SAE Aerospace
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AEROSPACE STANDARD

SAE AS87132

Issued 2006-09
Reaffirmed 2012-11

Lubricant, Cetyl Alcohol, 1-Hexadecanol, Application to Fasteners

RATIONALE

AS87132 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

This specification establishes the requirements for flake or granular cetyl alcohol, solvents for dissolving the cetyl alcohol, preparation and application requirements for use of cetyl alcohol as an installation lubricant on mechanical fasteners, such as pins, bolts, nuts, washers, threaded or nonthreaded fastening devices, and inspection criteria for coated parts.

1.1 Classification

The lubricant shall be classified in two types with grades as specified herein (see 6.1). Type I is the traditional classification. Type III shall be used when environmentally necessary.

1.1.1 Type I - Petroleum Base Solvent

a. Grade A: 30 to 90 grams of cetyl alcohol per liter (0.25 to 0.75 pound per gallon) of solvent.

b. Grade B: 120 to 150 grams of cetyl alcohol per liter (1.00 to 1.25 pounds per gallon) of solvent.

c. Grade C: 270 to 300 grams of cetyl alcohol per liter (2.25 to 2.60 pounds per gallon) of solvent.

1.1.2 Type II - Not Used.

1.1.3 Type III - Water Base Solvent

a. Grade A: 10 to 30 grams (0.08 to 0.25 pound per gallon) cetyl alcohol per liter of deionized water.

b. Grade B: 30 to 60 grams (0.25 to 0.50 pound per gallon) cetyl alcohol per liter of deionized water.

c. Grade C: 60 to 100 grams (0.50 to 0.83 pound per gallon) cetyl alcohol per liter of deionized water.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this specification and references cited herein, the text of this specification takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS87132

2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 56 Standard Test Method for Flash Point by Tag Closed Cup Tester

ASTM D 86 Standard Method for Distillation of Petroleum Products at Atomospheric Pressure

ASTM D 94 Standard Test Method for Saponification Number of Petroleum Products

ASTM D 287 Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

ASTM D 1957 Standard Test Method for Hydroxyl Value of Fatty Oils and Acids

ASTM D 1980 Standard Test Method for Acid Value of Fatty Acids and Polymerized Fatty Acids

ASTM D 2075 Standard Test Method for Iodine Value of Fatty Amines, Amidoamines, and Diamines

ASTM F 766 Standard Test Method for Melting Points of Wax

2.2 ANSI Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-STD-290 Packaging of Petroleum and Related Products

FED-STD-313 Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

MIL-PRF-680 Degreasing Solvent

FED-STD-791 Lubricants, Liquid Fuels, and Related Products; Methods of Testing

2.3.1 Other Government Documents, Drawings, and Publications

Publications:

Available from Superintendent of Documents, Government Printing Office, Washington DC 20402.

Code of Federal Regulations:

Title 49 CFR 171-178 Subchapter C - Hazardous Materials Regulations

Department of Labor (DOL)

Guidline CPL 2-2.38 may be obtained from OSHA Publication Office, Room S-4203, 200 Constitution Avenue, NW, Washington DC 20210.

OSHA 29 CFR 1910.1200 - Federal Register, Part IV, Department of Labor, OSHA Hazard Communication: Final Rule

2.4 Miscellaneous Industry Publications

Available from The United States Pharmacopeial Convention Inc., 12601 Twinbrook Parkway, Rockville, MD 20852.

USP 28/NF 23 Mongraph Assay — The United States Pharmacopeia Twenty-Eighth Revison and The National Formulary Twenty-Third Edition

3. REQUIREMENTS

3.1 Properties

The lubricant shall be cetyl alcohol, normally obtained by the user in flake or granular form, and mixed with the appropriate solvent prior to use, as specified herein.

3.1.1 Cetyl Alcohol

Cetyl alcohol shall be National Formulary Grade, ($CH_3(CH_2)_{15}OH$), in flake or granular form in accordance with Table 1.

TABLE 1 - PROPERTIES OF CETYL ALCOHOL

Property	Requirement
Cetyl Alcohol	95% min purity
Hydroxyl Value	218 to 238
Acid Value	2.0 max
Saponification	3.0
Iodine Value	3.0 max
Melting Point	45 to 51 °C (113 to 124 °F)
Color	White

3.1.2 Petroleum Base Solvent (Type I)

Petroleum base solvent shall be a light petroleum base, chloride-free fluid complying with Table 2. Unless otherwise specified, MIL-PRF-680, Type I solvent shall be used. All solvents shall comply with applicable air quality regulations for the geographical area of use (see 6.5).

CAUTION: Special procedures are required for handling hazardous flash point fluids (see 6.1).

