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## INFORMATION SHEET & FAQ's

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| <b>Date:</b>   | August 2009   |
| <b>Topic:</b>  | <b>LOW SAPS ENGINE OILS</b>   |
| <b>Segment</b> | Passenger Car Motor Oil, Car & Light Commercial Diesel, Sports Utility Vehicles |

### ***A short history vehicle evolution.....a move towards low exhaust emissions in the 2000's***

Much of the developed world is now putting in place policies for cleaner air quality, motor vehicle exhaust emissions are now being subjected to strict rules and regulations with even tighter limits in the planning for future years. Air quality is a major area for ongoing social cost. Health, environmental, and quality of life are just some of the areas Governments and groups of Governments are now pushing for improvement. Europe has generally lead the way in this area. With much of Europe densely populated and using various form of vehicular transport in their day to day lives, the European Commission in conjunction with ACEA has set limits on vehicle emissions.... starting with Euro I (1), II (2), III (3), and in 2005 Euro IV(4). Euro V (5 ) limits also planned and are soon to take effect. The USA has set similar bench marks, Asia having many manufacturer alliances in both economic and technical sense are also moving in this direction. In order to fall into line with these new regulations, car and light commercial manufacturers have made some significant design changes to their product, many of which have had an effect on engine lubricants.

### ***Who Is ACEA?***

ACEA is the European Automobile Manufacturers Association. It is a body formed from 15 high profile member manufacturers such as BMW, Ford, Porsche and Renault to name a few. Among ACEA's many roles is a significant influence in the setting of emission levels from motor vehicles and setting guidelines for lubricants via its European Oil Sequences documents. These sequences define the minimum quality level of a product for presentation to ACEA members. ACEA itself does not certify oils or license or register compliance certificates. Lubricant manufacturers carry out all oil testing and evaluation in order to meet or exceed the requirements of ACEA and/or any specific requirements of member manufacturer companies. ACEA in effect performs a similar role in it's region to the API or American Petroleum Institute in regards to the setting of lubricant standards.

### ***In terms of air pollution, what are the Euro standards looking to achieve ?***

Euro emission standards are aiming to reduce the following by-products from vehicle exhausts.

- CO<sub>2</sub> :- Carbon Dioxide.
- NO<sub>x</sub> :- Oxides of Nitrogen.
- Particulate Matter :- Which is minute solid particles exiting with the exhaust stream into the atmosphere. Others include;

- CO :- Carbon Monoxide
- HC :- Hydrocarbons

Both of which have been on the hit list for a long time.

### ***What key changes have been made to vehicles to meet the Euro IV requirements ?***

#### **Petrol engines**

- Energy efficient designs:- Improvements to existing technology by new electronic engine management systems, more efficient catalytic convertors, engine component improvement and changes to provide reduced emissions through better fuel consumption.

#### **Diesel engines**

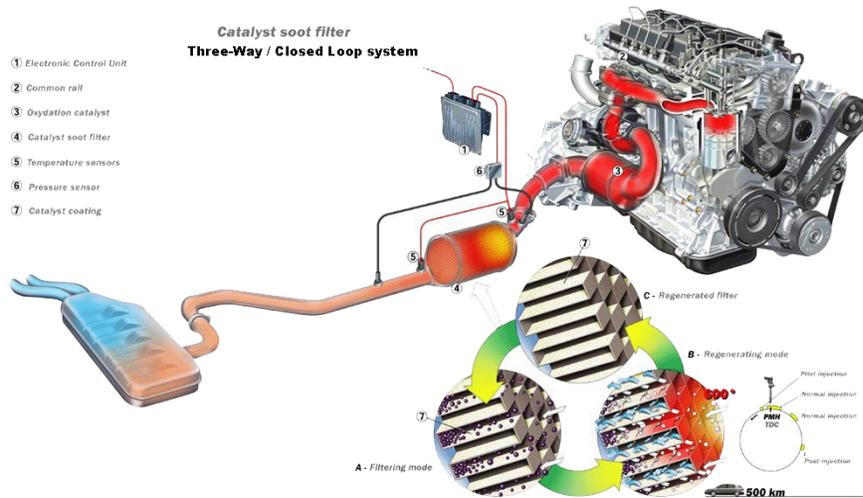
- Exhaust After-Treatment:- It's role is to reduce the particulate matter emitted to produce in effect a virtually smoke-free exhaust.
- Improved fuel injection systems :- High pressure fuel injection for better fuel atomization, common rail fuel supply, electronic fuel injection.
- Engine design :- Direct injection, energy efficient cylinder head and valve train systems. Closer piston to bore clearance, and modified piston ring positioning to assist in efficiency and lower emission outputs.

