METRIC
MIL-PRF-32654
19 May 2020

PERFORMANCE SPECIFICATION

OIL/WATER SEPARATOR (OWS), CENTRIFUGAL, 38-LITER (10-GALLON) PER MINUTE

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

1. SCOPE

1.1 Scope. This specification covers a fully automated, electrically powered, self-contained, and skid-mounted 38-liter (10-gallon) per minute centrifugal oil/water separator (OWS) (see 6.10.13) unit capable of providing treatment of oily bilgewater aboard Navy ships to 15 parts per million (ppm) effluent (see 6.10.6) concentration.

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 of 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. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680	-	Degreasing Solvent
MIL-DTL-901	-	Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for
MIL-DTL-917	-	Electric Power Equipment, Basic Requirements for
MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-PRF-9000	-	Lubricating Oil, Shipboard Internal Combustion Engine, High-Output Diesel
MIL-DTL-15024	-	Plates and Tags for Identification of Equipment, General Specification for
MIL-P-15024/5	-	Plates, Identification
MIL-D-16791	-	Detergents, General Purpose (Liquid, Nonionic)
MIL-DTL-16884	-	Fuel, Navy Distillate
MIL-DTL-17060	-	Motors, Alternating Current, Integral-Horsepower, Shipboard Use

Comments, suggestions, or questions on this document should be addressed to Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy mil, with the subject line “Document Comment”. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

AMSC N/A FSC 4330

MIL-PRF-17331	-	Lubricating Oil, Steam Turbine and Gear, Moderate Service
MIL-B-17931	-	Bearings, Ball, Annular, for Quiet Operation
MIL-PRF-23236	-	Coating Systems for Ship Structures
MIL-H-24135	-	Hose, Synthetic Rubber, Wire Reinforced for Flexible Hose Assemblies, General Specification for
MIL-H-24136	-	Hose, Synthetic Rubber, Synthetic Fiber Reinforced for Flexible Hose Assemblies, General Specification for
MIL-PRF-24385	-	Fire Extinguishing Agent, Aqueous-Film Forming Foam (AFFF) Liquid Concentrate, for Fresh and Sea Water
MIL-DTL-24441	-	Paint, Epoxy-Polyamide, General Specification for
MIL-DTL-24441/20	-	Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type III
MIL-DTL-24441/21	-	Paint, Epoxy-Polyamide, Haze Gray Formula 151, Type III
MIL-DTL-24643	-	Cables, Electric, Low Smoke Halogen-Free, for Shipboard Use General Specification for
MIL-F-24787	-	Fittings, End, Reusable for Flexible Hose Assemblies, General Specification for
MIL-DTL-32613	-	Controller, Auxiliary-System, Naval Shipboard Use

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-108	-	Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment
MIL-STD-167-1	-	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)
MIL-STD-461	-	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-740-2	-	Structureborne Vibratory Acceleration Measurements and Acceptance Criteria of Shipboard Equipment
MIL-STD-777	-	Schedule of Piping, Valves, Fittings, and Associated Piping Components for Naval Surface Ships
MIL-STD-889	-	Dissimilar Metals
MIL-STD-1310	-	Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety
MIL-STD-1399-300-1	-	Department of Defense Interface Standard Section 300, Part 1 Low Voltage Electric Power, Alternating Current
MIL-STD-1472	-	Human Engineering
MIL-STD-1474	-	Noise Limits
MIL-STD-1553	-	Digital Time Division Command/Response Multiplex Data Bus

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for Use in Shipboard Equipment

MIL-HDBK-470 - Designing and Developing Maintainable Products and Systems, Volume I

MIL-HDBK-781 - Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production

(Copies of these documents are available online at https://quicksearch.dla mil.)

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 of these documents are those cited in the solicitation or contract.

CODE OF FEDERAL REGULATIONS (CFR)

46 CFR 162.050 - Pollution Prevention Equipment

(Copies of this document are available online at www.ecfr.gov.)

DEPARTMENT OF DEFENSE (DOD) ISSUANCES

DoDM 4715.6, Volume 2 - Regulations on Vessels Owned or Operated by the Department of Defense: Oil Pollution Prevention

(Copies of this document are available online at www.esd.whs.mil/DD/.)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 1664 - N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-Polar Material) by Extraction and Gravimetry

(Copies of this document are available online at www.epa.gov.)

GENERAL SERVICES ADMINISTRATION

GSA Global Supply Catalog

(Copies of this document are available online at www.gsaglobalsupply.gsa.gov.)

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

NAVSEA T9070-AL-DPC-020/077-2 - NAVSEA Hazardous Material Avoidance Process

(Copies of this document are available online via Technical Data Management Information System (TDMIS) at https://mercury.tdmis.navy.mil/ by searching for the document number without the suffix. Refer questions, inquiries, or problems to: DSN 296-0669, Commercial (805) 228-0669. This document is available for ordering (hard copy) via the Naval Logistics Library at https://nll navsup navy mil. For questions regarding the NLL, contact the NLL Customer Service at nllhelpdesk@navy mil, (866) 817-3130, or (215) 697-2626/DSN 442-2626.)

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 these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers

(Copies of this document are available online at www.asse-plumbing.org.)

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 45.1 - Recommended Practice for Electrical Installations on Shipboard – Design

IEEE 45.2 - Recommended Practice for Electrical Installations on Shipboard – Controls and Automation

IEEE 45.3 - Recommended Practice for Shipboard Electrical Installations – Systems Engineering

IEEE 45.4 - Recommended Practice for Electrical Installations on Shipboard – Marine Sectors and Mission Systems

IEEE 45.5 - Recommended Practice for Electrical Installations on Shipboard – Safety Considerations

IEEE 45.6 - Recommended Practice for Electrical Installations on Shipboard – Electrical Testing

IEEE 45.7 - Recommended Practice for Electrical Installations on Shipboard – AC Switchboards

IEEE 45.8 - Recommended Practice for Electrical Installations on Shipboard – Cable Systems

IEEE 802.3 - Standard for Ethernet

IEEE 1451.2 - Standard for a Smart Transducer Interface for Sensors and Actuators - Transducer to Microprocessor Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats

(Copies of these documents are available online at www.ieee.org.)

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60072-1 - Dimensions and Output Series for Rotating Electrical Machines – Part 1: Frame Numbers 56 to 400 and Flange Numbers 55 to 1080

IEC 60072-2 - Dimensions and Output Series for Rotating Electrical Machines – Part 2: Frame Numbers 355 to 1000 and Flange Numbers 1180 to 2360

(Copies of these documents are available online at http://webstore.iec.ch.)

