

METRIC

MIL-PRF-6864D

7 August 2000

SUPERSEDING

MIL-C-6864C

26 September 1958

PERFORMANCE SPECIFICATION
CLEANING COMPOUND, SOLVENT, OIL COOLER

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers one type of oil cooler, solvent-type cleaning compound. The oil cooler cleaning compound solvent described herein is intended for cleaning either copper or aluminum-alloy aircraft oil coolers.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications. The following specifications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2(b)).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Richmond (DSCR), ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610 by using the Standardization Document Improvement Form Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6850

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-PRF-6864D

SPECIFICATIONS

FEDERAL

A-A-2904 - Thinner, Paint, Mineral Spirits, Regular and Odorless.

DEPARTMENT OF DEFENSE

MIL-A-8625 - Anodic Coatings For Aluminum and Aluminum Alloys.

MIL-D-16791 - Detergents, General Purpose (Liquid, Nonionic).

MIL-PRF-680 - Degreasing Solvent.

(Unless otherwise indicated, copies of the above specifications are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other government documents, drawings, and publications. The following other government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2(b)).

QPL-6864 - Cleaning Compound, Solvent, Oil Cooler.

(Copies of the above document are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2(b)).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes (DoD adopted).
- ASTM B 187 - Standard Specification for Copper Bar, Bus Bar, Rod, and Shapes (DoD adopted).
- ASTM B 272 - Standard Specification for Copper Flat Products with Finished (Rolled or Drawn) Edges (Flat Wire and Strip) (DoD adopted).
- ASTM D 92 - Standard Test Method for Flash and Fire Points by Cleveland Open Cup (DoD adopted).

MIL-PRF-6864D

- ASTM D 97 - Standard Test Method for Pour Point of Petroleum Products (DoD adopted).
- ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (DoD adopted).
- ASTM D 460 - Standard Test Methods for Sampling and Chemical Analysis of Soaps and Soap Products (DoD adopted).
- ASTM D 3699 - Standard Specification for Kerosine (DoD adopted).

(Application for copies of ASTM documents should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

INSTITUTE FOR INTERCONNECTING AND PACKAGING ELECTRONIC CIRCUITS (IPC)

- IPC J-STD-006 - Requirements for Electronic Grade Solder Alloys and Fluxed and Non-fluxed Solders for Electronic Soldering Applications (DoD adopted).

(Application for copies of IPC documents should be addressed to the Institute for Interconnecting and Packaging Electronic Circuits, 2215 Sanders Road, Northbrook, IL 60062-6135.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- SAE J1966 - Lubricating Oil, Aircraft Piston Engine (Nondispersant Mineral Oil) (DoD adopted).
- SAE AMS-QQ-A-250 - Aluminum and Aluminum Alloy, Plate and Sheet General Specification For (DoD adopted).

(Application for copies of SAE document requests should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The cleaning compound furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.2 and 6.3).

3.2 Materials. The cleaning compound shall be a single-phase liquid. It shall be free of silicates (except for ethyl silicate when used as a corrosion preventative) as well as abrasives,

MIL-PRF-6864D

inorganic acids, cyanides, inert fillers, and undissolved material. It shall conform to the applicable requirements as specified herein.

3.3 Toxicity. The material shall contain no compounds whose degree of hazards has not been appraised nor any combination of materials that might be hazardous to health when used in accordance with the manufacturer's recommendations.

3.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements and promotes economically advantageous life cycle costs.

3.5 Quantitative requirements. The cleaning compound shall conform to the following requirements when tested as specified in 4.4:

3.5.1 Moisture content. The moisture content shall be a maximum of 3.0 percent by weight (see 4.4.1).

3.5.2 Specific gravity. The specific gravity at 25/25 °C shall be a minimum of 1.20 (see 4.4.2).

3.5.3 Flash point. The flash point shall be a minimum of 26.7 °C (see 4.4.3).

3.5.4 Pour point. The pour point shall be a minimum of -29.0 °C (see 4.4.4).

3.5.5 Hydrogen ion concentration (pH). The pH in a 1 percent solution, dispersed in water, shall be between 9.3 and 10.0 (see 4.4.5).

3.6 Solubility. The compound shall be soluble to the extent that clear solutions shall form at room temperature when 10 mL portions of the compound are added to 90 mL of dry cleaning solvent, kerosine, and mineral spirits, respectively (see 4.4.6).

3.7 Emulsifiability. A 4 percent by volume mixture of cleaning compound with water shall form a stable emulsion which shall show no separation or creaming for at least 6 hours (see 4.4.7).