### How is Exhaust After Treatment achieved ?

Diesel Exhaust After Treatment (DEAT) is commonly achieved in three main ways

- Diesel Particulate Filters:- (Known as DPF for short) It's role is to reduce the particulate matter emitted to produce in effect a virtually smoke-free exhaust. Depending on the design of the DPF, they can remove anywhere between 85% and close to 100% of sooty particulates. The filters need to have a method of disposing of the captured particulate. Some filters are single use and are therefore disposable. While others are designed to burn off the accumulated particulate, by use of a catalyst, ECU initiated routines such as a fuel burner to heat the exhaust gases, or use higher temperatures of high speed highway activity to eliminate the accumulated particulates. Filter regeneration systems also exist to extend the service life of the units. Sulphur in the fuel interferes with many regeneration systems, so almost all countries interested in the reduction of particulate matter are also regulating fuel sulphur levels.

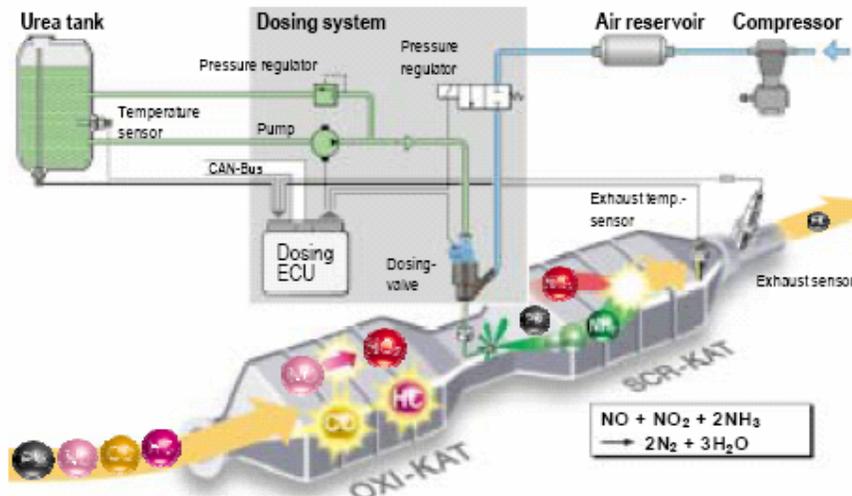
#### A typical DPF System



DPF systems are commonly used in diesel powered cars, light commercials and heavy trucks. They have started to appear in Australia from 2007 and have become common through 2008 and 2009.

- Urea injection (SCR or Selective Catalyst Reduction) :- SCR exhaust gas treatment injects a solution of liquefied Urea which acts as reductant (Commonly sold as AdBlue or No-Nox) into the exhaust gas stream prior to a catalytic converter. A chemical reaction inside the catalytic converter neutralizes the NOx emissions. Higher combustion temperatures mean that particulate matter is hardly produced. SCR engines are generally more fuel efficient, but this is off-set to a degree by the need for the Urea reductant.

