

19 August 1969

Materiel Test Procedure 10-4-011
U. S. Army Arctic Test Center

U. S. ARMY TEST AND EVALUATION COMMAND
ENVIRONMENTAL TEST PROCEDURE

ARCTIC ENVIRONMENTAL TEST OF
FUEL FILTER/SEPARATORS AND COLLAPSIBLE
PETROLEUM STORAGE RESERVOIRS

AD719268

1. OBJECTIVE

The objective of the procedures outlined in this MTP is to provide a means of evaluating the performance of fuel/separators and collapsible storage reservoirs under arctic winter environmental conditions.

2. BACKGROUND

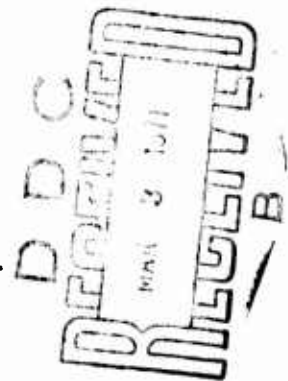
Valid comparison of different designs of petroleum handling equipment are necessary to insure selection of the most suitable equipment in a natural arctic winter environment. Testing for use in an arctic winter environment is used to substantiate or supplement data obtained from simulated tests conducted during the Engineer Design and Engineering Test phase. Testing in the arctic winter environment generally is not authorized until data from simulated environmental tests provide reasonable assurance that the test item will function satisfactorily when subjected to the conditions that would be encountered in the arctic.

3. REQUIRED EQUIPMENT

- a. Appropriate Arctic winter uniforms and individual field gear.
- b. Meteorological support facility.
- c. Platform scales.
- d. Photographic equipment (black and white or color).
- e. Steel measuring tape.
- f. Vehicles (cargo).
- g. Flowmeters.
- h. Pressure gage.
- i. Thermocouples.
- j. Filter/separator.
- k. Return pump.
- l. Water filter for water contaminant.
- m. Water contaminant as required.
- n. Karl Fisher assembly (for water content in fuel).
- o. Millipore filter apparatus.
- p. Sample containers.

4. REFERENCES

- A. AR 70-38, Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions.
- B. AR 705-5, Army Research and Development.
- C. AR 70-8, Human Factors and Social Sciences Research.
- D. AR 70-10, Test and Evaluation During Research and Development of materiel.



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- E. AR 750-6, Maintenance Support Planning.
- F. USATECOM Regulation 705-2, Documenting, Test Plans and Reports.
- G. USATECOM Regulation 350-6, Training in New or Modified Equipment and Training Devices.
- H. MTP 10-4-500, Arctic Preoperational Inspection, Physical Characteristics, Human Factors, Safety and Maintenance Evaluation.
- I. MTP 10-3-503, Transportability.
- J. MTP 9-2-298, Fuel Monitoring and Purity Devices.
- K. MIL-F-8901B, Filter/Separators, Aviation and Motor Fuel, Ground and Shipboard Use, General Requirements and Test Procedures For.

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP are designed to determine and evaluate the performance and characteristics of fuel filter/separators and collapsible petroleum storage reservoirs under arctic winter environmental conditions.

The specific tests to be performed and their intended objectives are listed below:

a. Preoperational Inspection and Physical Characteristics - This subtest provides for an inspection of the test item to determine:

- 1) If the test items are in proper condition for testing.
- 2) If the test items physical characteristics conform to applicable criteria.

b. Installation - The objective of this subtest is to determine the ease of installing the test item under arctic winter environmental conditions.

c. Transportability - The objective of this subtest is to determine the capability of the test items to be transported over secondary roads and cross country trails.

d. Installation - The objective of this subtest is to determine the ease of installing the test items and components under arctic winter environmental conditions.

e. Functional and Operational Suitability - The objective of this subtest is to determine the suitability of the test item for operation under arctic winter environmental conditions.

f. Human Factors Engineering and Safety - The objective of this subtest is to determine if all accessories and components of the test items enable easy operation by test personnel wearing the appropriate arctic winter uniform.

g. Maintenance Evaluation - The objective of this subtest is to determine if the test items meet maintenance and reliability requirements

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as defined by QMR, SDR, TC, MC or other established criteria under arctic winter environmental conditions.