3.8 Corrosion. The cleaning compound shall cause no visible trace of corrosive attack, oxidation, or discoloration when specimens of copper tubing, brass alloy, soldered ends of copper tubing, polished aluminum alloy, and anodized aluminum alloy are immersed (see 4.4.8).

3.9 Water tolerance. The cleaning compound shall remain clear and show no thickening when diluted with water equal to 25 percent of its volume (see 4.4.9).

3.10 Carbon removal. The cleaning compound shall show ability and rate of loosening carbon equal to or greater than that of the control formula (see 4.4.10.2).

MIL-PRF-6864D

3.11 "Lacquer" removal. The cleaning compound shall effect the removal of hot oil "lacquers" equal to or better than the control formula (see 4.4.10.3).

3.12 Effect on Heresite. The cleaning compound shall show no signs of softening, blistering, or removal of Heresite coated surfaces (see 4.4.10.4).

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 Qualification inspection. Qualification tests of cleaning compounds shall consist of all of the tests of this specification as described in 4.4.

4.3 Conformance inspection. Conformance inspection shall be performed in accordance with inspection provisions set forth herein. The characteristics shown in 3.5 through 3.12, when tested in accordance with 4.4, shall constitute minimum inspections to be performed by the supplier prior to Government acceptance or rejection of the material.

4.4 Test methods and procedures.

4.4.1 Moisture content. The moisture content of the cleaning compound shall be determined in accordance with ASTM D 460, sections 15-18. A 25 gram sample of the cleaning compound shall be used to make the determination.

4.4.2 Specific gravity. The specific gravity of the cleaning compound shall be determined by a suitable hydrometer at 25/25 °C.

4.4.3 Flash point. The flash point of the cleaning compound shall be determined in accordance with ASTM D 92.

4.4.4 Pour point. The pour point of the cleaning compound shall be determined in accordance with ASTM D 97.

4.4.5 Hydrogen ion concentration (pH). The pH of the specified cleaning compound dispersion shall be determined with a suitable pH meter.

4.4.6 Solubility. Ten mL of cleaning compound shall be placed into each of three 100 mL graduated cylinders having ground glass stoppers. To the three cylinders, in consecutive order, add 90 mL of degreasing solvent conforming to type I or II of MIL-PRF-680, kerosine conforming to ASTM D 3699, and mineral spirits conforming to A-A-2904, respectively. Each

MIL-PRF-6864D

cylinder shall be stoppered, shaken thoroughly, and the contents examined for conformance to the requirements of 3.6.

4.4.7 Emulsifiability. Four mL of the cleaning compound shall be placed into a 100 mL, glass-stoppered, graduated cylinder and diluted to 100 mL by adding distilled water. The cylinder containing the solution shall be stoppered, shaken vigorously for 30 seconds, and allowed to remain undisturbed at room temperature for 6 hours. The contents shall then be examined for conformance to the requirements of 3.7.

4.4.8 Corrosion. Approximately 1 liter of the cleaning compound shall be placed in a 1 liter, wide mouth, glass bottle having an air-proof seal. Specimens listed in table I shall be suspended out of contact with each other and completely immersed in the compound. The bottle shall be sealed and maintained at 25 °C for 24 hours. At the end of the specified time, the specimens shall be removed, rinsed with several portions of dry cleaning solvent conforming to MIL-PRF-680 until the surfaces are free of adhering cleaning compounds, and visually examined for conformance to the requirements of 3.8.

TABLE I. Corrosion test specimens.

Specimen	Requirements
Copper tubing	Conforming to ASTM B 187
Brass alloy	Conforming to ASTM B 21
Copper tubing	Conforming to ASTM B 187, whose ends have been soldered with solder conforming to IPC J-STD-006, Comp Sn50
Polished aluminum alloy	Conforming to aluminum alloy No. 6951
Aluminum alloy	Conforming to either to ASTM B 209, Type 4, or to SAE AMS-QQ-A-250, Type 4, which has been anodized in accordance with MIL-A-8625

4.4.9 Water tolerance. Eighty mL of the cleaning compound shall be placed into a 100 mL, glass-stoppered, graduated cylinder and diluted to 100 mL by adding distilled water in 5 mL quantities, agitating between each addition. After each addition and agitation, the contents shall be examined for conformance to the requirements of 3.9.

4.4.10 Performance.

4.4.10.1 Control formula. The control formula to be used as a standard of comparison for judging the performance of the manufacturer's product shall be compounded in strict conformance to table II.

