NAPHTHENIC ACIDS

INTRODUCTION:

* Naphthenic acids are a mixture of cyclo-paraffins with alkyl side chains ending with a carboxylic group.
* Molecular weights range from 126 through to 700 atomic mass units.
* The low-molecular-weight naphthenic acids (8–12 carbons) are compounds having either a cyclopentane or a cyclohexane ring with a carboxyalkyl side chain.
* These compounds are normally found in middle distillates such as kerosine and gas oil.
* High boiling naphthenic acids from the lube oils are monocarboxylic acids, (Cl4-Cl9) with an average of 2.6 rings. Naphthenic acids constitute about 50 wt% of the total acidic compounds in crude oils. Naphthenic based crudes contain a higher percentage of naphthenic acids. Consequently, it is more economical to isolate these acids from naphthenic-based crudes
* Crude oils with a high content of naphthenic acid are referred to as high TAN (Total Acid Number ) or a high acid crude oil (HAC).

TYPES:

TYPE A: Used to produce driers

TYPE B: Used to produce inhibitors and emulsifiers

PROPERTIES:

|  |  |  |
| --- | --- | --- |
| TEST | TYPE A | TYPE B |
| Density (d420) | 0.972 | 0.987 |
| Viscosity SU/210, °F | 40.1 | 159.0 |
| Pour point, °F | -30 | 40 |
| Refractive index (d420) | 1.476 | 1.503 |
| Average molecular weight of deoiled acids | 206 | 330 |
| Unsaponifiable matter (wt%) | 12.5 | 6.3 |
| Acid number, mg KOH/g | 235 |  |

PRODUCTION:

* The production of naphthenic acids from middle distillates occurs by extraction with 7–10% caustic solution.
* The formed sodium salts, which are soluble in the lower aqueous layer, are separated from the hydrocarbon layer and treated with a mineral acid to spring out the acids.
* The free acids are then dried and distilled. Using strong caustic solutions for the extraction may create separation problems because naphthenic acid salts are emulsifying agents.

+ NaOH

(CH2)nCOONa

(CH2)nCOOH

+ H2O

USES:

* Free naphthenic acids are corrosive and are mainly used as their salts and esters.
* The sodium salts are emulsifying agents for preparing agricultural insecticides, additives for cutting oils, and emulsion breakers in the oil industry.
* Other metal salts of naphthenic acids have many varied uses. For example, calcium naphthenate is a lubricating oil additive, and zinc naphthenate is an antioxidant. Lead, zinc, and barium naphthenates are wetting agents used as dispersion agents for paints. Some oil soluble metal naphthenates, such as those of zinc, cobalt, and lead, are used as driers in oil-based paints. Among the diversified uses of naphthenates is the use of aluminum naphthenates as gelling agents for gasoline flame throwers (napalm). Manganese naphthenates are well-known oxidation catalysts.