

ISO 8217 fuel characteristic definitions



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Introduction

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

Acid

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

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.

Calcium

A soft, grey alkaline earth metal, the fifth most abundant element in the earth's crust. It is 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.

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

Carbon residue

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

Catalytic (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.

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 commingled. Heavy marine fuels are complex mixtures of hydrocarbons. Some very large molecules called asphaltenes are held in suspension by maltenes. Mixing fuels can adversely affect this equilibrium.

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.

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Sulphur

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

Used lubricant (or lube) oil

Some used lube oil may contain components harmful to an engine, but not all used lube oils are necessarily 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.

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.

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.

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.

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.

Sediment

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

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 sulphide content of fuel oil via salt water contamination or through sodium ingress into a marine diesel engine due to salt water-saturated air.

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