INTERNATIONAL MARITIME ORGANIZATION

MEPC.107(49) - Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships

(Copies of this document are available online at www.imo.org.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 12103-1 - Road Vehicles – Test Contaminants for Filter Evaluation – Part 1: Arizona Test Dust

ISO 492 - Rolling Bearings – Radial Bearings – Geometrical Product Specifications (GPS) and Tolerance Values

(Copies of these documents are available online at www.iso.org.)

INTERNATIONAL SOCIETY OF AUTOMATION

ANSI/ISA 62443-4-1 - Security for Industrial Automation and Control Systems Part 4-1: Product Security Development Life-Cycle Requirements

(Copies of this document are available online at www.isa.org.)

NATIONAL ELECTRONIC MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

(Copies of this document are available online at www nema.org.)

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-SP 10/NACE No. 2 - Near-White Blast Cleaning

(Copies of this document are available online at www.sspc.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 specification exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Description. The centrifugal OWS consists of a separation system that utilizes a centrifuge and supporting subsystems (see 6.10.18) to separate the oil and water from wastewater collected in the ship's oily waste holding tank (OWHT) (see 6.10.15). The wastewater is separated by the centrifugal OWS to produce an effluent suitable for overboard discharge and a concentrated waste oil for collection in the ship's waste oil tank (WOT) (see 6.10.19). The centrifugal OWS system shall include a means of removing the buildup of accumulated solids in the centrifuge bowl generated during processing (see 6.10.17) from within the separation system. The centrifugal OWS shall be an electrically operated unit consisting of modular or single skid-mounted components ready for operation with the current ship's architecture (structure, mechanical, electrical, data). The OWS system shall not have tanks and pumps between the stages of processing, such as filtration, centrifuge, and polishing, if there are multiple stages. The OWS system shall not utilize chemical injection to meet the discharge requirements, and any secondary treatment shall meet the performance, operability, maintainability, and logistical requirements defined in 3.6 through 3.12.

3.3 Materials. The centrifugal OWS shall be fabricated from compatible materials, inherently resistant to or treated to provide protection against corrosion, erosion, and microbial deterioration for the system's service life and in any shipboard or storage environment specified herein. Painted surfaces are acceptable where they will hold up against wear and corrosion. The materials selected shall be capable of meeting all requirements specified herein. All materials shall be commercially available and conform to applicable commercial marine standards and practices.

3.3.1 Wetted materials. All materials in contact with the oily wastewater and processed byproducts shall be uncoated and compatible, with no evidence of deleterious effect, with the following: seawater, diesel fuel marine fuels specified in MIL-DTL-16884, turbine fuels specified in MIL-DTL-5624, 2190 TEP steam lube oil specified in MIL-PRF-17331, 9250 diesel lube oil specified in MIL-PRF-9000, contaminants such as the degreasing solvent specified in MIL-PRF-680 (type III), and aqueous film forming foam (AFFF) specified in MIL-PRF-24385. Carbon steel, iron, aluminum, and aluminum alloys shall not be used for any materials in direct contact with water, oily wastewater, sludge, or effluent.

3.3.2 Dissimilar metals. As specified in MIL-STD-889, dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Sacrificial anodes are not permitted.

3.3.3 Identification of materials and finishes. The specific material, material finish, or treatment shall be identified for use with the component and subcomponent.

3.3.4 Painting. Non-working surfaces that are normally painted shall be finished as follows:

a. Surface preparation prior to painting in accordance with SSPC-SP 10/NACE No. 2.

b. Coating options:

(1) Single coat of MIL-PRF-23236, type VII, class 5/18, 20 to 30 mils dry film thickness.

(2) Two coats – one coat MIL-PRF-23236, type VII, class 5, 4 to 8 mils plus one coat MIL-PRF-23236, type VII, class 5, 10 to 12 mils dry film thickness per coat.

(3) Two coats epoxy paint formula 151 and one coat of formula 150 in accordance with MIL-DTL-24441, MIL-DTL-24441/20, and MIL-DTL-24441/21; average 3 mils dry film thickness per coat.

3.3.5 Electrical cable materials. All electrical cable materials shall meet the low smoke requirements of MIL-DTL-24643. They shall be oil-proof if in any location potentially exposed to oil or bilgewater.

3.3.6 Toxicity and prohibited materials.

3.3.6.1 Toxicity. When evaluated in accordance with 4.2, the centrifugal OWS shall pose no serious or high risk to the health of personnel or the environment when used for its intended purpose (see 4.5 and 6.1).

3.3.6.2 Prohibited materials. The centrifugal OWS shall not contain any chemicals categorized as “prohibited” in accordance with NAVSEA T9070-AL-DPC-020/077-2 for NAVSEA programs or NAS 411-1 for all other programs.

3.3.7 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials shall 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 (see 6.7).

3.4 Environmental considerations. When specified (see 6.2), particular applications of this specification may require special environmental consideration other than those required in 3.4.1 through 3.4.11.

3.4.1 Shock. The centrifugal OWS shall meet the requirements of MIL-DTL-901, grade B, class I, type A shock when tested as specified in 4.5.2.1.

3.4.2 Environmental vibration. The centrifugal OWS shall meet the MIL-STD-167-1, type I environmental vibration requirements when tested as specified in 4.5.2.2.

3.4.3 Mechanical vibration. The equipment shall meet the requirements of MIL-STD-167-1, type II, and shall be free of self-induced destructive vibration under all operating conditions when tested as specified in 4.5.2.3.

3.4.4 Airborne noise. The centrifugal OWS shall meet the MIL-STD-1474, grade E equipment airborne noise requirements for any operational condition when tested as specified in 4.5.2.4.

3.4.5 Structureborne noise. The centrifugal OWS shall meet the MIL-STD-740-2, type II equipment structureborne noise requirements when tested as specified in 4.5.2.5.

3.4.6 Electromagnetic interference. The centrifugal OWS shall meet the applicable electromagnetic emissions and susceptibility requirements in MIL-STD-461 (see 6.2) for auxiliary equipment operating in a machinery space of the intended ship or class of ship when tested as specified in 4.5.2.6.

3.4.7 Operational temperatures. The centrifugal OWS shall meet specified performance requirements when operating in an ambient air temperature environment range of 4 to 50 °C (40 to 122 °F).

3.4.8 Storage (non-operating) temperatures. When in a non-operating state, the centrifugal OWS shall not be damaged, nor shall subsequent operational performance be degraded, as a result of being subjected to ambient air temperatures ranging from 4 to 71 °C (40 to 160 °F).

3.4.9 Humidity. The centrifugal OWS shall not be damaged, nor shall subsequent operational performance be degraded, when subjected to 95 percent humidity.

