



Member of the FM Global Group

Approval Standard for Diesel Fuel Maintenance Systems

Class Number 6063

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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1. INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states Approval requirements for fuel maintenance systems used with stored diesel fuel in order to ensure proper performance of stationary diesel engines despite being idle for extended periods. This would include stored diesel fuel supplies for emergency power systems and diesel engine driven fire pump applications.
- 1.1.2 Approval criteria may include, but are not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for diesel fuel maintenance systems. Fuel filtration and fuel polishing systems may be evaluated using this standard. Mobile filtration systems are not included within the scope of this standard.
- 1.2.2 There is no size requirement limitation outlined in this standard. The manufacturer shall state the appropriate maximum size of diesel storage tank for use with the evaluated product.
- 1.2.3 Approval standards are intended to verify that the product described will meet stated conditions of performance, safety, and quality useful to the ends of property loss prevention.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of diesel fuel maintenance systems having characteristics not anticipated by this standard may be FM Approved if performance equal, or superior, to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, diesel fuel maintenance systems which meet all the requirements identified in this standard may not be FM Approved if other conditions that adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate:
- Suitability of the product;
 - Performance of the product as specified by the manufacturer and required by FM Approvals; and, as far as practical,
 - Durability and reliability of the product.
- 1.4.2 An initial Surveillance Audit shall be conducted to evaluate the manufacturer's ability to consistently produce the product that was examined and tested as part of the Approval project. The audit shall review the facility and in-place quality control procedures used in the manufacturing of the product. Typically, areas of review are incoming inspection, work in progress, production testing, final quality control, marking, calibration of equipment, shipping procedures, and document and drawing control. These examinations are repeated periodically as part of FM Approvals' product follow-up program (Refer to Section 5.2, Surveillance Audit).

1.5 Basis for Continued Approval

1.5.1 Continued Approval is based upon:

- Production or availability of the product as currently FM Approved;
- The continued use of acceptable quality assurance procedures;
- Satisfactory field experience;
- Compliance with the terms stipulated in the Master Agreement;
- Satisfactory re-examination of production samples for continued conformity to requirements; and
- Satisfactory Surveillance Audits conducted as part of FM Approvals' product follow-up program.

1.5.2 Also, as a condition of retaining Approval, manufacturers shall not change a product or service without prior authorization by FM Approvals.

1.6 Effective Date

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or forfeit Approval.

The effective date of this standard is the publication date for full compliance with all requirements.

1.7 System of Units

Units of measurements used in this standard are United States (U.S.) Customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard. Conversion of U.S. customary units is in accordance with the Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10, *American National Standard for Metric Practice*.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

IEEE/ASTM SI 10, *American National Standard for Metric Practice*

International Standards Organization (ISO) 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*

ASTM D1331, *Standard Test Methods for Surface and Interfacial Tension of Solutions of Paints, Solvents, Solutions of Surface-Active Agents, and Related Materials*

1.9 Definitions

For purposes of this standard, the following terms apply:

Accepted

This term refers to installations acceptable to the authority enforcing the applicable installation rules. When the authority is FM Global, such locations are termed "FM Global Accepted." Acceptance is based upon an overall evaluation of the installation. Factors other than the use of FM Approved equipment impact upon the decision to accept, or not to accept. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere (Contrast with FM Approved).

Centrifuge

A machine using centrifugal force for separating substances of different densities, for removing moisture, or for simulating gravitational effects.

Du Noüy Ring Method

A method for measuring the surface tension of a liquid and the interfacial tension between two liquids. The force referred to the wetted length acting on a ring as a result of the tension of the withdrawn liquid lamella when moving the ring from one phase to another is measured in this method.

FM Approvals Certification Marks

The use of the FM Approvals Certification Mark is mandatory on all FM Approved products. These registered marks cannot be used except as authorized by FM Approvals via the granting of Approval to a specific product.

FM Approved

This term refers to products FM Approved by FM Approvals. Such products are listed in the *Approval Guide*, an on-line resource of FM Approvals. All products so listed have been successfully examined by FM Approvals, and their manufacturers have signed and returned a Master Agreement to FM Approvals. This form obligates the manufacturer to allow re-examination of the product and audit of facilities and procedures at FM Approvals' discretion. It further requires the manufacturer not to deviate from the as-FM Approved configuration of the product without review by and agreement of FM Approvals. Approval is product and site specific.

Force Tensiometer

A device for measuring the surface tension of a liquid and/or the interfacial tension between two liquids. The tensile force which occurs as a result of wetting an immersed probe is measured with reference to the wetted length. The measuring probe is usually a ring (Du Noüy ring method).

