



## Technical Bulletin

# ISO 8217:2010 Fuel Characteristic Definition

ISO specification 8217 stipulates acceptable characteristics of marine fuel oil products. In order to understand the relative importance of each characteristic it is important to understand the definition. The following definitions are deemed useful to users of marine fuels products.

### Viscosity

A measure of fluid resistance to flow. Viscosity of fuel oil decreases with increasing temperature. The viscosity of the fuel oil at the point of injection into the engine is key to performance. Viscosity is used to classify residual fuel types but is not a key indicator of fuel quality. For example, all other characteristics being equal, a fuel of 360 cSt is of no better or worse quality than a fuel of 400 cSt, it is just less viscous.

### Density

Mass per unit volume of a product. It is used to convert the volume delivered into the quantity purchased. Density varies with temperature and is an important parameter in the onboard purification of the marine fuel product.

### Calculated Carbon Aromaticity Index (CCAI)

The most widely accepted empirical formula to estimate the ignition quality of fuel oil. CCAI uses the physical properties of density ( $d$ ) and viscosity ( $V$ ) in the following equation:

$$CCAI = d - 81 - 141 \cdot \log [\log (V+0.85)]$$

### Sulfur

Sulfur is the main inorganic component of fuel. It occurs naturally in crude oils and tends to concentrate in the heavier fractions. Sulfur concentration in fuel oil strongly influences the choice of lubricant. Energy content of fuel oil diminishes with increasing sulfur.

### Flash Point

Flash point is the minimum temperature at which vapours released from the fuel oil will ignite when exposed to an open flame. The flash point of a blended fuel oil is the same as that of the lightest component in the fuel oil product.

### Acid

Generally, marine fuel products should not contain inorganic acids, however ISO 8217 allows for minimal acceptable levels.

### Sediment

Sediment in distillates is composed mainly of rust, general dirt & scale. Marine fuel oil sediment can be both inorganic and organic in nature.

### Carbon Residue

Carbon residue is a measure of the carbonaceous material left after the volatile components of a fuel have been vaporized in the absence of air. It is used to estimate the potential of a fuel to create deposits in an engine upon combustion.

### Pour Point

The pour point of a fluid is the lowest temperature at which it ceases to flow. In fuels, the pour point is largely determined by the petroleum wax content in the oil. Pour point determines the minimum temperature required for storage and handling onboard of fuel oil products.

### Ash

Ash is the carbon free (inorganic) residue remaining after completely burning the fuel in air. It occurs naturally in crude oils and tends to concentrate in the heavier fractions. Ash can contain hard and erosive particles, some of which may also be corrosive.

### Vanadium

Vanadium is a metal occurring naturally in some crude oils and is concentrated in residual components during refining. In high concentration, it can form high melting point, corrosive deposits. In combination with sodium, it can form lower melting point, oxygen deficient deposits.



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### Sodium

Sodium occurs naturally in crude oils and is concentrated in residual streams during refining. It can be introduced into fuel streams as a scavenger used to control the hydrogen sulfide content of fuel oil, via salt water contamination, or through sodium ingress into a marine diesel engine due to salt water saturated air.

### Cat Fines

Cat fines contamination in fuel oil is caused by carryover of catalytic material used in the refining process and evidenced by the presence of Alumina and Silica. Cat fines are hard and abrasive.

### Used Lubricant (or Lube) Oil

Some used lube oil may contain components harmful to an engine, but all used lube oils may not necessarily be unfit for purpose. Some additives used to identify used lube oil such as calcium are naturally occurring in crude oil and hence residual fuel. Test methods are designed to eliminate false positives.

### Calcium

A soft grey alkaline earth metal, the fifth most abundant element in the earth's crust. Essential for living organisms, particularly in cell physiology, and is the most common metal in many animals. Calcium occurs naturally in crude oils. It is introduced into the combustion space via cylinder lubrication oil. The alkaline Total Base Number (TBN) additives of cylinder lube oil contain calcium. Calcium is concentrated in the residual part of the refinery process as lighter products are removed.

### Compatibility

Compatibility of a fuel is a function of the stability of the two individually stable oils used to blend marine fuel oil when they are co-mingled. Heavy marine fuels are complex mixtures of hydrocarbons. Some very large molecules called asphaltene are held in suspension by maltenes. Mixing fuels can adversely affect this equilibrium.

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