

2 Testing

Various tests and analysis will be carried out at testing laboratory on the received samples such as:

- General Quality Control Test
- Special Analysis Tests as requested

2.1 General Quality Control Tests

Depending on the type of the oil, equipment and operating conditions, properties of lubricating oil varies greatly during usage. To investigate the changes in the oil properties, usage conditions and selection of the appropriate tests must be taken into account.

The following tests are performed on lubricating oil samples taken for regular inspection for quality control purpose.

Items of General Quality Control Test

Types of Test	Equipment & Types of Oil	Marine System Oil	Hydraulic Oil (inc Turbine Oil)	Gear Oil
Specific Gravity	20 °C	(Note 1)		
Flash Point	(COC)	O (Note 2)		
Kinematic Viscosity	(40°C) cSt		O	O
Kinematic Viscosity	(100°C) cSt	O		
Total Acid Number	mg KOH/g		O	O
Total Base Number	mg KOH/g	O (Note 3)		
Solvent Insolubles	wt %	O (Note 4)		
Water Content	Vol %	O (Note 5)	O (Note 5)	O (Note 5)
Contamination Level (0.85u)	mg/100ml			
Colour	ASTM			

O: Executed Items

Notes :

1. Specific gravity is measured in main engine system oil only
2. Measurement of flash point is limited to 200°C. Pensky-Martens flash point test shall apply for flash point below 200°C. When dilution by fuel oil is recognized clearly, application of Pensky-Martens flash point test will be requested by the sales department.
3. Total base number is measured in accordance with GB/T7304 perchloric acid method.
4. As for solvent insolubles, analysis test will be done taking into account toluene insoluble content with N-pentance insolubles exceed 1.0 to 2.0 or 5.0 wt% subject to type of oil used.
5. Salt content reaction will be checked when water content exceeds 0.5 vol %

If any special analysis is required to investigate the cause of operational problems in equipment, please approach our Marine Oil Customer Service Department at Shanghai +86 21 5081 8361 or Singapore +65 6285 7833.

2.2 Special Analysis Tests

The following special tests will be conducted when necessary

- (1) Demulsibility Test
- (2) Foaming Test
- (3) Rust Prevention Characteristics Test
- (4) Load Carrying Capacity Test
- (5) Oxidation Stability Test
- (6) Metal Analysis Test
- (7) Component Analysis Test
- (8) Others

2.3 Significance of Each Test

The purposes and significance of regular tests for quality control are listed as follows:

1. Specific Gravity

Specific gravity does not indicate the quality of lubricating oil but is a measure of lubricant deterioration due to combustion residue and other insolubles in the oil such as oxidized insolubles. Presence of water and other types of oil also change the specific gravity. Since the type of ring dam used in the purifier is determined according to specific gravity, it is always necessary to know the specific gravity of the oil being used.

2. Flash Point

Dilution of system oil and crank case oil by fuel is inevitable. The test result will indicate the degree of dilution of lubricating oil by the fuel oil and warn of contamination of the oil which is having a low flash point.

3. Kinematic Viscosity

Viscosity of system oil used in diesel engine increases when oxidized matter or combustion residues mixes into the oil and viscosity of system oil will decrease when fuel dilution takes place. The objective of this test is to find out whether the viscosity of the oil used is appropriate. Generally, lubricating oil used in turbine engines show little change in kinematic viscosity during usage. And when there is a significant change of kinematic viscosity, it is usually due to entry of a different oil type.

4. Total Acid Number

Total acid number of lubricating oil may increase due to either entry of combustion residues or formation of deteriorated substances during usage. Combustion residue is usually the cause of total acid number increment in diesel engine. And in turbine and engine oil, quality of the oil will deteriorate during the initial stage of use due to the characteristics of the lubricating oil. Degree of oil contamination and deterioration can be determined from the total acid number.

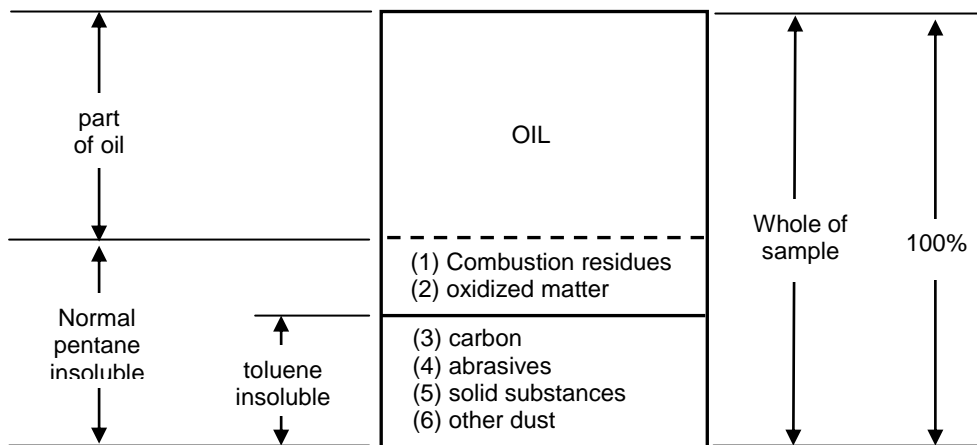
5. Total Base Number

Objective of this test is to determine how well the oil will dissolve, disperse and neutralize the acid. All of these properties are required in HD type oil. The test result will indicate the amount of cylinder oil that is mixed into premium type oils.

6. Solvent Insolubles

Solvent insolubles generally implies to normal pentane insoluble and toluene insoluble. The test results are also a measure of oil contamination and degradation. The difference between the two insolubles, known as resin quantity, indicates whether the contamination of oil is due to degradation of oil itself or due to entry of foreign matter.

Substances other than lubricating oil, such as combustion residues, oxidized matters formed by the oil itself, carbon, abrasives and solid substances entering the oil are all detected as normal pentane insolubles. Toluene insolubles detect inorganic matters such as carbon, abrasives and solid substances entering the oil. The two insolubles obtained implies as follows :



Amount of normal pentane insoluble	Amount of toluene insoluble	State of oil used
Small	Small	Little contamination or deterioration. Oil is in good condition
Large	Small	Deterioration has taken place with little contamination
Large	Large	Extreme contamination and deterioration. Oil must be purified
Extremely Large	Large	Oil should not be used and must be replaced

7. Water Content

This test determines the amount of water which has entered the oil. Increase in the water content will deteriorate the quality. And, when chlorine or substances with strong acid properties are also present, corrosion and rusting of lubricating systems are also accelerated and emulsification will take place when using HD type oil. To determine type of water, i.e. brine or fresh water, the amount of chlorine must be measured.

8. Contamination Level

This test indicates the amount of foreign matter present in the oil and is mainly done on turbine, gear and hydraulic oils. It measures the amount of impurities such as impurities, abrasives, rust, water and oxidized matter that has entered the oil during usage.

9. Colour (ASTM)

Quality of used oil is interpreted by change in appearance. Colour is a measure of deteriorated level in oil. E.g. turbine oil and hydraulic oil are light in colour when new.