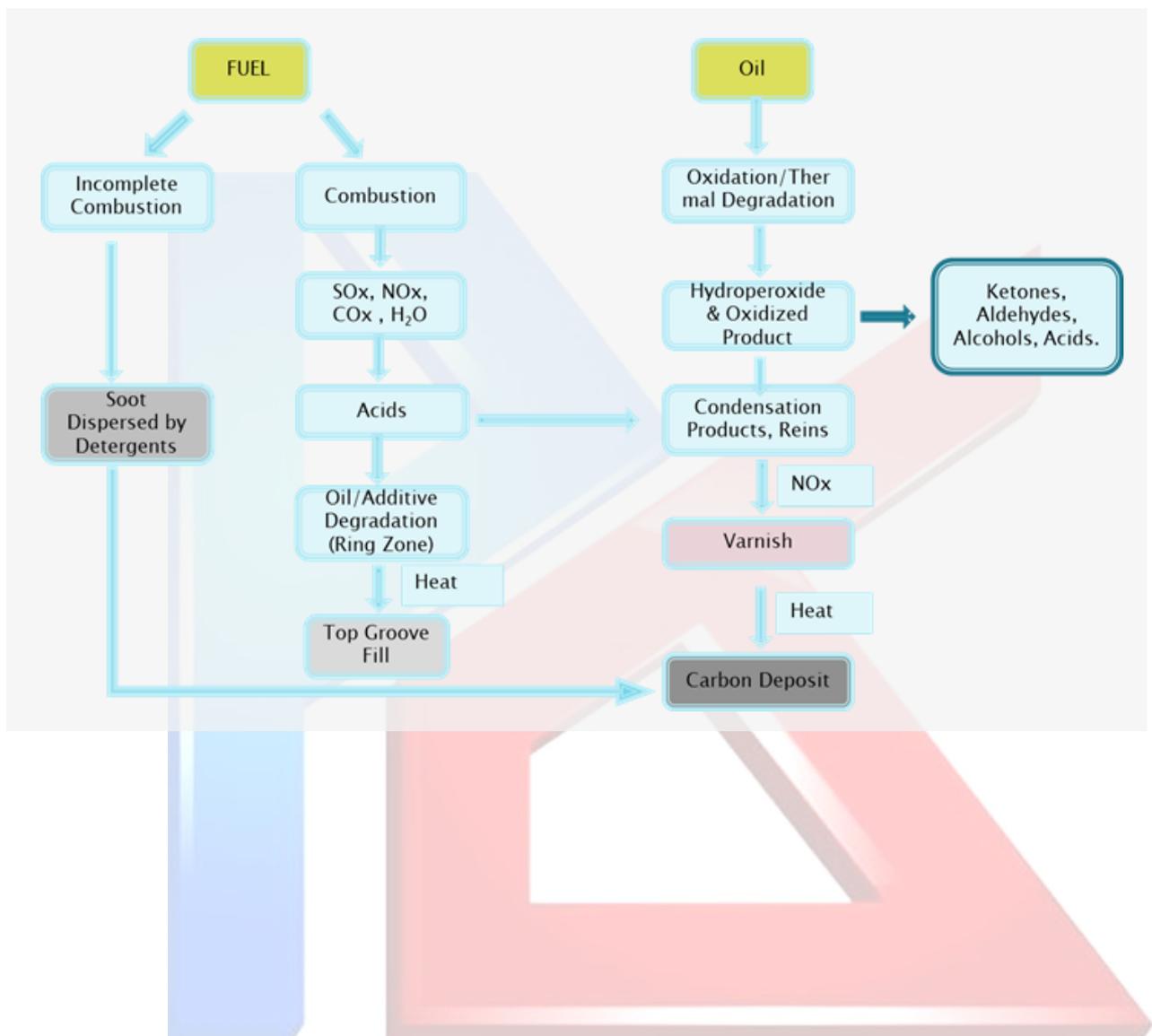


IB004. BASE NUMBER

What is base number?

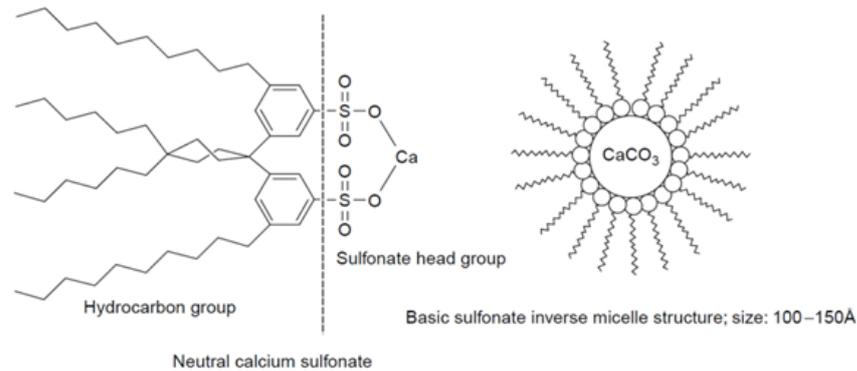
Base Number, also known as Total Base Number (TBN), is a key parameter in the marine lubricant field. It identifies the lubricant's ability of neutralizing the "acids" formed during engine combustion process. The Base number describes the alkalinity reserve of the lubricant. The Base Number expressed in terms of the equivalent number of milligrams of alkaline potassium hydroxide that is required to neutralize all in one gram of sample, and the unit is mg KOH/g.

Modern diesel engines burn fuels with HFO or distillate fuels, thus sulphur is sometimes present in the fuel oil. During the combustion process, sulphur could be turned into SO_x by reacting with H₂O and they could produce corrosive sulphuric acid. Moreover during the combustion process, other organic acids are formed such as RCOOH.



Which additives provides the Base Number?

The main source of base number is from the overbased detergents. The structure of detergents is depicted below. It consist of an inorganic core and an organic shell. The core is sometimes composed of MCO_3 or MOHO_2 that provides the most part of base number. In that structure, with different “shell”, there are three types of detergents, sulfonates, phenates, and salicylates. There are different types of metals used in the “core” structure, such as calcium , magnesium and barium. The most commonly used is the calcium type.



How Base Number affects the lubricant?

It is very crucial to select the correct BN marine lubricant for the engine. Generally, marine lubricant selection should follow the OEM and lubricant provider’s recommendations. The base number selection should take into consideration the fuel, engine type as well as the engine load.

There are general roles for selecting the correct base number marine lubricants. For medium speed engines, with distillate fuel, the selection of base number would be 10~20 mg KOH/g; for residual fuel, the sulphur content may vary, as such the recommended base number would be 25~50 mg KOH/g. For cylinder oil, with low sulphur fuels, such as MDO or MGO, or even LNG, the recommended base number is 20~40; while for fuels with sulphur content from 1.5~4%, the recommended base number would be 70~120 mg KOH/g. However the actual choice of the lubricant BN to be used is strongly depending upon the actual operating conditions of the engine such as the load.

	Sulphur Content/%	Base Number/ mg KOH/g
TPEO	Distillate Fuel	10~20
	Residual Fuel	25~50
2 Stroke Crosshead engine Cylinder oil	MDO,MGO, LNG	20~40
	Residual Fuel	70~120
2 Stroke crosshead engine System oil		5~10

The base number for low speed engines sometimes should follow special rules. During the long periods of “low load” applications, a high BN (100 mg KOH/g) are recommended for the cylinder oil. This has been proven by major OEMs that if low BN lubricants (70 mg KOH/g) were used, it might cause serious “cold corrossions” in the cylinder walls.