raise the level of concern when extending oil drain intervals.

RECOMMENDATION:

Although AMSOIL Premium Diesel Oils have shown the ability to maintain integrity in some fuel-dilution conditions, AMSOIL is forced to adjust its drain interval recommendations for 2007–2009 Caterpillar C13 and C15 on-highway engines as a precautionary measure.

In these applications, AMSOIL recommends changing AMSOIL Premium API CJ-4 Synthetic Diesel Oils (DEO, DME) at the manufacturer-recommended drain interval. Drain intervals may be extended further for these applications, but through oil analysis only. Operating conditions and drain intervals for severe and normal service are defined by the original equipment manufacturer (OEM). Refer to your owner’s manual for details.

Fuel dilution has not been an issue in pre-2007 Caterpillar C13 and C15 on-highway engines and the drain interval recommendation for these applications has not been affected (3X OEM, not to exceed 50,000 miles/600 hours, or one year).

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