USED OIL ANALYSIS INTERPRETATION.

Monitoring the condition of the oil in use is of vital importance not only for the good operation of the engine but can also considerably increase the operational life of the Lubricant.

Used oil Analysis and correct interpretation of the results obtained can indicate any trends on the condition of the oil, the operating performance of the purifier and, of major importance, to detect a damage or malfunction at the very beginning.

The Engine/Machinery maker may recommend the frequency of the Analysis, but operating conditions can dictate action for analysis. If the condition of the oil is in doubt, then it is recommended to proceed with new analysis after recommended actions will be taken.

For the Main Engine 3 analysis per year is adequate provided that the condition of the oil found satisfactory.

Sampling procedure
-The sample must be representative of the whole charge in the system
-The sample must be taken into the bottles supplied by the Lubricant supplier to avoid contamination after sampling
-The samples must be fully identified
-The same sampling point / cock must be used each time
-Preferred location is in the main supply line and after the filter.
-The sample must be taken only when the engine is in operation and the Oil temperature has reached its normal operating levels.

PARAMETERS MEASURED

1)KINEMATIC VISCOCITY

Kinematic viscosity is expressed in centistokes, formerly measured at 40 C but recently it was recommended to be measured at 100 C. To obtain the Kinematic viscosity at 40 C and provided that the Viscosity Index of the oil is about 100 the following table can be used:
The most common reason for the Viscosity increase is the appearance of Total Insolubles but it may also indicate contamination with a heavier grade, contamination with HFO or even oxidation of the oil. Decrease in Viscosity generally

indicates contamination with MDO / MGO. Water can also change the viscosity if emulsions are formed

2) VISCOSITY INDEX

Indicates the resistance of the oil viscosity to the changes of the temperature. [The higher VI means smaller decrease in viscosity as the working temperature increases]

3) FLASH POINT

Is the lowest temperature at which the vapor above the liquid will ignite when a flame appears. It is expressed as "closed" or "open" depending on the test method in use. Flash point of 200 C and above is satisfactory. Bellow 180 C immediate action needed. Depression of flash point indicates contamination with Fuel

4) TOTAL INSOLUBLES

These are particles derived from products of combustion blow by the piston Rings and are expressed as a percentage of the quantity of the oil. It also includes burnt lubricant and additives, rust, salt, wear and Abrasive particles. The maximum percentage of Total Insolubles accepted depends on the BN of the oil in use and is determined by the engine makers

5) BASE NUMBER (Former TOTAL BASE NUMBER)

The Base Number (formerly Total Base Number) is the alkaline reserve incorporated into the oil on purpose to neutralize the acidic products of the combustion created due to the presence of the sulphur into the Fuel. It is expressed in mg KOH/g. Base Number decreases during engine's operation. Lowest acceptable limit is 50% of the new oil, but for exact limits please refer to Maker's recommendations.
High piston ring and or cylinder liner wear resulting excessive blow by can increase the BN depression.
Sump tank capacity can also affect the BN depreciation as the small quantity of the oil in circulation contains small quantity of total alkalinity too, which will be neutralized faster.
Modern Trunk piston engines running with IFO 380cst and designed to have very low L.O. consumption (0.55-0.65 gr./BHP/ hr) can also face rapid BN depreciation.
The BN of circulating oil in Crosshead engines some times increases due to contamination from cylinder oil.

6) WATER

Fresh water may appear due to Jacket or piston cooling water leaks or in some cases due to condensation inside the crankcase or in scavenge space. Salt-water maybe originated from cooler leaks but sometimes seawater enters into Lube. Oil tanks and sump tanks via broken filling lines and or air vents. In some cases, detected water can be partly fresh and partly salt. At the most of those cases the water is fresh, coming from the jacket cooling water system but the chlorides of the chemical additives added in the cooling water for cooling space protection leads the Laboratory to wrong assumptions. The maximum acceptable level is generally 0.2%

7) WEAR METALS

The most common method to detect and quantify wear metals is using spectroscopy. Results may detect and quantify and other elements which are not wear metals. Example of these is Silicon, contaminants originated outside the engine (Sea water, Air, Fuel) or elements originating from oil additives. (See table below for the possible origins).
The importance of the findings is not the quantified result but the comparability with the previous ones through which trends can be detected. Acceptable limits vary. Makers have defined specific limits for their engines which sets the parameters for Laboratories to make their comments on the findings. The following table can be used as general guidance:

METAL	Normal Accepted	Check is required	Mandatory action
IRON	0-60	60-100	>100
ALUMINIUM	0-10	10-15	>15
COPPER	0-25	25-40	>40
LEAD	0-20	20-40	>40
CHROMIUM	0-10	10-15	>15

Metal elements quantified indicate the condition of the engine rather than the condition of the oil. This is of major importance as the correct interpretation of the results can give advance guidance of a problem at its initial stage or about to occur. These materials can be either “wear metals” or “contaminants” a combination of

both or the lub oil additives, example Magnesium or Zincwhich can be “wear metals” but are also used in Additives as well. Their possible origins are:

Wear metals possible origin:

a)Aluminium (AL)
Pistons, Bearings. Also as contaminant from residual Fuel
b)Chromium (Cr)
Cylinder liners, Piston rings, Crankshaft
c)Copper (Cu)
Bearings, Coolers
d)Iron (Fe)
Cylinder liners, Piston rings, Crankshaft, Cams, Gears.