Fuel Filtration System

This term refers to an assembly of components that are used to extract sediment and developed solids within the fuel by passing through a filtration media. Some designs of filtration will also extract developed water within the stored fuel.

Fuel Polishing System

This term refers to an assembly of components that are used to not only extract the sediment and water from the stored fuel but will also help to break down the combustible solids to help maintain the fuel.

Interfacial Tension

The work which must be expended to increase the size of the interface between two adjacent phases which do not mix completely with one another.

NEMA Type 3R

This term refers to electrical enclosures. NEMA Type 3R Enclosures are constructed for either indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow); and that will be undamaged by the external formation of ice on the enclosure.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Diesel fuel maintenance systems are intended to be automated equipment designed to remove water, particulate, fungi and bacteria from stored diesel fuel through filtration and fluid separation. This equipment is standalone and self-diagnosing, monitoring each stage of filtration and designed to shut down and provide an audible alarm and/or a visual signal should the equipment need attention. The equipment is designed to maintain the integrity of clean diesel fuel, extending the fuel life expectancy and storage life.
- 2.1.2 In order to meet the intent of this standard, all systems must be examined on a model-by-model, type-by-type, manufacturer-by-manufacturer, and plant-by-plant basis. This is predicated on the basis that identical designs, fabricated in identical materials by different manufacturer or, even by different plants of the same manufacturer, have been seen to perform differently in testing. Sample diesel fuel maintenance systems, selected in conformance to this criterion, shall satisfy all of the requirements of this standard.

2.2 Approval Application Requirements

To apply for an Approval examination, the manufacturer, or its authorized representative, should submit a request to information@fmapprovals.com.

The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- A complete list of all models, types, and options for the products or services being submitted for Approval consideration;
- General assembly drawings and one complete set of manufacturing drawings;
- Anticipated marking format;
- Brochures, sales literature, specification sheets;
- Installation, operation and maintenance procedures; and
- The number and location of manufacturing facilities.

All documents shall be part of a controlled system and shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All foreign language documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

- 2.3.1 Following set-up and authorization of an Approval examination, the manufacturer shall submit samples for examination and testing. Sample requirements are to be determined by FM Approvals following review of the preliminary information. Sample requirements may vary depending on the options available for the diesel fuel maintenance systems that are to be examined, product design features and results of prior testing. The manufacturer's test facilities may be used for testing.
- 2.3.2 It is the manufacturer's responsibility to submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of FM Approvals.
- 2.3.3 If there are failures encountered during the examination, FM approvals will provide the manufacturer with information regarding what testing will need to be repeated and any additional sample requirements.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 During the initial investigation and prior to physical testing, the manufacturer's specifications, technical data sheets, and design details shall be reviewed to assess the ease and practicality of installation and use. The product shall be capable of being used within the limits of the Approval investigation.
- 3.1.2 The manufacturer's dimensional specifications and/or design drawings shall fully describe the product. All critical dimensions shall be indicated with allowed upper and lower tolerance limits clearly shown.
- 3.1.3 All documents pertaining to the product materials, dimensions, processing and marking shall be controlled by the manufacturer's Quality Assurance procedures, and shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All foreign language drawings shall be provided with an English translation.

3.2 Operation, Physical or Structural Features

- 3.2.1 The diesel fuel maintenance system construction shall not adversely affect the functionality, present the risk of fire, electric shock, and/or injury to persons that may operate the product, when tested under all conditions as defined in this standard.
- 3.2.2 As tested within the definitions of this standard, the system shall:
- Not sustain damage that may compromise functionality, except were permitted, and/or safety;
 - Restrict entry of foreign objects so functionality, except were permitted, and/or safety are not compromised;
 - Protection against electrical shock from enclosed live parts;
 - Protect the equipment from external combustible materials.
- 3.2.3 Enclosures for diesel fuel maintenance systems shall comply with the requirements for a NEMA environmental rating no lower than Type 3R, or with the requirements for an IEC IP designation code of no lower than IP14. When using IEC IP designation code, care shall be taken to ensure that the IP code and test method is equivalent to the prescribed NEMA Type rating.
- 3.2.4 The diesel fuel maintenance system shall provide an automatic system shut-off with accompanying audible and/or visible alarm indicators for:
- Fuel line blockage and/or filter saturation and/or motor overload and/or zero flow condition and/or system overpressure
 - High water level/water collector full
 - Fuel leak detection of the fuel maintenance pumping system

3.3 Markings

- 3.3.1 All FM Approved diesel fuel maintenance systems shall bear at least the following minimum markings:
- Manufacturer's name, code or trademark
 - Model designation and serial number
 - Fuel flow rate
 - Specific source code, indicating location of manufacture (if more than one)
 - Date of manufacture code
 - FM Approvals Certification Mark
- 3.3.2 All markings shall be legible throughout the useful life of the product.

