

ACID NUMBER

BY POTENTIOMETRIC TITRATION: D664

(Equivalent Test Methods: IP 177, ISO 6619, and JIS K2501)

EXPLANATION

New and used petroleum products may contain acidic constituents that are present as additives or as degradation products formed during service, such as oxidation products. The relative amount of these materials can be determined by titrating with bases. The acid number is a measure of this amount of acidic substance, in the oil—always under the conditions of the test. The acid number is used as a guide in the quality control of lubricating oil formulations. It is also sometimes used as a measure of lubricant degradation in service. Any condemning limits must be empirically established. Since a variety of oxidation products contribute to the acid number and the organic acids vary widely in corrosion properties, the test cannot be used to predict corrosiveness of an oil under service conditions. No general correlation is known between acid number and the corrosive tendency of oils toward metals.

The test method resolves constituents into groups having weak-acid and strong-acid ionization properties, provided the dissociation constants of the more strongly acidic compounds are at least 1000 times that of the next weaker groups. In new and used oils, the constituents that may be considered to have acidic characteristics include organic and inorganic acids, esters, phenolic compounds, lactones, resins, salts of heavy metals, salts of ammonia and other weak bases, acid salts of polybasic acids, and addition agents such as inhibitors and detergents.

The test method may be used to indicate relative changes that occur in an oil during use under oxidizing conditions regardless of the color or other properties of the resulting oil. There are four test methods for the determination of acid numbers. See Table 1 for comparison of these test methods. Test Method D 4739 is described in the base number section of the manual since it can analyze both acid and base numbers.

DEFINITIONS

Acid number—the quantity of base, expressed in milligrams of potassium hydroxide per gram of sample, re-

quired to titrate a sample in the solvent from its initial meter reading to a meter reading corresponding to a freshly prepared non-aqueous basic buffer solution or a well defined inflection point as specified in the test method.

Strong acid number—the quantity of base, expressed as milligrams of potassium hydroxide per gram of sample, required to titrate a sample in the solvent from its initial meter reading to a meter reading corresponding to a freshly prepared non-aqueous acidic buffer solution or a well defined inflection point as specified in the test method.

TEST SUMMARY

The sample is dissolved in a mixture of toluene and isopropyl alcohol containing a small amount of water and titrated potentiometrically with alcoholic potassium hydroxide using a glass indicating electrode and a calomel reference electrode. The meter readings are plotted manually or automatically against the respective volumes of titrating solution and the end points are taken only at well defined inflections in the resulting curve. When no definite inflections are obtained, end points are taken at meter readings corresponding to those found for freshly prepared non-aqueous acidic and basic buffer solutions.

TEST PRECISION

	Fresh Oils and Additives at Inflection Points		Used Oils at Buffer End Points	
	Manual	Automatic	Manual	Automatic
Repeatability, percent of Mean	7	6	5	12
Reproducibility, percent of Mean	20	28	39	44