3.4.10 Pitch and inclination. The centrifugal OWS shall operate properly, suffer no damage, and prevent loss of fluid under permanent 15-degree inclination in any direction and symmetrical rolling to 45-degree inclination in any direction for a period of not less than 30 minutes.

3.4.11. Water spray. When in a non-operating state, the centrifugal OWS shall not be damaged, nor shall subsequent operational performance be degraded, as a result of all external system components being subjected to a water hose down test as specified in NEMA 250.

3.5 Design. The centrifugal OWS shall incorporate a feed (see 6.10.8) system, a separation system, and a control system including sensors. Its design shall include a means of automatically removing accumulated solids from the centrifuge bowl that are generated during processing from within the centrifugal separation unit. The centrifugal OWS shall take suction directly from the ship's OWHT via the influent connection. Without heating, it shall send cleaned effluent oil content of less than or equal to 15 ppm to the clean effluent (see 6.10.1) connection. When the centrifugal OWS effluent oil content is greater than 15 ppm, it shall be discharged through the dirty discharge (see 6.10.4) connection with the system/flushing water discharge. The centrifugal OWS shall have the ability to transfer waste oil and sludge directly to the ship's WOT through the sludge connection. Guidance for the centrifugal OWS system design is provided in section 6.

3.5.1 Feed system. The feed system shall provide the interface with the ship as specified in 3.7.1. It shall deliver feed from the OWHT, through the influent connection, and into the separation system as required to support the requirements specified herein.

3.5.2 Separation system. The separation system shall provide interface with the ship as specified in 3.7.1 and deliver an effluent with an oil content not greater than 15 ppm as specified in 3.6.2.

3.5.3 Solids mitigation. The centrifugal OWS shall provide means of automatically, without operator interaction, discharging accumulated solids captured in pre-separator filters, if provided, and in the separator itself during processing via a sludge discharge interface connection to the ship's WOT. The centrifugal OWS shall provide the ability to manually discharge solids via a waste oil discharge interface connection to the ship's WOT.

3.5.4 Waste oil transfer. The centrifugal OWS shall provide means to transfer waste oil produced during processing directly to the ship's WOT via a sludge discharge interface connection.

3.5.5 System/flushing water drains. The centrifugal OWS shall include drains which allow system process fluids and flushing water to be drained through the centrifugal OWS dirty discharge interface connection to the ship's OWHT.

3.5.6 System connections. The centrifugal OWS piping, electrical, and data interface connections shall consist of, at minimum, those referenced in table I. Only one ship service potable water and one compressed air connection shall be allowed.

3.5.7 Size and weight. The assembled wet weight of the centrifugal OWS shall not exceed 2,268 kilograms (5,000 pounds). The height of the centrifugal OWS, including maintenance clearance, shall not exceed 2.54 meters (100 inches) from the unit bottom in the upward vertical direction. The footprint shall not exceed 1.78 meters (70 inches) wide by 1.78 meters (70 inches) deep, and the clearance required for equipment removal and maintenance shall extend no further than 0.61 meter (24 inches) in the horizontal plane away from the unit front and one adjacent side designed for access. The centrifugal OWS shall be capable of being disassembled into subassemblies or components without the requirements of cutting. It shall be able to pass through standard Navy doorways 0.66 meter (26 inches) wide by 1.68 meters (66 inches) high, reduced further by round corners on a 0.20-meter (8-inch) radius, and hatches 0.76 meter (30 inches) wide by 1.52 meters (60 inches) long, reduced further by round corners on a 0.19-meter (7.5-inch) radius, and then being reassembled into an operational system. These sizes and weights include the complete centrifugal OWS system, all modules combined, and any auxiliary components required by and provided with the centrifugal OWS.

3.5.8 Power consumption. The centrifugal OWS power consumption shall not exceed 14 kilowatts (kW) at 440 volts, three-phase.

3.5.9 Grounding and bonding. Grounding and bonding of the centrifugal OWS electrical enclosure, pumps, and system frame to the ship's substructure shall be provided for electrical safety connection and an effective low-impedance radio frequency (RF) connection in accordance with MIL-STD-1310.

3.5.10 Mount. The centrifugal OWS shall be vertical, hard-mounted on a base plate, furnished completely, and ready for mounting directly to the deck of the ship without the use of a pedestal. Any shock or vibration mounts required to meet the operational, reliability, and environmental requirement shall be internal to the system envelope.

3.5.11 Brakes. The centrifugal OWS shall be equipped with bowl brakes or another method of slowing and stopping the bowl.

3.5.12 Markings. In accordance with MIL-DTL-15024 and MIL-P-15024/5, the centrifugal OWS shall have a permanently affixed and legible metallic identification plate located on the front of the unit that identifies the centrifugal OWS manufacturer's name, model and serial number, national stock number (NSN) (see 6.2), contract number, date of manufacture (month and year), nominal processing rate, and this specification number. The electrical enclosure shall have permanently affixed markings that identify the manufacturer's name, model and serial number, voltage, frequency, amperage, and, if applicable, low noise. Additionally, the electrical panel shall have all instrumentation displays marked as to their purpose and an electrical schematic posted inside the electrical enclosure. All system piping (including valves, inlets, discharges, and gauges) shall be identified for its specific service, pressure, and flow direction.

3.5.12.1 Wire identification. For internal chassis wiring, any wire less than 0.31 meter (12 inches) in length or wires connecting studs on a single part shall be marked for identification in the center, unless such wires are laced or secured by sleeving into a wire bundle. All other internal wires of the equipment shall be marked for identification at both ends. Designations shall be marked on sleeve type wire markers over the wire insulation. Markings shall be applied in a permanent, legible manner resistant to water, oil, and abrasion. Designations at each end of the wire shall consist of the part and terminal number as assigned in the wire list or schematic diagram. Adhesive strip-type markers designed for wrapping around wire shall not be used. Marking of internal chassis wiring or color-coding may be used as an aid in manufacture or maintenance. Internal wiring in a wire bundle terminating at a multi-pin connector does not require wire markers at the end of the wire that terminates at the connector.

3.5.13 Compressed air. The centrifugal OWS compressed air consumption shall not exceed 283 standard liters per minute (slpm) (10 standard cubic feet per minute [scfm]). The average air consumption shall not exceed 71 slpm (2.5 scfm). If the centrifugal OWS requires dry compressed air, it shall be capable of removing moisture from the supply air and discharging it to a ship-supplied bilge funnel.

3.5.14 Lubricants. Lubricants used for centrifugal OWS operation, assembly, and maintenance, except high speed (above 3,600 revolutions per minute) sealed bearings, should preferably be selected from those standard lubricants listed in MIL-HDBK-267. Commercial lubricants may be used for sealed bearings operating above 3,600 revolutions per minute.

