

INCH-POUND

MIL-PRF-85899A(AS)

10 July 1998

SUPERSEDING

MIL-F-85899(AS)

24 June 1988

## PERFORMANCE SPECIFICATION

### FUEL GELLING MIXTURE

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification establishes the requirements for a fuel gelling mixture (referred to as "mixture").

#### 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, standards, and handbooks.

(This section is not applicable to this specification.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 1325

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## MIL-PRF-85899A(AS)

2.3 Non-Government publications. The following document forms 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).

### AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC-Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD adopted).

(Application for copies should be addressed to the American Society for Quality Control, P. O. Box 3005, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

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 Materials. The mixture shall be composed of imbiber beads made of alkystyrene copolymer and wicking material made of polyolefin. The imbiber beads shall be treated to prevent static electricity build-up during handling (see 6.3). The total weight of all additives and impurities shall be not greater than one percent by weight.

### 3.2 Physical characteristics.

3.2.1 Imbiber bead diameter. Ninety five percent of the imbiber beads diameters by weight shall be not less than 0.21 mm and not greater than 1.0 mm (see 4.2.4.6).

3.2.2 Imbiber bead dryness. Imbiber beads shall be dried until the beads no longer cohere together and before blending with wicking material (see 4.2.4.5).

3.2.3 Wicking material particle. The wicking material shall wick fuel to all portions of the mixture within 30 minutes after adding any liquid jet or reciprocating engine petroleum fuel (see 4.2.4.2). Wicking material particle length shall be in the same range as the imbiber bead diameters (see 3.2.1).

## MIL-PRF-85899A(AS)

3.2.4 Formulation. The mixture shall consist of 65 to 70 percent imbiber beads and the balance wicking material, by weight. The two components shall be blended until a uniform mixture is produced (see 4.2.4.2).

3.2.5 Fuel gelling ability. The mixture shall absorb No. 2 fuel oil within one hour to produce a gelled fuel capable of adhering to a vertical surface (see 4.2.4.3). No stirring or shaking shall be necessary to gel the fuel (see 4.2.4.2).

3.2.6 Funnel flow. The mixture shall flow by gravity through a funnel with a throat diameter of not greater than 2.4 inches (see 4.2.4.1).

3.2.7 Flow. The mixture shall flow freely with no lumps or clumps measuring greater than 0.1 inch in the longest dimension (see 4.2.3 and 4.2.4.1).

3.3 Workmanship. The mixture shall be a uniform, dry, white granular substance with no dirt or off-color inclusions and only occasional off-size particles.

#### 4. VERIFICATION

4.1 Classification of inspection. The conformance inspection requirements are specified in 4.2.

##### 4.2 Conformance inspection.

4.2.1 Inspection lots and sublots. A lot shall be designated for each batch of imbiber beads produced by one manufacturer, at one plant from the same materials, and under essentially the same manufacturing conditions. A subplot shall be designated for each batch of mixture of imbiber beads and wicking material blended together. Each 43 pound unit of mixture shall be identified with a lot number and a subplot letter. The lot number shall be determined by batch of imbiber beads produced. The subplot letter shall be determined by batch of blended mixture, measured by the capacity of the blending machine.

4.2.2 Sampling. Sampling shall be conducted in accordance with ASQC-Z1.4. Sample frequency shall be determined by the number of units of mixture in the lot.

4.2.2.1. Fuel gelling and gel mobility tests. Samples of sublots shall be inspected for conformance to 4.2.4.2 and 4.2.4.3. One sample shall be taken at random from each subplot. Any sample failing to conform to the respective criteria shall be classified as defective. Defective sublots may be returned to the blending machine for more blending and retesting. The proportion of imbiber beads to wicking material shall not be adjusted beyond the limits specified in 3.2.4.

## MIL-PRF-85899A(AS)

4.2.2.2 Size determination tests. Following the first successful bead dryness test (see 4.2.4.5), samples shall be drawn at random for determination of conformance to imbibed bead size (see 3.2.1) and shall be tested as specified in 4.2.4.6. Special inspection level S-2 of ASQC-Z1.4 shall be used to determine sample frequency.

4.2.3 Examination. Each sample, selected in accordance with 4.2.2, shall be examined to determine conformance to 3.2.3, 3.2.6, 3.2.7, and 3.3.

4.2.4 Test.

4.2.4.1 Funnel flow test. The ability of the mixture to flow by gravity alone shall be tested by pouring not less than ten pounds of the mixture through a funnel. Funnel diameter at the throat shall be not greater than 2.4 inches. The flow through the funnel shall be blocked until material depth reaches no less than eight inches above the throat. After the minimum depth is reached, the flow shall be released and the mixture shall flow through the opening until all material directly above the throat has passed through the funnel. Mixture remaining in the funnel in a location not directly above the throat shall be acceptable under this test.