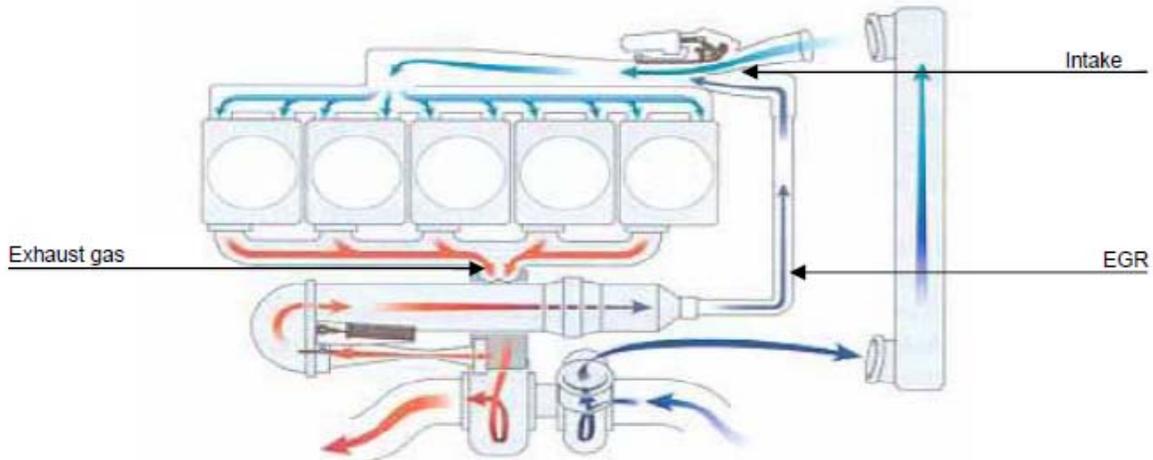
#### A typical SCR System



Currently SCR systems are common in Heavy Transport & Trucking, but are starting to appear in farming equipment and may enter the car and light commercial market places in the future. Trucks produced in Europe and some Japanese/Asian vehicles use this system.

- EGR (Exhaust Gas Recirculation) :- EGR is used reducing NOx gases especially in many petrol and diesel engines. In diesel engines some of the exhaust gases are cooled and rerouted back into the engine and mixed intake air. The combustion temperatures are cooled somewhat and the oxygen content of the fuel/air mix is reduced which result in less NOx formation. As combustion at lower temperatures does not reduce particulate matter, varying forms DPF's are used often in conjunction with "de-rated" motors using higher fuel injection pressures for better fuel atomisation to eliminate most of the particulate matter.

A typical EGR System



EGR systems are most common in heavy transport and align with some Euro III and many Euro IV compliant vehicles. European, Asian and American technology heavy vehicles use this system in some form or another.

#### ***What has Euro IV meant for engine lubricants?***

To effectively lubricate these newer technology high speed high horsepower diesel engines, engine lubricants have naturally needed to be improved. They have to;

- Be generally of lower viscosity, and offer a wider viscosity range to cater for change in engine designs such as closer internal clearances and tolerances.
- Use highly stable "stay in grade" synthetic base oil and additives to allow for extended drain intervals and reliable performance in extremes of environmental and mechanical conditions.
- Be low in Sulphur and Phosphorous (Low SAPs) to preserve petrol engine catalytic converters, and diesel engine DPF's service life.
- Be a fuel conserving style of lubricant to assist in achieving exceptional fuel economy common to the new generation of motor vehicles.
- Be effective in keeping hard oil deposits and sludge to a minimum, keeping engine cleaner inside for longer between oil changes.

Therefore Euro IV Low SAPs lubricants are very sophisticated lubricants and are somewhat more expensive a formula than the regular and mid SAPs products of equivalent grade and service level.

#### **Low SAP's lubricant FAQ's.**

##### ***What are some of the more common makes and models using DPF systems or requiring a Low SAP's oil that I will encounter?***

Generally speaking the cars, sports utility and light commercial vehicles made from 2007 powered by high speed diesel engines are most likely to use DPF exhaust after treatment. Vehicles fitting within this category and using an automatic transmissions generally always use a DPF, while the manual transmission versions often do not.....the vehicle owners manual will give a clear indication of what is required. Alternatively the Peak Lube Line can offer technical assistance. Phone 1300-722 256.

Common makes and models with Turbo Diesels made between 2007-2009 needing ACEA A3/B4 or A3/B4/C3 lubricants are; (Cars only.....for a complete list see Peak Lubricants technical)

- |  |                        |
|--|------------------------|
| • Audi                                       | • BMW 320D             |
| • Chrysler                                   | • Citroen C3           |
| • Fiat 500 TDi & Punto                       | • Ford Focus & Mondeo. |
| • Holden Astra AH & AH, Captiva CG, Cruze JG |                        |



- Hyundai I30
- Mazda CX-7, (Mazda 6 ACEA C1 required)
- Mercedes Benz A180
- Renault Laguna II
- Volvo C30, S40, V50, XC60, XC70, XC90.
- Kia Grand Carnival
- Peugeot 207, 307, 308, 407.
- Volkswagen Golf 1.9, Golf 2.0, and 103, Jetta, Passat & Polo TDI,

***How will I know that the oil I've selected is Low SAPs?***

Generally speaking the oil will be clearly labeled indicating low SAP's rating. Within the labeling detail most packaging will indicate an SAE rating for the viscosity grade, an API rating which indicates how modern the lubricant is when relating to American and many Asian spec requirements (API SM is the highest petrol engine / spark ignition rating currently) and an ACEA rating for the European specifications, and finally some dedicated manufacturer E.g. BMW Long Life 04, or Volkswagen VW505.00 etc. When it comes to a dedicated low SAP's formula the ACEA rating will generally list a "C" classification which indicated suitable for use where exhaust after treatment is used....i.e. DPF's or Catalytic convertors.