3.1.3 Water Base Solvent (Type III)

Water base solvent shall be nonflammable, deionized water with a 1 meg-ohm minimum resistivity modified with cetyl alcohol.

TABLE 2 - PROPERTIES OF SOLVENTS

Base Solvent	Property	Requirement
Petroleum	Flash point, tag closed tester, min, with MIL-PRF-680, Type I solvent	38 °C (100 °F)
	Flash point, tag closed tester, min, with alternate higher flash point solvent (see 3.1.2)	57 °C (135 °F)
	Flash point, tag closed tester, min, with alternate lower flash point solvent (see 3.1.2)	10 °C (50 °F)
	Distillation endpoint, dry temp	135 to 210 °C (275 to 411 °F)
	Residue	Nil
	Chloride	None

3.2 Application Solution Composition and Preparation

3.2.1 Type I, Petroleum Base

Petroleum base, Type I shall be prepared by heating the appropriate solvent to 40 to 55 °C (105 to 130 °F), adding the appropriate amount of cetyl alcohol flake or granules for the grade solution being prepared in accordance with Table 3A, and stirring until the cetyl alcohol particles are completely dissolved. If the solution is to be stored, it shall be cooled to room temperature and stored in closed containers until used.

CAUTION: Care should be taken in heating the solvent, which may have a flash point as low as 10 °C (50 °F).

3.2.2 Type III, Water Base

Water base, Type III shall be prepared by heating deionized water up to 71 °C (160 °F) and adding the appropriate amount of cetyl alcohol flakes or granules for the grade solution being prepared in accordance with Table 3B. The solution shall be stirred until the cetyl alcohol particles are completely dissolved. Dispersing agents and corrosion inhibitors are allowed.

NOTE: Care should be taken to reduce the possibility of freezing, or shock with organic solvents of hard water.

TABLE 3A - PROPERTIES OF TYPE I AND TYPE II MIXED LUBRICANT SOLUTIONS

Property	Type I, Grade A	Type I, Grade B	Type I, Grade C
Cetyl Alcohol Concentration	30 to 90 g/l solvent (0.25 to 0.75 lb/gal solvent)	120 to 150 g/l solvent (1.00 to 1.25 lb/gal solvent)	270 to 300 g/l solvent (2.25 to 2.50 lb/gal solvent)
Solvent Base	Petroleum	Petroleum	Petroleum
Flash Point, Tag Closed Tester, Min, with MIL-PRF-680, Type I	38 °C (100 °F)	38 °C (100 °F)	38 °C (100 °F)
Flash Point, Tag Closed Tester, Min, with Slow Drying Solvent	57 °C (135 °F)	57 °C (135 °F)	57 °C (135 °F)
Flash Point, Tag Closed Tester, Min, with Fast Drying Solvent	10 °C (50 °F)	10 °C (50 °F)	10 °C (50 °F)
Application Temperature	40 to 55 °C (105 to 130 °F)	40 to 55 °C (105 to 130 °F)	40 to 55 °C (105 to 130 °F)

TABLE 3B - PROPERTIES OF TYPE III MIXED LUBRICANT SOLUTIONS

Property	Type III, Grade A	Type III, Grade B	Type III, Grade C
Cetyl Alcohol Concentration	10 to 30 g/l solvent (0.08 to 0.25 lb/gal solvent)	30 to 60 g/l solvent (0.25 to 0.50 lb/gal solvent)	60 to 100 g/l solvent (0.50 to 0.83 lb/gal solvent)
Solvent Base	Water	Water	Water
Application Temperature	71 °C Max (160 °F)	71 °C Max (160 °F)	71 °C Max (160 °F)

3.3 Properties of Mixed Solutions

3.3.1 As Mixed

As mixed solutions shall be as specified in Table 3A or 3B.

3.3.2 Storage Life in Closed Containers

Mixed solutions shall meet the requirements of Table 3A or 3B when tested at any time up to 36 months after mixing, when stored in closed noncontaminating containers at ambient temperatures.

3.3.3 Working Life in Application Tank or Container

3.3.3.1 Coatability After Cycling

Solutions shall maintain coatability after repeated cycling from ambient temperature to application temperature specified in Table 3A or 3B until replenishment is necessary as required by 3.3.3.2 or replacement is required as specified in 3.3.3.3. Flotation control devices may be used to reduce solvent evaporation provided there is no contamination of parts or solutions.

3.3.3.2 Maintain Solution Concentrations

Solutions shall be maintained within the concentrations specified in Table 3A or 3B by a suitable method, such as gravimetric, evaporations, or specific gravity. The appropriate amounts of either cetyl alcohol or solvent shall be added as necessary, generally at the beginning of each work period or shift.