3.5.15 Piping and valves. Connections to ship's piping shall be flanged. Flange size, rating, specification, and surface finish for piping connections shall be as specified (see 6.2). Centrifugal OWS external connection valves, flanges, bolting, gaskets, fittings, and piping shall conform to MIL-STD-777.

3.5.16 Overload relay. An overload relay shall be provided, which will be effective for all operating conditions other than the initial starting period. It shall be the compensated thermal type. An embedded detector type shall not be used.

3.5.17 Cybersecurity. The cybersecurity measures of MIL-DTL-32613 shall be implemented.

3.5.18 Interchangeability. Identically identified components shall be functionally and physically interchangeable without degradation of performance, reliability, or operating characteristics and without selective assembly or modification, except for calibration and adjustment. Repair parts shall be interchangeable with and identified identically to the part they replace. Notwithstanding the above, parts balanced as complete assemblies shall not be exchanged without rebalancing the complete assembly.

3.5.19 Motors. Motors shall conform to MIL-DTL-17060 for alternating current (AC) motors and shall have the following characteristics:

Horsepower (hp)	See 3.5.19.2
Service	A
Speed classification	Constant
Duty	Continuous
Enclosure	Totally enclosed or drip-proof
Bearings	In accordance with ISO 492 (MIL-B-17931 if low noise application)
Ambient temperature	50 °C (122 °F)
Insulation	B or F with sealed insulation system
Type	Squirrel cage induction
Voltage rating	440 volts AC, three-phase, unless otherwise specified (see 6.2)
Design	As required (see 3.5.20)
Low noise application	As specified (see 6.2)
Mechanical balance	Precision (super precision if low noise application)

3.5.19.1 Direct current (DC) motors. When specified (see 6.2), DC motors shall be provided in accordance with IEC 60072-1 or IEC 60072-2.

3.5.19.2 Horsepower (HP) rating. The HP rating of each motor shall be not less than the sum of the maximum brake HP of the driven components under any condition of service. The actual motor rating shall be in accordance with Navy standard HP sizes in accordance with MIL-DTL-17060, or IEC 60072-1 or IEC 60072-2 for other sizes, as required. If the maximum brake horsepower (BHP) of the equipment is less than 2, and if there is a possibility of an unpredictably high frictional load due to improper adjustment of glands or to some other cause, then the maximum BHP shall be multiplied by a safety factor of [1.5 - (Max. BHP)/4] before selecting the next larger Navy standard rating.

3.5.19.3 Thermal protection. Thermal protection shall be provided for the centrifugal OWS motor stator and motor bearings in accordance with MIL-DTL-17060, with the provision for de-energizing the motor control. Thermal protection for motor bearings and the motor stator shall be in parallel electrically. Thermal protection shall include motor-mounted monitor control with a plug-in relay having not less than one pair of normally open contacts and one pair of normally closed contacts. The temperature sensing system shall include not less than three thermal sensors imbedded in the stator windings and one thermal sensor for each motor bearing. Positive temperature coefficient thermal sensors shall be used and shall have a temperature coefficient of resistance at the switch point of not less than 15 percent per degree Celsius.

3.5.20 Acceleration allowance. The motor and controller shall permit acceleration of the unloaded centrifugal OWS to full operating speed in minimal time (less than 12 minutes) without exceeding permissible temperature rise in any components or causing wear due to slippage of drive.

3.6 Performance requirements. The centrifugal OWS system shall receive electrical signals from the ship's OWHT level indicators, receive the influent wastewater from the OWHT, process it as feed at a rated capacity of 38 to 45 liters per minute (10 to 12 gallons per minute [gpm]), and generate effluent and concentrated waste oil. The centrifugal OWS shall deliver system-generated effluent that is less than or equal to 15 ppm through the clean effluent connection. The centrifugal OWS shall deliver concentrated waste oil through the sludge connection. Volumes of waste oil sent to the WOT shall not be excessive. Operation and control of the centrifugal OWS shall be maintained as specified in 3.6.7. The centrifugal OWS performance shall be compatible with the shipboard interfaces defined in 3.7. The basic centrifugal OWS design shall meet the requirements of 46 CFR 162.050 or IMO MEPC 107(49) and shall have a U.S. Coast Guard certificate stating as such.

3.6.1 Influent requirements. The centrifugal OWS shall pull influent from the OWHT at a rated capacity of 38 to 45 liters per minute (10 to 12 gpm).

3.6.2 Clean effluent discharge requirements. The centrifugal OWS shall deliver clean effluent through the clean effluent connection. When operating at rated flow and pressure, the centrifugal OWS shall deliver effluent water containing not more than 15 ppm of free oil (as measured by EPA Method 1664 SGT-HEM and by a USCG type approved, per 46 CFR 162.050, oil content monitor [OCM] [see 6.10.14]) for 95 percent of the time from oily wastewater feed when tested as specified in 4.5.3.

3.6.3 Waste oil and sludge discharge requirements. The centrifugal OWS shall deliver waste oil through the sludge discharge connection to the ship's WOT at positive flow against a hydraulic resistance range of -0.21 to 1.52 bar (-3 to 22 psig).

3.6.4 System flushing requirements. If flushing water is required, the system shall have a single point and isolation valve at which to connect potable water.

3.6.5 Back flow prevention. The centrifugal OWS shall prevent back flow of oily wastewater, potable water, and compressed air (if used) into their respective ship supply sources. The centrifugal OWS shall also prevent system effluent, flushing water, and waste oil from backing up into their respective centrifugal OWS discharge port. A reduced-pressure principle sanitary back flow preventer conforming to ASSE 1013 shall be used to protect the ship's potable water from cross-contamination.

3.6.6 Flexible hose assemblies. Flexible hose assemblies may be used in elements that are assembled and disassembled on a regular basis for operation or maintenance. Flexible hose assemblies interfacing to the ship shall meet the system design temperature, be compatible with the fluid, and have a rated working pressure equal to or greater than the intended service in which they are used. Flexible hose assemblies internal to the system and not interfacing to the ship shall be compatible with the fluid, meet the system design temperature, and have a rated working pressure equal to or greater than the intended service in which they are used (see 6.9).

3.6.7 Operation and controls. The centrifugal OWS MIL-DTL-32613 compliant control system shall monitor and control operation, report status, activate warning indicators, and sound alarms for all centrifugal OWS systems (including separation, pneumatic, potable water, and monitoring). All centrifugal OWS systems shall self-monitor their respective operating parameters (such as flow and pressure). The centrifugal OWS control system shall provide the capability to interface with the ship's remote machinery monitoring system in a continuously manned space. Manual overrides shall be provided for troubleshooting purposes.