- 3.3.3 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the product as FM Approved. The manufacturer shall not place this model or type identification on any other product unless covered by a separate agreement.

3.4 Manufacturer's Installation and Operation Instructions

The manufacturer shall provide installation instructions which provide details necessary to properly install, operate, and maintain the system. These instructions shall be submitted to FM Approvals prior to the examination of a system.

3.5 Calibration

- 3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of its stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment shall be submitted to FM Approvals for its records. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified as traceable to the National Institute of Standards and Technology (NIST) or traceable to other acceptable reference standards and certified by an ISO 17025 "*General Requirements for the Competence of Testing and Calibration Laboratories*" calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service accreditation certificate as an ISO 17025 calibration laboratory is required for FM Approvals' records.
- 3.5.2 The calibration of new equipment is also required. Documentation indicating either the date of purchase or date of shipment, equipment description, model and serial number is required for identification. The new test equipment shall be clearly identified by label or sticker showing the date of initial calibration and the next due date.
- 3.5.3 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of the equipment.

3.6 Tolerances

Tolerances on units of measure shall be as described in Appendix A, unless otherwise specified in this standard.

4. PERFORMANCE REQUIREMENTS

4.1 Examination

4.1.1 Requirement

The diesel fuel maintenance systems shall conform to the manufacturer's drawings and specifications and to FM Approvals requirements.

4.1.2 Evaluation

A sample system shall be examined and compared to drawings and specifications. It shall be verified that the sample conforms to the physical and structural requirements described in Section 3, General Requirements.

4.2 Filtration Testing

4.2.1 Requirement

The diesel fuel maintenance system shall demonstrate the ability to remove particulate and water from contaminated #2 diesel fuel.

4.2.2 Test/Verification

The volume of clean #2 diesel fuel for this test should be equal to the amount of fuel expected to pass through the maintenance system one time over a 5 minute duration. A 2 oz (30 mL) sample of the clean #2 diesel fuel shall be extracted as a baseline for the filtration testing.

To simulate fuel contamination, water and particulate material will be added to the specified volume of clean #2 diesel fuel. 1 fl oz (30 mL) of water and 0.5 oz (15 g) of ISO 12103-1, A4 Coarse Test Dust per gallon of clean #2 diesel fuel shall be stirred into the volume of clean fuel.

The contaminated #2 diesel fuel shall be extracted from the bottom of the storage tank and passed through the diesel fuel maintenance device one time. A 2 oz (60 mL) sample of the filtered fuel shall be extracted at 2.5 minutes from the start of the filtering sequence. A second 2 oz (60 mL) sample shall be extracted at 5 minutes from the start of the filtering sequence.

4.2.2.1 A 2 oz (30 mL) sample of clean #2 diesel fuel, sample of filtered fuel from the 2.5 minute interval, and a filtered fuel sample from the 5 minute interval shall be placed individually in a centrifuge and spun for 15 minutes at 1550 rpm. Each sample shall be visually inspected for remaining particulate and water. No visible water or particulate shall be visible when observed under direct light.

4.2.2.2 Each sample described in Section 4.2.2.1 shall undergo force tensiometer testing to measure the interfacial tension between the water and fuel sample. The force tensiometer shall be equipped with a Du Noüy ring. As described in ASTM D1331, the Du Noüy ring method measures the force required to pull a platinum-iridium ring of known circumference through the surface of the liquid sample. The two filtered samples shall have a force tensiometer reading less than or equal to that of the clean baseline #2 diesel fuel sample.

4.3 Fault Condition Simulation

4.3.1 Requirement

The diesel fuel maintenance system shall be equipped with the ability to shut down, alarm, and display a fault indication on the system control panel when a fault condition occurs.

4.3.2 Test/Verification

4.3.2.1 Place a ball valve or some other temporary device to simulate a blockage/zero flow condition on the incoming fuel line to the diesel fuel maintenance device. The maintenance device should shut down, alarm and display a visual indication of the blockage/overpressure fault on the control panel of the maintenance system device.

4.3.2.2 Simulate a fuel leak in the diesel fuel maintenance device. The maintenance device should shut down, alarm and display a visual indication of the leakage fault on the control panel of the maintenance system device.