***If I use the wrong oil what will happen?***

If you use the wrong oil in a vehicle requiring a Low SAPs oil this is not an ideal practice. The DPF unit has an expected service life and requires the correct lubricant for the regeneration process and hence maximum life expectancy. It is expected that using the wrong lubricant long term will shorten the life of the DPF unit. Some operating problems such as drivability, abnormal oil consumption, and hard starting maybe experienced. Using the wrong viscosity can in some instances will not allow the vehicle to start. Hence using the correct product is the desired course of action for reliability and longevity.

***What does the number designate.....E.g. ACEA C1, C2, C3, C4?***

This number indicates a specific Sulphur and Phosphorous limit, and in turn designates the alignment towards a certain vehicle manufacturer requirements.

ACEA C1 :- Is a stand alone spec for a narrow field of application which relates specifically to Mazda and Ford, offers low SAPs and fuel economy. Generally C1 lubes do not achieve an API SM rating hence have limited application outside of the manufacturers listed.

ACEA C2 & C3 :- Offer a very broad application platform and covers the greater number of low SAP's requirements. They are aligned with API SM hence offer some excellent service in vehicles of more standard requirements, and have ACEA A5/B5 (for C2) and A3/B4 (for C3) specifications by default.....adding again to their versatility.

ACEA C4 :- Is again a dedicated specification which relates only to Renault at present. C4 cannot accompany API SM and is hence a stand alone product.

In simple terms you need to stick with the specification listed by the OEM. If the OEM says you need C1 for example then use oil that meets C1.

***Can I use a low SAP's engine oil in older cars and light commercials?***

The short answer is yes providing a few rules are followed.

1/. If an ACEA C3 oil (for example) also lists SM, then the oil can be used in any vehicle requiring SL, SJ, SH, SG etc. However it is wise to take into account that many of these oils are low viscosity eg 5W30, 5W40, 0W40 and are not suitable in many older vehicles requiring (and which run happily on ) a 15W40, 15W50 20W50 viscosity. They are also very expensive formulations and would not be cost competitive in older applications; when compared to a high quality regular SAPs engine oil in the 15W40 to 20W50 grade range, however if the Low SAP's product selected meets viscosity requirement and the additional expense is not in consideration then they can be used.

Generally speaking a cut-off at models made before 2000 is a reasonable and balanced time frame.

2/. That the vehicle must ideally have some sort of exhaust after treatment, i.e. a catalytic convertor for petrol engines or a DPF for the diesel motors. The key is that vehicles produced up until 2000 are better suited to a formula with conventional Zinc levels, hence they will have a greater life span.

***Can I use a low SAP's engine oil in petrol powered cars or LCV's on dual fuel or dedicated gas?***

Yes these products will do a excellent job providing a the following criteria are met;

- 1/. Is the viscosity grade suitable for the car?
- 2/. Is the vehicle suited to a API SM rated oil, or an ACEA A3/B4 or A3/B4/C3 spec'd engine oil?



Again the additional expense of the higher spec'd oil is a consideration. In general sense LPG fueled vehicles are often better served on other formulations; for example a 15W40 diesel dedicated product such as Peak Synpro Diesel 10W40 CI4/SL Semi-Synthetic, Peak Global Diesel 15W40 CI4/SL, or Peak Performance Diesel 15W40 CH4/SJ are all options. They are low to medium ash formulations and perform well in gas fueled vehicles. Their high performance additive packs and stable base oil will counter the by-products and elevated combustion temperatures common to LPG.