3.6.7.1. Automatic mode. The centrifugal OWS shall automatically start or stop processing according to signals received from the OWHT and WOT level indicators via the remote machinery monitoring system. The OWHT shall have two tank level indicators (TLIs): one measuring the total liquid level, and one measuring the oil/water interface. The OWHT shall also have two tank level switches (TLSs). The OWHT Low TLS shall only float on water. The OWHT High TLS shall be designed to float on either oil or water. The total level TLI set point shall be located above the High TLS, and the low level set point for the oil/water interface TLI shall be located above the Low TLS (see figure 1). The TLIs shall be connected to the remote machinery monitoring system. The TLSs shall only be connected to the local OWS control panel.

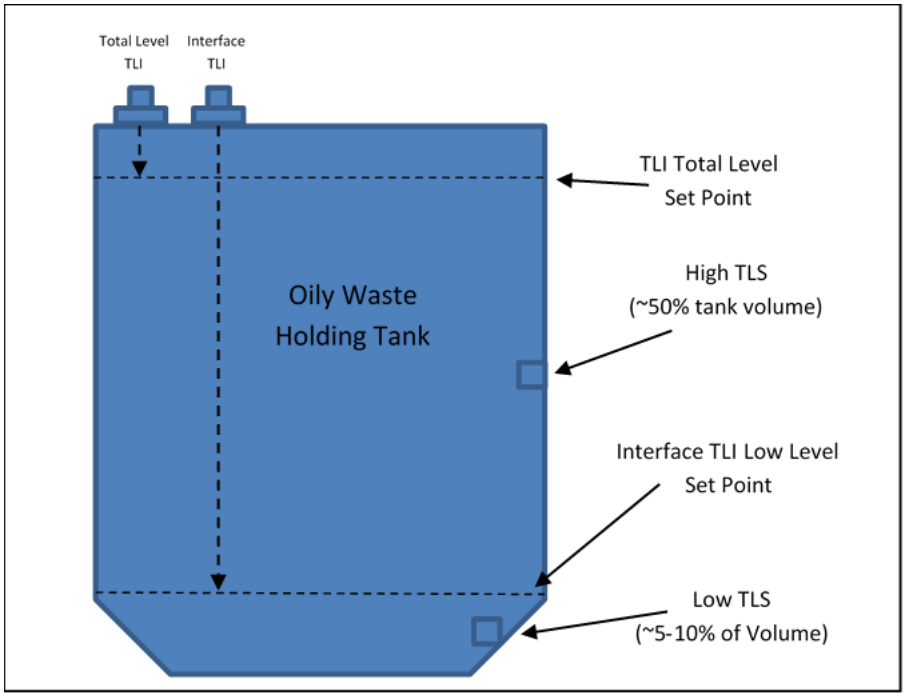


FIGURE 1. Recommended centrifugal OWS configuration.

3.6.7.1.1. Automatic start-up. Once the system has been powered up, valve alignment has been completed, and the automatic mode has been selected, the centrifugal OWS shall automatically start when the liquid in the OWHT reaches the high total level TLI set point. However, the OWS shall not start processing until both OWHT High and Low TLSs are activated and contacts are closed as well. When both switches are closed, the water level is equal to or above the Low TLS, and total liquid level is above the High OWHT TLS. If the ship's OCM determines the oil content in the effluent is less than or equal to 15 ppm, the ship's diverter valve will allow the effluent overboard. If the ship's OCM determines the oil content in the effluent is greater than 15 ppm, the ship's OCM will remove the power to the ship's diverter valve, directing the flow back to the OWHT.

3.6.7.1.2. Automatic stop. The centrifugal OWS shall automatically stop processing (normal shutdown [see 6.10.12]) when the water level drops below the interface TLI low level set point. However, if the OWHT Low TLS is deactivated prior to the water level reaching the interface TLI low level set point, the system shall also stop processing. The centrifugal OWS shall also automatically stop processing (normal shutdown) when the WOT is full, as determined by electrical signals received by the WOT total level or interface TLIs.

3.6.7.1.3. Local OWS control. If the remote machinery monitoring system or the TLIs are not operational, automatic operation of the system shall be controlled solely by the local OWS control panel via signals received from the two TLSs inside the OWHT. Both switches shall be closed in order for the system to start processing. Processing shall cease (normal shutdown) when the water level drops below the Low TLS. Improper valve alignment shall not cause critical failure of the system (see 6.10.3).

3.6.7.2 Manual mode. The system shall have the ability to be stopped or started manually via controls on the local OWS control panel regardless of tank levels in the OWHT and WOT. This will allow for the system to be operated if both TLIs and TLSs are inoperable or if the system needs troubleshooting. If the TLSs are working, the OWHT Low TLS shall still stop the system from processing and initiate a normal shutdown. The operator shall always be able to turn the centrifugal OWS off at any point when necessary without pressing the emergency stop button. Capability shall also be provided to allow the centrifugal OWS to be manually started and stopped via the ship's remote machinery monitoring system. Improper valve alignment shall not cause critical failure of the system (see 6.10.3).

3.6.7.3 Standby mode. When power is applied to the system, the system shall go into standby mode. The controller and displays shall be activated, but the feed pump and separator shall not be energized. The system shall return to standby if the separator processing is turned off normally. If the emergency stop button is pressed or an alarm condition is encountered, the alarm shall be cleared or the emergency stop button shall be pulled out prior to returning to standby. The system shall remain in standby mode when automatic mode is selected and there is no fluid to process in the OWHT.

3.6.7.4 Controller. The centrifugal OWS MIL-DTL-32613-compliant control system shall automatically adjust the appropriate subsystems to maintain system operation and performance as specified herein and prevent system damage. The controller shall incorporate a programmable logic controller (PLC). Unless otherwise specified (see 6.2), the controller shall be capable of being remotely mounted with the cable length of 15.24 meters (50 feet). Each module shall have removable terminal strips to allow PLC component replacement without disconnecting wiring. The control system shall incorporate a system control switch (standby and automatic), main power disconnect switch, emergency stop, and elapsed time meter for system pumps. The controller shall incorporate a message display unit that provides visible display of system status and has keypad pushbuttons to allow operator access to modes and conditions. The controller shall have the following additional control modes and features accessed through the message display unit:

a. Calibration mode that allows the user to monitor all sensors sequentially while adjustments are made.

b. Maintenance mode providing means of jogging pumps and valves that requires a key or password code to limit access only to maintenance personnel.

c. Lamp and alarm test.

d. Totalized values reset.

e. Key or password code protected manual mode that enables the start and stop of the unit regardless of up level tank level switch.

f. Feed pump or centrifuge hour meter/counter which does not require the centrifugal OWS to be energized.