4.3.2.3 Simulate high water level/ full water collector alarm on the diesel fuel maintenance device. The maintenance device should shut down, alarm and display a visual indication of the high water level/ full water collector fault on the control panel of the maintenance system device.

4.4 Voltage Variation

4.4.1 Requirement

It shall be verified that the diesel fuel maintenance system maintains the normal operational capability and functionality throughout typical voltage extremes of both the primary and secondary power supplies.

4.4.2 Test/Verification

As a minimum, the normal operation of the equipment shall be verified at 85% to 110% of the rated primary (AC) power source. If the manufacturer specifies a voltage range beyond these extremes, the equipment will be tested using those values specified by the manufacturer.

4.5 Dielectric Strength

4.5.1 Requirement

The diesel fuel maintenance system shall withstand for 1 minute the application of AC voltage, or a DC voltage applied between live parts and the enclosure and dead metal parts that may come in contact with, and live parts of circuits operating at different voltages. During this test there shall be no signs of arcing or breakdown.

4.5.2 Test/Verification

The voltage, based on the circuit rating, as shown in Table 4.5.2, shall be applied between live parts and the enclosure and dead metal parts that may come in contact with, and live parts of circuits operating at different voltages. This voltage shall be applied in each test for a duration of 1 minute. During the dielectric test there shall be no signs of arcing or breakdown. If a DC test voltage is to be applied, the test parameter AC value in Table 4.5.2 should be multiplied by 1.414.

Table 4.5.2 Dielectric Test

<i>Voltage Ratings</i>	<i>Test Parameters</i>
24 Volt	500 Volts
60 Volt, or higher	1000 Volts + 2 * (AC Voltage if over 60 Volts)

4.6 Additional Tests

At the discretion of FM Approvals additional tests may be required, depending on design features, results of any tests, material application, or to verify the integrity and reliability of the diesel fuel maintenance system.

Unexplained failures shall not be permitted. A re-test shall only be acceptable at the discretion of FM Approvals with adequate technical justification of the conditions and reasons for failure.

5. OPERATIONS REQUIREMENTS

A Quality Control Program is required to assure that diesel fuel maintenance systems produced by the manufacturer at an authorized location shall present the same quality and reliability as the specific diesel fuel maintenance systems examined. Design quality, conformance to design, and performance are the areas of primary concern. Design quality is determined during the Approval examination and tests, and is covered in the Approval Report. Conformance to design is verified by control of quality and is covered in the Surveillance Audit Program. Quality of performance is determined by field performances and by periodic re-examination and testing.

5.1 Demonstrated Quality Control Program

5.1.1 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- Existence of corporate quality assurance guidelines
- Incoming quality assurance, including testing
- In-process quality assurance, including testing
- Final inspection and tests
- Equipment calibration
- Drawing and change control
- Packaging and shipping
- Handling and disposition of non-conformance materials.
- In order to assure adequate traceability of materials and products, the manufacturer shall maintain records of all quality control tests performed, for a minimum period of two years from the date of manufacture.

5.1.2 Documentation/Manual

There shall exist an authoritative collection of procedures and policies. Such documentation shall provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system shall require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.3 Drawing and Change Control

The manufacturer shall establish a system of product configuration control that does not allow unauthorized changes to the product. Revisions to critical documents, identified in the Approval Report, must be reported to, and authorized by, FM Approvals prior to implementation for production. The manufacturer shall assign an appropriate person or group to be responsible for, and require that, proposed changes to FM Approved or Listed products be reported to FM Approvals before implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals Form 619, *FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report*. Records of all revisions to all FM Approved products shall be maintained.

5.1.3.1 The table below has been included as a guide to manufacturers of what is considered to be a significant change to FM Approvals. As mentioned above, modifications that fit this category shall be documented by means of a letter stating the change, and requesting a quotation for an Approval examination.

<i>Modification</i>	<i>Description/Example</i>
Addition or Relocation of the Manufacturing Location	The product was originally FM Approved in location A, and now is desired to be made in locations A and B, or only in location B.

<i>Modification</i>	<i>Description/Example</i>
Hardware	Any reduction in material class, performance or electrical rating for all electrical and mechanical components such as circuit breakers, wire, insulation, relays, switches, pushbuttons, etc.
Software	Any change in format or functionality.
Addition of Alternate Suppliers for Purchased Items	Enclosure cabinet, electrical components, mechanical hardware, and filter media.
Changes to Critical Dimensions	
	Modifications that would have an effect on the ability of the product to maintain the same performance as the originally Approved product.

5.1.3.2 The table below has been included as a guide to manufacturers of modifications that are commonly submitted on FM Approvals Form 619, *FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report*.

