Memo

To:		**From:**	Nigel McKenzie
Cc:		**Date**	18/02/06
Subject:	Engineering Bulletin – Oil Trending		

A number of questions have come my way regarding the increase in the "life" of oil after the use of X-1R. In most cases the oil change interval can be dramatically increased but it is not safe to ignore the manufacturers oil change recommendations unless you can analyse the oil, this is also known as Oil Trending. This then begs the question, "how do you trend oil?". As is so often the case, the question is simple but the answer is not!
Here's a shot anyway.

The basic assumption the ministry has made is correct if you start out with a new engine, but not so for an old, worn engine. In the latter case if the friction level in the engine is reduced, the engine will likely last longer than otherwise, but not necessarily the oil!

Engine oils consist of two basic components. First, a base oil which can be derived from crude oil, be synthetic, or a blend of the two. Second, an additive package that contains a complex mixture of chemicals that are designed to provide the base oil with enhanced wear protection, corrosion protection, enhanced oxidation resistance, acid neutralization ability, deposit detergency and dispersancy, and modified viscosity and flow properties.

As mileage is accumulated on a given oil the individual components within the additive package are consumed, and at some point the protection they provide for the base oil is no longer there. The oil must be changed before the protection is depleted or else catastrophic failure can occur. As a general rule, the older the engine (or the greater the wear within the engine), the quicker the additive package will be depleted. This is because the piston ring "blow-by" gases that consist of partially combusted fuel and acid pre-cursors are the main consumers of the add-pack, and they are usually greater in an old (worn) engine.

In the U.S. the big truck fleets are very skilled at maximizing the life of their engine oils. They conduct a number of tests on the new old, and then at the periodic service intervals they repeat the tests and monitor any changes. At some point they reach what from previous experience they have defined as a "condemning limit" in one of the tests, and that indicates time to change the oil.

The tests that would be run to monitor the useful life of a gasoline or diesel engine oil are similar, but the condemning limits would likely be different, and to some extent would depend on the specifications and quality of the local fuel being used. I've listed the key tests and what they measure below. In the U.S. there are many private labs that are set up to receive used oil samples from truck fleets and quickly perform these tests at an economical cost.

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1. Any significant change over time of the oil viscosity and Viscosity Index (VI) can be a problem indicator. The viscosity is measured by ASTM D445, and the VI calculated using the methodology described in ASTM D2270.

2. For diesel engine oils, especially those operating on high sulfur fuel, a significant drop in the Total Base Number (TBN) of the oil is important. TBN is measured by the ASTM D4739 procedure.

3. All oils become corrosive if there is a significant increase in their Total Acid Number (TAN). TAN is measured by ASTM D664.

4. The above tests are fairly easy to run, and don't require expensive equipment. If these properties are in good shape then the oil probably has lots of life left in it. As a further precaution the more sophisticated companies measure the level of additive and "wear" metals in the used oil. This requires an expensive spectrometer, but the levels of iron, copper, and lead detected are usually very definitive of the oil condition, since they are primary wear metals. The procedure for this is ASTM D5185.

5. A final simple test that some use detects the presence of trace quantities of ethylene glycol (as from anti-freeze) in the oil - indicative of a head gasket leak - using ASTM D4291.

With the exception of the ethylene glycol test, I've attached very brief summaries of the other procedures. Some of them contain references to equivalent IP (British Institute of Petroleum) or ISO test methods, which may be of more relevance in Malaysia.

Hope this is helpful for you.

Best regards,

Mac.

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