Nephron technology for lube oil

Nephron technology makes a difference Engr Maliha Maisha Rahman Bannichi Enterprise limited Literature Review: TBN: In short, a TBN (total base number) measures the amount of active additive left in a sample of oil. The TBN of a used oil can aid the user in determining how much reserve additive the oil has left to neutralize acids. The lower the TBN reading, the less active additive the oil has left. Oil’s function is to lubricate, clean, and cool the engine. Additives are added to the oil to enhance those functions. Viscosity: Technically, viscosity is defined as resistance to flow.

Commonly though, we think of it as an oil's thickness. To be more specific, it is the thickness of an oil at a given temperature. The viscosity of an oil could be reported at any temperature, but to standardize things, most laboratories report either a low temp (100F or 40C) or a high temp (210F or 100C) and stick with either SUS or cSt. The standardized temperature reading allows us to compare apples to apples for judging the thickness of the oil. Single Grade ; Multi Grade Viscosity: today since most gas- or diesel-engine manufacturers recommend multi-grades.

At operating temperature, a straight weight performs just as well as a multi-viscosity oil, and there is nothing wrong with using a straight weight. It's just a simpler form of oil. Some diesel fleets still use straight weights, as do about half the piston aircraft operators. The difference between multi-grade and straight-weight oil is simply the addition of a viscosity improving (VI) additive. The most common grade of automotive oil in use today is the 5W/30, which is a mineral oil refined with VI additives that leave it reading as an SAE 5W viscosity when cold, yet an SAE 30W when hot (210F).

The advantage to the multi-weight is that when starting the engine, the multi-viscosity oil (with its thickness of an SAE 5W when cold), allows the engine to spin over more easily. The most common diesel use oil is 15W/40. It is an SAE 15W oil with a VI additive that leaves it the thickness of an SAE 40 weight at operating temperature. What makes an oil a diesel-use oil (rather than automotive-use) is the level of additives used. Diesels require heavier levels of dispersant and anti-wear additives. These heavier additive levels are objectionable for automotive engines since they may interfere with the emission controls andated by the EPA. Need To Choose the Proper Viscosity: We are seeing that trend for newer engines, for which the recommended grade is getting progressively lighter. The common 10W/30 has become a 5W/30, and some manufacturers even recommend 5W/20 oil. On the other hand, we can't see (in oil analysis) where it hurts anything to run heavier 10W/30s or even 10W/40s in modern automotive engines. The heavier oils provide more bearing film, and that's important at the lower end. If your oil is too light, the bearing metals can increase. If the oil is too heavy, the upper end metals can increase.

The trick is to find the right viscosity for your particular engine, which is why we suggest following the manufacturer's recommendation. Changes in Viscosity/Adding additives? Then the Result Comes: Adding anything foreign to your oil can change its viscosity. Some types of after-market oil additives cause a quite high viscosity at operating temperature. While an additive might improve bearing wear, it can often cause poorer upper-end wear. We don't recommend any type of after-market additives. Other changes to viscosity can result from contamination of the oil.

Moisture and fuel can both cause the viscosity to increase or decrease, depending on the contaminant and how long it has been present in the oil. Antifreeze often increases an oil's viscosity. Exposure to excessive heat (leaving the oil in use too long, engine overheating) can also increase viscosity. When your oil's viscosity comes back as either lower or higher than the " Should Be" range, something is causing it. If the high/low viscosity is hurting wear, the key is to find out what it is and repair your engine or adjust your driving habits accordingly, to correct the viscosity and optimize your engine's efficiency.

If you decide to use a different viscosity oil than what the manufacturer recommends, you might want to use oil analysis while you are experimenting. Your wear data doesn't lie. People selling oils and additives may be sincere, but they don't have to live with the results. They simply smile a lot on the way to the bank. MoistureProblems: Industrial oils run " cold" compared to other (such as automotive-use) oils, and they tend to accumulate moisture. The moisture comes from humidity in the air, or in some cases, it's directly introduced to the oil from coolants and related systems.

Moisture affects the lubricity of the oil, decreasing its effectiveness. Moisture in the oil can cause a variety of problems, such as poorly running hydraulic rams, machine sizing, and chatter. Another negative effect of moisture in oil is acidity. Oil, by its molecular nature, cannot become an acid. But there is always a little moisture present in oils operating at relatively cool temperatures, and that moisture can turn acidic. Acids in a machine's oil

sump will corrosively attack internal parts not only the metallic parts, but the seals as well. Corroded valves become ineffective.

Many headaches in a machine's operation can be directly attributed to oil condition. Though oils do not respond to the pH test, there is a neutralization test called Total Acid Number (TAN) that can easily spot oil that is becoming problematic. AbrasionProblems Industrial oil becomes abrasive from wear metals, abrasive dirt, and particle contamination. The most serious result of abrasive oil is the detrimental effect it has on seals. Machine seals are lubricated by the system's oil, and they will last a long time if the oils are maintained effectively.