4.4.10.2 Carbon removal. A used, thoroughly carbon covered tube from an approved oil cooler shall be placed in a suitable test tube. A sufficient amount of the cleaning compound under test shall be added to the test tube to totally immerse the test oil cooler tube. The test tube

MIL-PRF-6864D

will be stoppered and placed in a rack without shaking. Another tube from the same oil cooler will be similarly treated using the control formula product. After soaking for 30 minutes, both oil cooler tubes shall be removed and rinsed under running tap water. If the carbon has not been removed sufficiently to make a satisfactory comparison, the 30 minute soaking and rinsing procedure shall be repeated and a visual comparison shall again be made to determine conformance to the requirements of 3.10.

TABLE II. Control formula.

Ingredient	Percent by weight
95 percent ethyl alcohol	10
Cresol USP	10
Methylene chloride	70
Potassium oleate	8
Wetting agent (Polyethyleneglycol monalkylaryl ether conforming to MIL-D-16791)	2

4.4.10.3 "Lacquer" removal.

4.4.10.3.1 Preparation of test oil. Prepare a quantity of test oil, sufficient for performance of this test, by heating oil conforming to specification SAE J1966 at 149 °C for 1,000 hours while providing constant stirring.

4.4.10.3.2 Preparation of test panels. Two 20 mm by 100 mm by 0.6 mm panels, composed of polished copper conforming to ASTM B 272, shall be cleaned by boiling for 1 minute in chemically pure (c.p.) isopropanol and 1 minute in c.p. benzene. Four drops (approximately 8 mg) of test oil shall be evenly placed on one face of each test panel using a clean plastic spatula to uniformly distribute the oil over the entire face of the test panel. The panels shall then be placed horizontally in a muffle furnace, preheated to 316 °C, for 10 minutes. The panels shall then be removed, cooled to room temperature, and stored in a desiccator until needed.

4.4.10.3.3 Procedure. One panel shall be placed in a 25 mm by 200 mm test tube containing 30 mL of the cleaning compound under test. The second panel shall be placed in a similar test tube containing 30 mL of the control formula. The tubes shall be corked, sealed by taping, and clamped in a double burette clamp. A horizontal shaft shall connect the burette clamp to an electric stirring apparatus fastened to a ring stand. The tubes shall be rotated at 60 to 65 rpm for 15 minutes. At the end of this period, the panels shall be removed from the tubes, rinsed under tap water, air dried, and visually examined for conformance to the requirements of 3.11.

4.4.10.4 Effect on Heresite. Two aluminum alloy cooler tubes, evenly coated with Heresite, shall be cleaned by thoroughly rinsing in acetone. Each shall be placed in a suitable test

MIL-PRF-6864D

tube to which a sufficient amount of the cleaning compound under test shall be added to totally immerse the oil cooler tube. The test tube will be stoppered and allowed to stand for 24 hours. After soaking for that time, both oil cooler tubes shall be removed, rinsed under running tap water, and visually examined for conformance with the requirements of 3.12.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2(c)). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cleaning compound covered by this specification is intended for use at room temperature in a closed system for cleaning oil coolers.

6.1.1 Military-unique rationale. The cleaning compound covered by this specification is mandated by military maintenance manuals for the cleaning of the C-130 aircraft oil coolers and not used by commercial activities.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue individual documents referenced (see 2.2 and 2.3).
- c. Packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 6864 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Information pertaining to qualification of products

MIL-PRF-6864D

may be obtained from Defense Supply Center Richmond (DSCR), ATTN: DSCR-VBD, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610.

6.4 Subject term (key word) listings.

Carbon
Cresol
Heresite
Lacquer
Methylene Chloride

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - EA
Navy - AS
Air Force - 11

Preparing activity:
DLA - GS
(Project 6850-1437)

Reviewer:
Army - MR

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:		1. DOCUMENT NUMBER MIL-PRF-6864D	2. DOCUMENT DATE (YYYYMMDD) 20000807
DOCUMENT TITLE CLEANING COMPOUND, SOLVENT, OIL COOLER			
4. NATURE OF CHANGE (<i>Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.</i>)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (<i>Last, First, Middle Initial</i>)		b. ORGANIZATION	
c. ADDRESS (<i>Include Zip Code</i>)		d. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (2) DSN (<i>if applicable</i>)	7. DATE SUBMITTED (YYYYMMDD)
8. PREPARING ACTIVITY			
a. NAME Defense Supply Center Richmond		b. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (804) 279-5019 (2) DSN 695-5019	
c. ADDRESS (<i>Include Zip Code</i>) ATTN: DSCR-VBD (C. Hammond) 8000 Jefferson Davis Highway Richmond, VA 23297-5610		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: DEFENSE STANDARDIZATION PROGRAM OFFICE (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888	