GUIDELINE

ASHRAE Guideline 40-2017

Refrigeration Oil Description

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NOTE

Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD

Refrigeration oil covers a wide variety of commercially available or experimental lubricants that often differ widely in both composition and performance characteristics. Guideline 40 provides a uniform means of identifying particular refrigeration oils without resorting to commercial names or designations by utilizing common laboratory tests that are well recognized by those concerned with the use of the oil. The use of this guideline in the literature will permit investigators concerned with oil performance to duplicate experimental programs and allow readers to relate oil characteristics to the subject presented.

First published in 1981, Standard 99 was developed under the sponsorship of ASHRAE Technical Committee 3.4. It represents a joint effort of knowledgeable refrigerating industry consultants, equipment builders and oil suppliers to define the most meaningful laboratory tests that will adequately characterize a particular refrigeration oil. The 1981 standard was reaffirmed with minor editorial changes in 1987. In 2006, the standard was revised to include synthetic lubricants. In 2015, Standard 99 was converted to Guideline 40.

1. PURPOSE

The purpose of this guideline is to describe lubricants used in refrigeration and air-conditioning systems based on molecular structure, physical properties, and chemical properties. Because the properties of generically similar lubricants can vary significantly depending on source of formulation, terms such as "refrigeration lubricant" have little meaning in defining such materials. This guideline defines those properties critical to the precise identification of refrigeration lubricants, along with recognized test procedures for the determination of these properties.

2. SCOPE

2.1 Application. This guideline applies to lubricants used or proposed as compressor lubricants in refrigeration systems.

2.2 Test Methods. This guideline provides recognized test methods to

a. describe a specific class of refrigeration lubricant without the use of commercial designations,
b. describe the molecular structure for various classes of refrigeration lubricants, and
c. define the critical properties needed to describe a refrigeration lubricant using recognized test procedures.

2.3 Limits. This guideline is not intended to define refrigeration oil quality through the establishment of test specifications or requirements. In addition, performance tests intended to measure quality have been excluded from this guideline.

3. DEFINITIONS

alkylbenzene: a synthetic hydrocarbon composed of a benzene ring attached to one or more saturated hydrocarbon chains.

aniline point: the minimum temperature at which a lubricant is soluble in aniline, a solvent for hydrocarbons. It is used to estimate the aromatic/olefin content in a lubricant.

antioxidants: typical additives that scavenge oxygen-containing species to prevent further breakdown of the lubricant or refrigerant.

antiwear/extreme pressure additive: typical additives that improve the lubrication when circumstances of boundary lubrication (lubricant film break through) are present.

aromatic content: the fraction of aromatic hydrocarbon contained in a lubricant.

aromatic hydrocarbon: a hydrocarbon compound containing one or more cyclic or ring structures characterized by alternating double bonds.

ASTM test: a test conducted according to an ASTM International standard test procedure.

cloud point: the temperature at which haziness is first observed upon cooling of a lubricant under prescribed conditions. This temperature designation also applies for refrigerant/lubricant mixtures with or without impurities.

color: the appearance of a lubricant when viewed by transmitted light.

complex ester: an ester lubricant prepared from a polyol and both mono- and dicarboxylic acids, either together or sequentially.

diester: an ester lubricant prepared from a dicarboxylic acid and monohydric alcohols.

flash point: the minimum temperature to which a lubricant must be heated under prescribed conditions in order to give off sufficient vapor to form a flammable mixture with air in the presence of an ignition source.

floc point: the highest temperature at which a mixture of lubricant and refrigerant forms a distinct precipitate.

foaming: the formation of a frothy mass of refrigerant bubbles in or on the surface of a lubricant.

hydrotreated oil: a mineral-oil lubricant that has been treated with hydrogen to remove aromatic and olefinic components.

kinematic viscosity: a measure of a lubricant's resistance to flow.

miscibility: a measure of the limit of mutual solubility of liquid refrigerant and lubricant fluid.

naphthenic oil: a mineral-oil lubricant fraction consisting predominately of cyclic or ring hydrocarbon structures.

olefin: a hydrocarbon molecule containing at least one carbon-to-carbon double bond.

paraffinic oil: a mineral-oil lubricant fraction in which straight- and/or branched-chain hydrocarbon structures predominate.

polyalkylene glycol (PAG): a synthetic ethylene oxide and/or propylene oxide polymer normally initiated with an alcohol and sometimes capped.

polyalphaolefin (PAO): a synthetic, saturated acyclic hydrocarbon lubricant prepared from alphaolefins.