<i>Modification</i>	<i>Description/Example</i>
Change in Company Contact Information	Name, Title, Phone Number, Fax Number, Email Address, Company Office Address, Company Name
Updating of Drawings	FM Approved Product Revision Request Form is used to notify FM Approvals in the event of: minor dimensional changes to non-critical features, minor changes in notes, location of title block, re-creation of the same drawing on CAD, etc.
Changes in Markings	Please describe what changes are to be made and include a drawing of the proposed marking.
Changes in Materials of Component	Where new material is either superior, or comparable to material used in original Approval
Updating of Documentation	Creation of New or Revisions to Sales literature, Installation Instructions, Grooving Dimensions, Quality Manual, etc.

5.1.3.3 For the instances where the modification is difficult to categorize, manufacturers are encouraged to contact FM Approvals to discuss the nature of the change, and inquire about how to send the information to FM Approvals. The examples shown in Sections 5.1.3.1 and 5.1.3.2 are based on common examples of modifications as they relate to the manufacture of the product.

5.2 Surveillance Audit Program

5.2.1 An audit of the manufacturing facility is part of the Approval investigation to verify implementation of the quality control program. The surveillance audit shall ensure that the appropriate controls are in place to verify that the product bearing the FM Approval Mark conforms to the specified requirements. Although the structure defined in ISO 9001 “Quality Management Systems - Requirements” may be applied, the focus of surveillance audits is principally the FM Approved or Listed product. Initial inspections of facilities already producing similar FM Approved products may be waived at the discretion of FM Approvals.

- 5.2.2 Surveillance audits shall be conducted by FM Approvals, or its representatives, at least annually at each location that manufactures the product, and/or applies the FM Approval Mark as listed in the final Approval Report to confirm continued compliance. The frequency of, and time needed to complete, the surveillance audit is dependent on the product class, product complexity, jurisdictional requirements, FM Approvals accreditation requirements, and findings.
- 5.2.3 The manufacturer shall manufacture the product or service only at the location(s) audited by FM Approvals and as specified in the Approval Report. Manufacture of products bearing the FM Approval Mark is not permitted at any other locations without prior written authorization by FM Approvals.
- 5.2.4 In the event that all or part of the quality inspection is subcontracted, the manufacturer shall provide FM Approvals with documentation outlining the nature of the inspection, frequency, test details, and pass / fail criteria that was provided to the subcontracted company, and documentation that they have received and implemented these procedures.

5.3 Manufacturer's Responsibilities

The manufacturer shall notify FM Approvals of changes in product construction, design, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation of such changes.

5.3.1 Manufacturing and Routine Production Tests

The manufacturer shall perform routine production tests as specified below on 100 percent of all FM Approved diesel fuel maintenance systems prior to shipment. Routine tests shall be made on each individual diesel fuel maintenance system in the manufacturing facility. Routine tests for diesel fuel maintenance systems shall include:

5.3.1.1 Verification of Fault Conditions

It shall be verified that the diesel fuel maintenance systems operates according to the requirements of Section 4.3 of this standard.

5.3.1.2 Verification of Dielectric Properties

The diesel fuel maintenance system shall withstand 5 seconds of AC voltage, or DC voltage, applied between live parts and the enclosure. The voltages defined in Table 4.5.2 shall be used for this test. During this test there shall be no signs of arcing or breakdown.

APPENDIX A: Tolerances

Unless otherwise stated, the following tolerances shall apply:

Length	± 2 percent of value
Volume	± 5 percent of value
Pressure	± 5 psi (0.35 bar)
Temperature	$\pm 4^{\circ}\text{F}$ (2°C)
Time	+ 5/-0 seconds +0.1/-0 minutes

Unless stated otherwise, all tests shall be carried out at a room (ambient) temperature of $68 \pm 9^{\circ}\text{F}$ ($20 \pm 5^{\circ}\text{C}$).

APPENDIX B: Sample Listing

Diesel Fuel Maintenance System

Automated equipment designed to remove water, particulate, fungi and bacteria from stored diesel fuel through filtration and fluid separation. The equipment is standalone and self-diagnosing, monitoring each stage of filtration and designed to shut down and provide an audible alarm and/or a visual signal should the equipment need attention. The equipment is designed to maintain the integrity of clean fuel, extending the fuel life expectancy and storage life.

ABC Co, 123 Streets Ave, City, ST 33303

System Model Name	System Flow Rate, GPM (L/min)	Maximum Storage Tank Size, Gal (L)
Model XYZ	2.8 GPM (10.6 L/Min)	5,000 Gal (18,930 L)