3.3.3.3 Contamination of Solution

Solutions shall be replaced when contamination of the solution is indicated by poor coating of parts or parts become contaminated from the solution. This is evident by spotty coating or application on parts, and the solution becomes cloudy, dark, or includes foreign particles. A fresh solution should be clear and approximately water white for Type I. Type III should be a white, opaque emulsion.

3.4 Safety Considerations

3.4.1 Cetyl Alcohol Toxicity

Cetyl alcohol flakes and granules are nontoxic, noncorrosive, and are practically odorless; however, safety and health information or precautionary labels applied to containers or packages by the manufacturer should be read and understood by all supervisory personnel and employees before handling the material.

3.4.2 Mixing Solvents, Petroleum Base

The petroleum base solvents have relatively low flash points, as indicated in Table 2. These solvents and mixed lubricant solutions should be handled and used in equipment designed for volatile flammable liquids. Avoid prolonged breathing of solvent vapors. Drying of parts shall be accomplished in such a manner that the evaporated solvent will not produce a hazard and will comply with applicable air quality regulations.

3.5 Properties of Coated Parts

3.5.1 Physical Properties

The physical properties of the cetyl alcohol coated parts shall be as follows:

a. Parts shall be uniformly coated and shall be free from coating nodules and localized buildup on pin and bolt shanks, in locking grooves, and in threads.

b. Parts shall be slippery to the touch.

c. Parts may exhibit a white or slightly colored film or frosty appearance, which does not affect the performance of the coating and shall not be cause for rejection.

3.5.2 Physical Inspection Criteria

Useful inspection criteria to indicate the presence of coating on parts include:

a. Slippery feeling to the touch.

b. Presence of white surface film or frosty appearance.

c. Nonwetting of surface when dipped in water.

d. Coating shall be thin and uniform in appearance.

3.6 Coating Equipment

3.6.1 Application Tank

The application tank shall be any suitable tank or container into which racked or basketed parts can be immersed. The tank or container should contain provisions for, or be capable of maintaining the coating solution within the application temperature range for the applicable solution specified in Table 3A or 3B. The tank lining shall be made from noncontaminating materials.

3.6.2 Racks and Baskets

Racks and baskets shall be made from, or coated with noncontaminating materials. There shall be free movement of solution around and through the parts. The position of parts in the racks or baskets shall promote thorough draining and drying of parts after removal from immersion.

3.6.3 Power Driven Equipment

Power driven equipment shall be provided with explosion and spark-proof motors and switches to minimize the possibility of flash when Type I solutions are used.

3.7 Workmanship

The ingredient materials shall be intimately assembled and processed as required in accordance with the best practice for the manufacture and use of low flash point materials.

4. QUALITY ASSURANCE REQUIREMENTS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the manufacturer may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the procuring activity. The procuring activity reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for Compliance

All items shall meet all requirements of Section 3 and 5. The inspection set forth in this specification shall become a part of the manufacturer's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the manufacturer of the responsibility to assure that all products or supplies submitted to the procuring activity for acceptance comply with all the requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the procuring activity to accept defective material.

4.2 Classification of Inspection

The inspection requirements specified herein are classified as follows:

a. First article testing (see 4.3)

b. Quality conformance inspection (see 4.4)

4.3 First Article Testing

First article testing shall include all tests to determine the conformance to all technical requirements as specified in Section 3 and in Tables 1, 2, and 3A or 3B.

4.4 Quality Conformance Inspection

4.4.1 Routine Acceptance Tests

Tests on each lot of cetyl alcohol, solvent, or coated parts shall consist of the tests specified in Table 4. Samples shall be labeled completely with information which identifies the purpose of the sample, name of the product, specification number, type, lot, batch number, date of sampling, and contract number. Unless otherwise specified, sampling of the lubricant shall be in accordance with ANSI/ASQ Z 1.4 accept on zero.

4.4.2 Bulk Lot

A bulk lot (batch) is an indefinite quantity of homogeneous mixture of material offered for acceptance in a single, isolated container; or manufactured in a single plant run (not to exceed 24 hours) through the same processing equipment, with no change in ingredient material.

4.4.3 Packaged Lot

A packaged lot is an indefinite number of 55-gallon drums or smaller unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of material from one isolated container, or filled with a homogeneous mixture of material manufactured in a single plant run (not to exceed 24 hours) through the same processing equipment, with no change in ingredient material.

4.4.4 Submission of Material Safety Data Sheets

The contractor shall furnish to the procuring activity the toxicological data and formulations required to evaluate the safety of the material for the proposed use through the submission of the Material Safety Data Sheet detailed in FED-STD-313.