5.2 LIMITATIONS

The procedures described in this MTP are limited to the general testing only of petroleum handling equipment.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test items are delivered to the Arctic Test Center prior to 1 October.

b. TDY personnel shall be used to augment assigned personnel and shall be trained to the degree that they are as proficient on the individual test items as the troops who will use the equipment.

c. Ensure that all test personnel are familiar with the required technical and operational characteristics of the item under test, such as stipulated in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of equipment, and familiarize all test personnel available for reference.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET) as referenced in 4G.

f. Record the following information:

- 1) Nomenclature, serial number(s), and manufacturer's name of the test items.
- 2) Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.

g. Select test equipment ideally having an accuracy 10 times greater than that of the function to be measured.

h. Prepare record forms for systematic entry of data, chronology of test, and analysis in final evaluation.

i. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test. Ensure that a Safety Release has been obtained prior to test conduct.

j. Outfit all test personnel in appropriate arctic winter clothing as described in MTP 10-4-500.

6.2 TEST CONDUCT

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The following tests shall be conducted in ambient air temperatures of 0°F to the lowest available temperature.

6.2.1 Preoperational Inspection and Physical Characteristics

Upon receipt, carefully inspect all test items and their shipping or packaging containers for completeness, damage and general conditions in accordance with the applicable sections of MTP 10-4-500.

6.2.2 Transportability

- a. Inspect the test item and accessories for loose, damaged or missing parts and place in the best possible condition.
- b. Load the test item and accessories into a vehicle (cargo) in accordance with appropriate technical manuals.
- c. Transport the test item over cross-country trails and secondary roads as specified in the test plan and MTP 10-3-503.
- d. Off-load and uncrate the test item and accessories and thoroughly inspect for loose, damaged or missing parts and record the following:

- 1) Damage attributed to environmental effects
- 2) Problems encountered during loading, transporting and off-loading.
- 3) Damage to test item and accessories due to handling and transporting.
- 4) Maximum and minimum ambient air temperatures during transport.
- 5) Number of personnel and type of equipment required to prepare, load and off-load the test item from the vehicle.
- 6) Mileage accumulated and road conditions.

- e. Install and operate the test item. Record any malfunctions.

6.2.3 Installation

6.2.3.1 Filter/Separation

- a. Inspect the test item for loose, damaged or missing parts and place in the best possible condition.
- b. Install the test item in accordance with appropriate technical manuals and record the following:

- 1) Ambient air temperatures and wind velocities during test.
- 2) Type and quantity of special equipment required for installation.
- 3) Number of personnel and skill level required to assemble and install the test item.
- 4) Time required to assemble and install the test item.
- 5) Difficulties encountered during assembly and installation.
- 6) Photographs of the test site and installation.

NOTE: Filter/Separators up to 400 GPM capacity will be installed in a recirculating system which will provide an injection in known quantities of contaminants. Filter/Separators in excess of 400 GPM capacity will be installed in a petroleum distribution facility capable of maintaining the required flow rate. In such a system, contamination of fuel will not be possible.

6.2.3.2 Collapsible Storage Reservoir

- a. Inspect the test item for loose, damaged or missing parts and place in the best possible condition.
- b. Prepare the test site in accordance with the appropriate draft technical manual and the instructions given in the test directive.
- c. Install the test item in accordance with the technical manuals and test directive described in step b, above.
- d. Record data as described in 6.2.3.1 above and include the following:

- 1) Type and quantity of Engineering support equipment for site preparation.