LPG while offering a cheap, environmentally friendly fuel, does produce some particularly aggressive acids and other chemical compounds which can do damage to engine internals. The build up of these products which are not easily identified by discoloring of the crankcase oil can have a dramatic effect on engine bearings and valve guides. Diesel dedicated engine oils in these applications use their robust acid fighting, heavy-duty credentials to great effect.....again the viscosity selection is important.

**Can I use a low SAP's engine oil in European vehicles and those from other areas like Asia ?**

The short answer is yes. As low SAP's oils available in Australia are generally accompanied by both API and ACEA specifications provided the lubricant covers these requirements and the SAE viscosity grade is within that required they can be used. Again the year 2000 limit is a good guide as well.

**Is there any application that I should definitely not use a low SAP's engine oil in ?**

Yes, as Low SAP's engine oils are characteristically low in Zinc they should not be used where a lubricant where a more traditional Zinc level is required. E.g. 4-Stroke Outboard Motors, small air-cooled stationary motors, 4-Stroke motorcycles, ATV's and Ag vehicles, and engines that have more conventional valve train systems. I.e. side valve, push-rod OHV, flat tappets and early roller cam motors. These engine types obtain the most longevity with lubricants offering higher Zinc levels. Looking at the engines in vehicles built up to Yr 2000 as a limit, this in a general sense aligns with oils with a regular SAP's and Zinc levels. If in doubt contact the Peak Lube line.

**Is there a general guide to ACEA specs and the OEMs ?**

Yes, the table below gives a general guide to the requirements for manufacturers and their requirements.

| REGULAR SAPS LUBRICANTS                |                                  |   |                                   | LOW SAPS LUBRICANTS                               |                              |  |  |
|--|----------------------------------|---|-----------------------------------|---|------------------------------|--|--|
|  |                                  | Renault RN0700<br>RN0710                |                                   |   |                              | Isuzu PC<br>Mitsubishi                                 |  |
|  |                                  | Volkswagen VW<br>502.00 VW505.00        |                                   |   |                              | Volkswagen VW<br>504.00/507.00 VW<br>502.00/505.01     |  |
| Volkswagen VW<br>501.01 & VW<br>505.00 |                                  | Mercedes Benz MB<br>229.5 MB            |                                   | Renault RN0700                                    |                              | Mercedes Benz MB<br>229.51 MB                          |  |
| Mercedes Benz MB<br>229.1              |                                  | Opel (GM)<br>GM-LL B-025                |                                   | Opel (GM)<br>GM-LL B-025 with<br>B4 limit for TDI |                              | 229.31   |  |
| Ford VSS-<br>M2C 913E                  | Porsche                          | BMW Long<br>Life 01                     | BMW Long<br>Life 01FE             | Mazda<br>Service Fill                             | Nissan<br>Service Fill       | Opel (GM)<br>Low SAPs Draft                            |  |
|  |                                  |   |                                   | Ford<br>VSS-M2C 934A                              | PSA                          | BMW<br>Long Life 04                                    | Renault<br>LLR / RN 0720                               |
| ACEA A1/B1                             | ACEA A3/B3                       | ACEA A3/B4                              | ACEA A5/B5                        | ACEA C1   | ACEA C2                      | ACEA C3  | ACEA C4  |
| Standard Quality<br>& Fuel Economy     | Higher Quality &<br>Longer Drain | Highest Quality<br>DEO or Long<br>Drain | Highest Quality &<br>Fuel economy | Low SAPs and<br>Fuel Economy                      | Mid SAPs and<br>Fuel Economy | Mid SAPs   | Low SAPs   |
|  |                                  | Fulfills A3/B3                          | Fulfills A1/B1                    | Fulfills A5/B5                                    | Fulfills A5/B5               | Fulfills A3/B4 with<br>higher limit on<br>wear and TDI | Noack Volatility<br>11%, TBN > 6,<br>M111, RN 100 > 40 |

Please feel welcome to ring the Peak Lubricants Lube line on;

**1300 722 256** if you require further information or advice.

- Service bulletins and material safety data sheets (MSDS's) are available on request.
- **Established in 1982, Peak Lubricants P/L** is an Australian Owned and Operated Company dedicated to providing its Customers with **Goods and Services of the highest quality.**
- All products are 100% guaranteed and meet or exceed all SAE, API Specifications, and where indicated ACEA
- **Peak Lubricants Pty Ltd** Is a fully endorsed distributor and reseller for international lubricant manufacturing group **Total-Elf** products in Victoria