3.6.7.5 Alarms. Audible and visual alarms, as well as an emergency shutdown (see 6.10.7), shall automatically activate when an abnormal condition occurs that could damage the system. All alarms shall be of the latching variety with reset. A method to silence the alarms shall be installed. All alarms shall employ procedures to prevent inadvertent or nuisance alarms during transient operations (such as system start-up and normal shutdown) or from transient conditions (such as electrical spikes or pulses, electronic noise, and sea conditions). The centrifugal OWS shall not be damaged nor shall subsequent operational performance be degraded as a result of any alarm condition. The following conditions (at a minimum) shall activate an alarm indicator:

a. Centrifugal OWS influent pressure outside the upper or lower design operating range.

b. Centrifugal OWS bowl speed outside the upper or lower design operating range.

c. Any sensor is not ON (operational) or is inoperative.

d. High waste oil tank level.

e. An overload trip has been activated.

f. The OWS feed system has failed.

g. Air pressure too low for proper operation (if ship provided compressed air is used).

h. Centrifugal OWS experiences vibration outside the operating range.

i. If secondary treatment is used, the need to clean or replace the secondary media.

j. Emergency stop is pressed.

3.6.7.6 Indicator panel. The centrifugal OWS shall display the current status of the system locally via a message display unit installed on the centrifugal OWS unit. The message display indicators shall be in English standard units.

a. The following status conditions and operating parameters shall be displayed locally at all times:

(1) System status (off, standby, processing, and alarm conditions).

(2) System mode (automatic or manual).

(3) Flow rate of effluent delivered by centrifugal OWS.

b. The centrifugal OWS shall be capable of displaying the following status conditions and operating parameters locally:

(1) Date and time (year, month, day, hour, and minute in Greenwich Mean Time).

(2) Pressure and flow rate of the oily wastewater feed entering the centrifugal OWS from the OWHT.

(3) Total gallons of effluent delivered by centrifugal OWS. Totalizers shall be capable of being reset after each overboard discharge event.

(4) Operating hours of each system pump.

(5) If secondary treatment is used, a resettable timer shall be provided to note the processing hours since it was replaced.

(6) Particular alarm and warning status description.

3.6.7.7 Remote machinery monitoring system signals.

a. The centrifugal OWS shall be able to send the following signals to the remote machinery monitoring system.

(1) Centrifugal OWS status (on or off).

(2) Centrifugal OWS status (standby or running).

(3) Centrifugal OWS in alarm condition.

(4) Centrifugal OWS mode (automatic or manual).

b. The centrifugal OWS shall be able to receive the following signals from the remote machinery monitoring system.

(1) Centrifugal OWS off.

(2) Centrifugal OWS emergency stop.

3.6.7.8 Data logging. The centrifugal OWS MIL-DTL-32613-compliant control system shall monitor and save values of the status conditions and operating parameters defined below and allow retrieval of this information. In addition to the logging requirements of MIL-DTL-32613, the control system shall be capable of saving performance data sets defined in this section at 1-hour intervals for a period of at least 200 hours of processing before data retrieval is required. When operated beyond 200 hours, the control system shall save the most recent data sets recorded within the last 200 hours of processing. Provisions shall be made to allow transfer of data from the control system PLC to an Ethernet port on a laptop computer that includes software as required or to a universal serial bus (USB) memory device. The physical connection on the centrifugal OWS control panel for the laptop computer or USB device shall be accessible without opening the control panel, but it shall be lockable to prevent uncontrolled access. Downloaded data shall be in a format compatible with Microsoft Excel. Data logging and retrieval shall be provided for the following performance conditions and parameters:

a. Date and time (year, month, day, hour, and minute in Greenwich Mean Time).

b. System status (processing, alarm, and warning conditions).

c. Pressure and flow rate of effluent delivered by centrifugal OWS.

d. Total gallons of effluent delivered by centrifugal OWS.

e. Total gallons of waste oil and sludge delivered by centrifugal OWS.

f. In the event of a loss of ship's power, the following data shall not be lost: total gallons of effluent, total gallons of waste oil and sludge, and operating hours of each pump.

g. If secondary treatment is used, a resettable timer shall be provided to note the processing hours since it was replaced.

h. Mode (automatic or manual).

i. Loss of AC power to system or DC power in control circuitry.

3.6.7.9 Sensors and instruments. Sensors used in the centrifugal OWS shall have minimum ±0.5 percent accuracy for the system's design operational range. Sensors shall be capable of calibration adjustments and allow replacement without unwiring. A method shall be provided to prevent connectors from being misconnected. All fluid condition sensors shall be capable of being isolated from the system.

3.6.7.10 Emergency stop (E-Stop). An E-Stop push button shall be provided on or near the centrifugal separator control panel and equipped with a protective guard to avoid accidental activation. Activation of the E-Stop will activate an alarm and transition the unit to standby mode.

3.6.8 Secondary treatment. If a secondary filter or polisher is required after the centrifugal stage to enable discharge, it shall require replacement not more than every 300 hours.

3.7 Interface requirements.

3.7.1 External (ship) interfaces.

3.7.1.1 Functional interface. The centrifugal OWS functional interfaces with ship systems shall be compatible with the shipboard electrical, data, hydraulic, and pneumatic functional interfaces defined in table I.

3.7.1.2 Physical interface. The centrifugal OWS interfacing pipe connections shall be compatible with the mating shipboard interface connection defined in table I. The centrifugal OWS shall be skid-mounted with interfacing structural mounts capable of attachment to a steel deck without deforming or damaging the ship's deck. Components heavier than 23 kilograms (50 pounds) shall have safe lift points identified suitable for vertical and horizontal lifts.

TABLE I. Shipboard interface connections.

