



DEFINITION OF PHYSICAL PROPERTIES OF FUEL OIL

VANADIUM - Naturally found in crude oils, vanadium is considered the most detrimental metal contaminant in fuel oil. The melting points of vanadium ashes are affected by the presence of sodium. The defined weight ratio between vanadium and sodium with low exhaust temperature may cause deposits on the exhaust valves. Vanadium cannot be removed only treated.

ALUMINUM/SILICON - Is a result of catalysts used in catalytic cracking of crude oil which leave cat fines.

ASPHALTENES - The contents of asphaltenes has an impact on the combustion quality. Compatibility or incompatibility of fuel oils may be highly related to asphalt contents.

TOTAL SEDIMENT EXISTING (TSE) - The combination of inorganic and hydro-carbon sediments existing in a fuel. This test is to limit the amount of sludge present in fuel that might possibly be separated at the filters in a ship's centrifuges.

TOTAL SEDIMENT POTENTIAL - Looks at the amount of sediment in fuel after fuel has been treated. Thermally or chemically aged fuels.

SPECIFIC ENERGY - The energy available by the combustion of a fuel. Fuel measured in BTU's, calories or megajules. Most fuel sold by weight not units of energy. To get the Gross Specific Energy, need density, sulphur, ash & water specification. If an owner wants to control specific energy, he will have to specify density.

CALORIFIC VALUE - Is the energy value (BTU) you get from your bunkers. The calorific value is calculated by a formula containing the content of sulphur, water, ash and the density.

CALCULATED CARBON AROMATICITY INDEX (CCAI)

The CCAI ranks the fuel with respect to the ignition quality and higher value of the CCAI implies lower ignition quality. CCAI is a function of density of the fuel at 15° C and the Viscosity at 50° C. The value of the CCAI generally varies from 800 to 950 over the range of residual fuels. Fuels with a higher CCAI implies lower ignition quality. Fuel for medium or slow speed diesel engines should have a CCAI value of less than 850.

PROBLEMS

- Turbocharger deposits
- Mechanical wear, pump liner injector and fuel pump. Abrasive effect
- May indicate poor combustion problems.
- Sludge, clogged filters, ignition combustion, piston, cylinder liners and piston rings can damage.
- Fuel is unfilterable, cannot purify. Compatibility
- Less energy per ton therefore more money/energy spent on voyage
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- Combustion, ignition quality.



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DENSITY - is the weight of one liter of fuel at 15° C. measured in kilograms. When density is given in terms of specific gravity, it is the ratio of the weight to the volume of oil at 60° F to the weight of an equal volume of water at 60° F.

VISCOSITY - Measure of a fluid's resistance to flow at a certain temperature, viscosity is always specified at a stated temperature.

FLASH POINT - The temperature at which oil fuel vapor will flash or ignite when exposed to a flame or ignition. The U.S. Coast Guard has set 60° C (140° F) as the minimum acceptable flash point for marine fuels.

POUR POINT - The lowest temperature C or F at which oil will flow.

CARBON RESIDUE - The tendency of a fuel to form carbon deposits injection under very high temperature conditions in the absence of air. CCR has bearing on the engine's combustion performance. Thermal cracked fuels usually have a higher percentage of carbon residue.

ASH - Non-combustible residue of a fuel or lubricating oil present in fuel.

WATER - Percentage of free water that is found in fuel.

SULPHUR - An element which is chemically bonded within the molecules that constitute crude oil. It cannot be economically removed from fuel oil at the refining state, but may be blended to acceptable levels. Sulphur can lead to low temperature corrosion through the formation of sulphuric acid and therefore affects the cylinder wear rate. Its effects in an engine can be reduced by the use of appropriate cylinder lubricants.

PROBLEMS

- Fuel system, temperature pressure. Purification, ignition quality.
- Handling, heating, mixing of fuels, layering tanks.
- Storage safety.
- Flow properties, storage temperatures, filter blocking.
- Engine combustion, ignition delay, fouling of nozzles, increased valve temperature, wearing of injectors and valves.
- Mechanical wear on engine, valves and turbocharger, inhibits combustion.
- Loss of valve, purification, on board housekeeping.
- Corrosive cylinderware, (TBN) of cylinder lube, low temperature corrosive of exhaust valves.