4.2.4.2 Fuel gelling test. The fuel gelling test is used to determine conformance of the mixture to 3.2.3 through 3.2.5. Ambient temperature shall be  $72 \pm 6$  °F. The gelling test shall be conducted as follows:

Conduct the test in a clear glass cylinder or jar with a diameter of  $3.0 \pm 0.6$  inches. Tare weight of the glass container shall be recorded before adding the mixture. Mixture depth shall be no less than 2.5 inches. The mixture shall be settled into the bottom of the cylinder or jar by gentle tapping of the container. The weight of the mixture shall be determined by weighing the glass container with the mixture. Number 2 fuel oil shall be gently added in a ratio of 10.5 parts by weight of fuel to one part fuel gelling mixture. Weight of fuel and mixture shall be determined and recorded to an accuracy of  $\pm 0.05$  pound. The container shall remain stationary and no mechanical mixing or stirring shall be permitted from the time the fuel is added until 60 minutes has elapsed. Fuel shall wet the mixture to the bottom of the container within 30 minutes. While the fuel and mixture remains at rest in the container, fuel-saturated beads shall rise through the liquid fuel, reaching the topmost level of fuel. Fuel absorption and gelling shall be complete in not more than 60 minutes. Save the product of this test for gel mobility testing per 4.2.4.3.

4.2.4.3 Gel mobility test. Conduct this test at an ambient temperature of  $72 \pm 6$  °F and between 60 minutes and 90 minutes from the addition of the fuel in the fuel gelling test of 4.2.4.2. The gelled fuel from 4.2.4.2 shall be stirred to achieve a uniform consistency before conducting the mobility test as follows:

## MIL-PRF-85899A(AS)

Obtain a sample of not less than 15 cc from the container used in 4.2.4.2. Drop the sample from a height of not more than 12 inches to a clean, smooth, horizontal metal plate. After the gelled fuel has been allowed to rest on the horizontal plate for not more than 60 seconds, the plate shall be elevated to a vertical position for observation of gel mobility. No part of the gel sample shall slide down the plate more than two inches within 60 seconds of the time of elevation of the plate.

4.2.4.4 Samples for gelling and mobility tests. Samples failing to gel or stick in conformance to the criteria of 4.2.4.2 and 4.2.4.3, respectively, shall indicate that all mixture in that tested subplot is defective. Defective sublots may be returned to the blending machine for more blending and retesting. The proportion of imbiber beads to wicking material shall not be adjusted beyond the limits specified in 3.2.4.

4.2.4.5 Bead dryness test. Bead dryness (see 3.2.2) shall be verified by dropping a sample of not less than 0.25 pound of the imbiber beads to a clean, smooth, horizontal, metal plate. The beads shall readily separate into individual beads without cohering or sticking to the metal plate. Visual observations made during this test shall be recorded for each lot.

4.2.4.6 Bead size determination test. Each lot of imbiber beads shall be tested for conformance to 3.2.1 after bead dryness has been established per 4.2.4.5. Collect a sample of imbiber beads weighing not less than 0.5 pound. The sample shall be agitated for five minutes in a Ro-Tap machine at 750 revolutions per minute using Tyler standard screens with openings of 1.0 mm and 0.21 mm. The weight of imbiber beads retained on each screen shall be determined and recorded to determine conformance to 3.2.1.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity for 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 which may be helpful, but is not mandatory.)

## MIL-PRF-85899A(AS)

6.1 Intended use. The mixture will be stored in aluminum MK 77 firebombs, where it will produce a gelled fuel by absorbing 65 gallons of any liquid jet or reciprocating engine petroleum fuel. No mixing or stirring is necessary to produce a gelled fuel within one hour after adding the fuel to the firebomb (see 4.2.4.2). The mixture has no commercial application.

6.2 Acquisition requirements. Acquisition documents must specify the following:

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

6.3 Kaolin. Kaolin may be used to prevent static electricity build-up during handling..

6.4 Subject term (key word) listing.

Alkystyrene copolymer  
Bead, imbiber  
Firebomb  
Polyolefin  
Wicking material

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.

## CONCLUDING MATERIAL

Preparing activity:  
Navy - AS  
(Project 1325-0181)

# 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.

<b>I RECOMMEND A CHANGE:</b>		1. DOCUMENT NUMBER MIL-PRF-85899A(AS)	2. DOCUMENT DATE (YYMMDD) 10 July 1998
3. DOCUMENT TITLE FUEL GELLING MIXTURE			
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 (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION		b. TELEPHONE NUMBER ( <i>Include Area Code</i> ) (1) Commercial (732) 323-2947 (2) DSN 624-2947	
c. ADDRESS ( <i>Include Zip Code</i> ) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Logistics Agency (DLSC-LM), Attn: Carla Jenkins/John Tascher 8725 John J. Kingman Road, Ste 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6874	