Centrifugal OWS Interface	**Ship Interface (Ship Side of the Interface)**
Influent Connection - Ship's OWHT Supply	System: Oily Waste Transfer System (from the OWHT) Connection: 40-millimeter diameter nominal (DN) (1.5-inch NPS) with flange connection in accordance with (IAW) MIL-STD-777 (see 6.2). Suction lift: 4.57 meters (15 feet) water (0.33 meter [13 inches] mercury [in Hg]) Oil concentration: 0 to100% (average oil concentration 1%) Temperature: 4 to 71 °C (40 to 122 °F) pH range: 5 to 8 Oil can be present in water in different forms, including free oil, mechanically emulsified oil, and chemically emulsified oil. In addition to free oil and emulsions, the ships' oily wastewater may contain dirt or sediment particles, fibers, sludge, grit, paint chips, heavy metals, cleaning solvents, surfactants, and AFFF. Typical solid particles in oily wastewater have a maximum particle diameter of 4,750 microns and an average specific gravity of 2.6. Total suspended solids: 10 to 100 ppm
Clean Effluent Discharge Connection	System: Oily Waste Transfer System (overboard discharge) Connection: 40-millimeter DN (1.5-inch NPS) with flange connection IAW MIL-STD-777 (see 6.2). Discharge pressure: minimum of 1 bar (15 psig)
Sludge Discharge Connection	System: Oily Waste Transfer System (to the WOT) Connection: 40-millimeter DN (1.5-inch NPS) with flange connection IAW MIL-STD-777 (see 6.2). Back pressure: -0.21 to 1.52 bar (-3 to 22 psig)
Dirty Discharge Connection - System/Flushing Water Discharge	System: Oily Waste Transfer System (to the OWHT) Connection: 40-millimeter DN (1.5-inch NPS) with flange connection IAW MIL-STD-777 (see 6.2). Back pressure: -0.21 to 1.52 bar (-3 to 22 psig)
Potable Water Supply	System: Potable Water System (one connection point to the system) Connection: 15-millimeter DN (0.5-inch NPS) with flange connection IAW MIL-STD-777 (see 6.2). Supply characteristics: Pressure: max. 6.9 bar (100 psig), min. 3.5 bar (50 psig) Temperature: 4 to 32 °C (40 to 90 °F) Bromine or halogen residual: 0.2 mg/L
Compressed Air Supply (if required)	System: Compressed Air Service System (one connection point to the system) Connection: 15-millimeter DN (0.5-inch NPS) with flange connection IAW MIL-STD-777 (see 6.2). Supply characteristics: Pressure: max. 8.6 bar (125 psig), min. 4.1 bar (60 psig) Temperature: max. 13 °C (55 °F) Moisture Content: max. 0.00039 kilogram (kg) H_2O/ kg dry air 0.00085 lb H_2O/ lb dry air) (4 °C [40 °F] dewpoint) at 5.5 bar (80 psig)

TABLE I. Shipboard interface connections – Continued.

Centrifugal OWS Interface	Ship Interface (Ship Side of the Interface)
Electrical Power Supply	System: Electrical Power Distribution System Connection: see 6.2 Supply characteristics: IAW MIL-STD-1399-300-1 (440/115 VAC, 60 hertz, three-phase) Conductor identification of control and signal cables specified in IEEE 45.1, IEEE 45.2, IEEE 45.3, IEEE 45.4, IEEE 45.5, IEEE 45.6, IEEE 45.7, and IEEE 45.8. Note: only one voltage source is allowed per electrical enclosure. If lower, 440 VAC and 115 VAC are both required in one electrical enclosure, then a step down transformer and appropriate fusing shall all be provided in the enclosure. Note: electrical power (as defined in MIL-STD-1399-300-1) is significantly different from commercial standards. Some supply characteristics, such as fault currents, harmonic current limits, and voltage variations are more severe than those seen in a commercial environment. All electrical equipment shall be in accordance with MIL-DTL-917 and MIL-STD-108, except as specified in this section.
Data (Remote Monitoring)	System: remote machinery monitoring system Connection: see 6.2 Functional: IAW IEEE 45.145.8, IEEE 802.3, IEEE 1451.2, and MIL-STD-1553.
Tank Level Indicator 1	Oil/Water Interface OWHT Tank Level Sensor – Low Set Point 4 to 20 milliamp (mA), Loop Powered by OWHT
Tank Level Indicator 2	Total Level OWHT Tank Level Sensor – High Set Point 4 to 20 mA, Loop Powered by OWHT
Tank Level Indicator 3	Oil/Water Interface WOT Tank Level Sensor – High Set Point 4 to 20 mA, Loop Powered by WOT
Tank Level Indicator 4	Total Level WOT Tank Level Sensor – High Set Point 4 to 20 mA, Loop Powered by WOT
Tank Level Switch 1	OWHT Low Water Level Float Switch Closed when water level above low tank level
Tank Level Switch 2	OWHT High Water or Oil Level Float Switch Closed when water or oil level above high tank level

3.8 Hydrostatic integrity. The centrifugal OWS shall withstand the system design pressure and shall show no sign of leakage, material deformation, rupture, or other defects that harmfully affect the performance and serviceability of the centrifugal OWS at any point during testing.

3.9 Reliability and maintainability. Guidance for reliability and maintainability may be found in MIL-HDBK-470 and MIL-HDBK-781.

3.9.1 Mean time between critical failure (MTBCF). The MTBCF (see 6.10.11) of the system shall be at least 400 hours with a 90 percent confidence level when the system is operated at rated capacity. In order to achieve this level of confidence, no critical failures shall occur during 922 hours of processing.

3.9.1.1 Failure. For purposes of reliability calculation, the centrifugal OWS is in a failed state if it cannot be started or if a malfunction occurs that forces the centrifugal OWS to a normal or emergency shutdown prior to the completion of its scheduled test time or operating time. In addition, the centrifugal OWS shall be considered to fail if the capacity (see 3.6.1) or the quality of purification (see 3.6.2) is not in accordance with the requirements specified, even if the unit has not experienced an emergency shutdown. The need to change a secondary filter or polishing element shall not be considered a failure as long as not more than two change-outs are performed during the 922 hours of process testing and the change-out time meets the maintenance requirements. Failures shall be classified as either relevant or non-relevant. Only relevant failures shall be chargeable for verifying reliability requirements.

a. Relevant failures are caused by:

(1) Equipment design defects.

(2) Equipment manufacturing defects.

(3) Parts defects.

(4) All other causes not specifically listed as non-relevant.

(5) A significant safety issue or risk.

b. Non-relevant failures are caused by:

(1) Accident, mishandling, or improper storage.

(2) Operator or procedural error.

(3) External test equipment or facility failures.

(4) Drawing, maintenance manual, or other documentation errors, provided prompt correction is shown to eliminate future similar failures (this shall not be construed to include design errors).

(5) Failures of multiple, simultaneous, or immediately sequential nature (only the initial failure shall be counted in such cases).

(6) Direct result of relevant or non-relevant failures of another item of equipment (secondary failures).

(7) Improper maintenance induced failures.

(8) Foreign object damage (unless caused by failure of protective device built into equipment).

3.9.2 Maintenance ratio. The centrifugal OWS shall have a maintenance ratio (see 6.10.10) of not greater than 0.03. The time required to perform any preventive maintenance (see 6.10.16) action shall be not greater than eight man-hours by an Engineman third class or Electrician's Mate third class with no formal equipment training.