If they are not maintained properly, the seals will degrade and cause leakage. Leaking machines require pans under them, which need to be vacuumed regularly, and the waste oils pose a disposal problem. Fresh oil is purchased needlessly, running up maintenance costs. Machines that leak oil also run the risk of being run low on oil and having improper oils used as replacement. All these expensive problems can be eliminated by keeping machine oils in serviceable condition. WhatAboutFilteringOil? Many industrial operations hire filtration companies to filter insolubles and abrasive contaminants from their oil.

Some plants operate their own filtration equipment. Filtering oil that's currently in use is a good idea, and it helps companies avoid needlessly purchasing virgin oil products, but it has limits. Oil that is filtered too many times can contain damaged additives. If the additives are damaged, the oil can't function effectively: the oil loses lubricity and becomes oxidized. There is a point at which the additives either need to be restored or the oil needs to

be replaced, and oil analysis is useful in determining this point. It can also help to rate the effectiveness of a company's filtration program.

Not all wear metals and abrasive contaminants can be filtered out of the oil; they tend to accumulate and eventually reach levels that leave the oil unserviceable. A test known as the ISO Cleanliness Code (also called a " Particle Count") can be used to rate the cleanliness of an oil sample. This test also shows the effectiveness of the machine's in-line oil filtration. Insolubles test : The insolubles test measures the total insoluble materials in an oil sample, that is, all solid or liquid materials that are not soluble (won't mix) in oil.

Virgin oil shouldn't have any insoluble materials in it. When it occasionally does, the most we normally find is a trace level. The insolubles in virgin oil are from the normal oxidation process of the oil, which leaves free carbon in suspension when oxygen forms with hydrogen (oil is a hydrocarbon). The insolubles test is a centrifuge method. A measured volume of oil is mixed with a heated solvent, agitated, and spun at high speed. Insoluble materials collect at the bottom of a tapered glass tube and can then be quantified.

The insolubles test is a fair measure of how fast the oil is oxidizing and receiving contaminants, and how effectively the system's oil filtration is functioning. Industrial oil normally contains very low insolubles due to the few and relatively mild heat cycles the oil experiences (heat cycles accelerate the oil's normal tendency to oxidize). Further, oil filtration on industrial machines may filter particles as small as 2 to 10 microns, keeping the oil pristine for a very long time, often years. Automotive and aircraft oils

however, suffer the most difficult environmental problems of all types of oils we analyze.

They regularly receive blow-by products from the combustion process. They suffer extreme heat cycles. Any contaminant in the oil will accelerate the oxidation process, causing insoluble materials to increase. Engine oil needs to be changed regularly due to all of the above. Excessive insolubles can form in an engine oil if the oil: is running hot, is receiving more than a normal amount of contamination, is suffering more (or more severe) heat cycles than is normal, is being run longer than a typical use cycle, or, on the other side of the coin, if oil filtration is marginal or relatively ineffective.

If we found no contamination in your oil and your change intervals are normal, we often mention a problem at oil filtration as a possible cause of higher insolubles. Insolubles may be forming because your oil change interval is too long for the condition of the engine. Your oil filter may be inferior. It is possible the oil filter bypass valve has relived if the filter is becoming restricted. The filter system bypass may also open upon unusually cold starts when the oil is too thick to pass through the filter media. Once the bypass relieves, the filter is effectively out of the system.

Fig: insoluble pentane and tolueneReport of E16(without using nephron system) and E-45 (with our nephron system): Figure: working procedure of nephronMarine Engineering thesis- 30000 hours lubricating oil continued using experimentEngine specification, graphs showing lube oil change and viscosity, Tables showing wear and tear ratio. Engine Specification Engine model| | 8N21AL-EV| | Type| Vertical water-cooled 4-cycle diesel engine| Number of cylinder| 8| Cylinder bore x stroke [mm]| 210 x 290| Total

displacement [lit.]| 80. 36| Continuous rated output [kW(PS)]| | 1300 (1768)| |

Engine speed [min-l]| | | 900 | 1000| | | Generator capacity [kWe]| | 1200| | Combustion system| Direct injection| Starting system| Air-motor starting| Engine model| | 6N21AL-EV| | Type| Vertical water-cooled 4-cycle diesel engine| Number of cylinder| 6| Cylinder bore x stroke [mm]| 210 x 290| Total displacement [lit.]| 60. 27| Continuous rated output [kW(PS)]| | 970 (1319)| | Engine speed [min-l]| | | 900 1000| | | | Generator capacity [kWe]| | 900| | Combustion system| Direct injection| Starting system| Air-motor starting| | | | | | | | | | | | | | | | | | | | | | | Conclusion: The nephron system cleans the impurities in the LO at almost the same time that they appear, continually cleaning and maintaining the oil. This is the main reason why this system was selected for this experiment. Those particles of the lube oil that do deteriorate via oxidation are so small when using the filtration system of the nephron system that they can be disregarded. The particles of lube oil that is lost when using lube oil are those that are oxidized, evaporated or destroyed by high temperature.

In other words, the ratio of molecules with large molecular weight grows as time passes using the lube oil. This is because the molecules which are smaller are more susceptible to heat and are therefore lost more easily. The oil begins to resemble the properties of the high grade naturally occurring lube oil in such location as bright stock. The actual burning proof load of this oil is approximately 25% better than that of new oil. For these reasons it is natural to use nephron system. The more time proceeds it gets more viscous.