6.2.4 Functional Suitability

6.2.4.1 Filter/Separation

- a. Inspect the test item for loose, damaged or missing parts and place in the best possible condition.
- b. Commence operation of the test item in accordance with instructions given in the draft technical manual.
- c. The test item shall use fuels as specified in appropriate QMR, SDR's.
- d. During operation, obtain an appropriate number of fuel samples from the line immediately preceding the test item and from the effluent stream and record the amount of filtration being accomplished.
- e. Inject a known amount of contaminants into the fuel flow in accordance with MIL-F-8901B.
- f. Determine the ability of the test item to sustain fuel flow surge reactions resulting from fuel pump starting and stopping operations.
- g. The maximum amount of operational hours shall be determined, consistent with the availability of low ambient air temperatures, adequate manpower and product movement.
- h. Determine and record the following:
 - 1) Ambient air temperature
 - 2) Product temperature
 - 3) Type of fuel
 - 4) Total amount of fuel used (gallons)

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- 5) Average pumping rate (GPM)
- 6) Total hours of operation
- 7) Number of samples and results
- 8) Number and circumstance of faulty indicator alarm actuations

6.2.4.2 Collapsible Storage Reservoir

a. Inspect the test item for loose, damaged or missing parts and place in the best possible condition.

b. Install a thermocouple near the fill and drain-off assembly and one in the test item through the overflow vent and record the surface and product temperature throughout the test.

c. Fill the test item to capacity with fuel and allow to remain in static storage for 60 days.

d. Obtain product samples from the overflow at the beginning, middle and end of storage phase and analyze in accordance with MIL-F-8901B and MTP 9-2-298.

e. Following the storage phase drain the test item and perform a fill-drain cycle once each week for four weeks as follows:

- 1) Fill to capacity one cycle and drain
- 2) Refill to half-capacity one cycle and drain
- 3) Refill to three-quarter capacity and drain for two cycles.

f. During step e, above the pumping will be interrupted periodically and the flow rate varied to determine the effects of flow fluctuation of the test item.

g. Record the following data:

- 1) Ambient air temperatures and wind velocity.
- 2) Product temperature.
- 3) Surface temperature of the test item.
- 4) Maximum depth of snow accumulated on the reservoir each day.
- 5) Effects of rocks, snow, ice and wind on the test item exterior (wear, pinholes, cracks, blisters, or leakage).
- 6) Effects of wind, snow, ice and temperature on the configuration of the test item.
- 7) Rate at which the test item can be filled and emptied (GPM).
- 8) Results of fuel analysis.
- 9) Storage capacity of the test item.
- 10) Amount of product that cannot be withdrawn from the test item.

6.2.5 Human Factors Engineering and Safety

a. Conduct all Human Factors and Safety tests in accordance with the applicable sections of MTP 10-4-500 and include the following:

- 1) Adequacy of marking and indicators
- 2) Adequacy of handles, levers, fasteners, connectors, and

- other items requiring manual operation.
3) Operations which are time consuming and inconvenient.

b. Conduct these tests concurrently with the operational tests (transportability, installation, and functional suitability as described in this MTP).

6.2.6 Maintenance Evaluation

- a. Conduct all maintenance evaluation tests (maintenance and reliability) in accordance with applicable sections of MTP 10-4-500.
b. Conduct these tests concurrently with the operational tests (transportability, installation and functional suitability as described in this MTP).

6.3 TEST DATA

All test data to be recorded will be as specified in the individual subtests of this MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

6.4.1 Preoperational Inspection and Physical Characteristics

Preoperational inspection and physical characteristics data shall be reduced and presented in accordance with MTP 10-4-500.

6.4.2 Transportability

The suitability of the test items to be transported under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to the test items attributed to transporting shall be compared with test item specifications contained in appropriate QMR and TC.

6.4.3 Installation

The suitability of the test items for installation under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to the test items attributed to installation shall be compared with test item specifications contained in appropriate QMR and TC.

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6.4.4 Functional and Operational Suitability

The functional and operational suitability data shall be compared against accepted military standards.

6.4.5 Human Factors Engineering and Safety

Human factors engineering and safety shall be reduced and presented in accordance with MTP 10-4-500.

6.4.6 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with MTP 10-4-500.

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