3.9.3 Maximum time to repair (MaxTTR). The MaxTTR of any centrifugal OWS system critical failure shall not exceed 35 man-hours.

3.9.4 Accessibility. All components shall be arranged so all maintenance can be performed by a 95th percentile male or 5th percentile female. The construction shall provide the maximum accessibility (within space limitations) to parts that require scheduled maintenance and to effect repairs. Removal of major operational parts shall not be necessary to permit accessibility for maintenance, inspection, and repair. Accessibility aspects of the OWS shall comply with MIL-STD-1472.

3.9.5 Special tools. Special tools, if required for maintenance and servicing, shall be provided with the centrifugal OWS when specified (see 6.2). Special tools shall be furnished in the quantity specified (see 6.2 and 6.6). Special tools are defined as those items required for shipboard maintenance, servicing, and repair not listed in the GSA Global Supply Catalog.

3.9.6 Special handling provisions. Special tools or fittings shall be provided for lifting all maintenance items weighing in excess of 16 kilograms (35 pounds).

3.10 Safety. The centrifugal OWS shall present no uncontrolled hazards to operating or maintenance personnel. External moving parts, which are a potential hazard to personnel, shall be avoided wherever practicable. When their use is unavoidable, positive protection in the form of a guard shall be provided. Sharp corners and projections, which may cause injury to personnel or on which clothing may catch, shall be avoided. The following are some of the known safety criteria that apply to auxiliary machinery; others are contained in MIL-DTL-917:

a. Exposed rotating or reciprocating components such as couplings, linkages, belts, chains, and flywheels shall be enclosed with a safety guard to prevent accidental personnel contact with the moving part.

b. When an equipment specification requires the presence of a hazardous material as a component of shipboard equipment, conspicuous indication on the equipment of the presence of such material, together with necessary warnings and instructions, is required.

c. All electrical enclosures shall be NEMA 4X or equivalent.

3.11 Workmanship. All parts of the centrifugal OWS, before and after painting, shall be clean and free of sand, rust, dirt, pits, sprues, scale, and other harmful extraneous material that might detract from the intended operation, function, or appearance of the equipment. Fasteners shall be fully engaged, and bolt heads and nuts shall be flat on washers or mating surface.

3.12 Human factors. All man-to-machine interfaces, such as controls, displays, and alarms, shall be suitable for user personnel with applicable 5th through 95th body dimensions as defined in MIL-STD-1472.

4. VERIFICATION

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

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall be performed on a sample centrifugal OWS unit of each new design that is produced with the equipment and procedures used in normal production when a first article sample is required (see 3.1). This inspection shall include the examinations (see 4.4) and tests (see 4.5) as presented in table II. Critical or major defects (see table III) shall be cause for inspection failure. Any changes from the first article to the production shall require retesting in accordance with 4.5 unless determined otherwise by the DoD Component Technical Authority (see 6.10.5).

4.3 Conformance inspection. Conformance inspection shall be as specified in 6.2 and shall include the examination of 4.4 and the tests of 4.5 as presented in table II.

4.4 Examination. Each centrifugal OWS shall be examined for compliance with the requirements of 3.5.1 through 3.5.7; 3.5.9 through 3.5.12; 3.5.14 through 3.5.20, including all subsections; 3.6.5; 3.6.6; 3.7, including all subsections; 3.9.4; 3.9.5, 3.9.6; 3.10; and 3.11. This element of inspection shall encompass all visual examinations, including verification of physical interfaces, operational parameters and capabilities, system design compliance, workmanship, weight, and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects shall constitute cause for rejection.

4.5 Tests.

4.5.1 Material verification. Conformance to 3.3 shall be as specified (see 6.2 and 6.3).

TABLE II. Requirements and verification methods.

Requirement Title	Requirement	First Article Inspection	Conformance Inspection
Materials	3.3	4.5.1	N/A
Wetted materials	3.3.1	4.5.1	N/A
Dissimilar metals	3.3.2	4.5.1	N/A
Identification of materials and finishes	3.3.3	4.5.1	N/A
Painting	3.3.4	4.5.1	N/A
Electrical cable materials	3.3.5	4.5.1	N/A
Toxicity and prohibited materials	3.3.6	4.5.1	N/A
Toxicity	3.3.6.1	4.5.1	N/A
Prohibited materials	3.3.6.2	4.5.1	N/A
Recycled, recovered, environmentally preferable,or biobased materials	3.3.7	4.5.1	N/A
Environmental considerations	3.4	N/A	N/A
Shock	3.4.1	4.5.2.1	N/A
Environmental vibration	3.4.2	4.5.2.2	N/A
Mechanical vibration	3.4.3	4.5.2.3	N/A
Airborne noise	3.4.4	4.5.2.4	N/A
Structureborne noise	3.4.5	4.5.2.5	N/A
Electromagnetic interference	3.4.6	4.5.2.6	N/A
Operational temperatures	3.4.7	4.5.2.7	N/A
Storage (non-operating) temperatures	3.4.8	4.5.2.7	N/A
Humidity	3.4.9	4.5.2.9	N/A
Pitch and inclination	3.4.10	4.5.2.10	N/A
Water spray	3.4.11	4.5.2.10	N/A
Design	3.5	N/A	N/A
Feed system	3.5.1	4.4	4.4
Separation system	3.5.2	4.4	4.4
Solids mitigation	3.5.3	4.4	4.4
Waste oil transfer	3.5.4	4.4	4.4
System/flushing water drains	3.5.5	4.4	4.4
System connections	3.5.6	4.4	4.4
Size and weight	3.5.7	4.4	4.4
Power consumption	3.5.8	4.5.3	N/A
Grounding and bonding	3.5.9	4.4	4.4
Mount	3.5.10	4.4	4.4
Brakes	3.5.11	4.4	4.4
Markings	3.5.12	4.4	4.4

TABLE II. Requirements and verifications methods – Continued.

Requirement Title	Requirement	First Article Inspection	Conformance Inspection
Wire identification	3.5.12.1	4.4	4.4
Compressed air consumption	3.5.13	4.5.3	N/A
Lubricants	3.5.14	4.4	N/A
Piping and valves	3.5.15	4.4	N/A
Overload relay	3.5.16	4.4	N/A
Cybersecurity	3.5.17	4.4	N/A
Interchangeability	3.5.20	4.4	N/A
Motors	3.5.19	4.4	N/A
Performance characteristics	3.6	N/A	N/A
Influent requirements	3.6.1	4.5.3	N/A
Effluent discharge requirements	3.6.2	4.5.3	N/A
Waste oil and sludge discharge requirements	3.6.3	4.5.5	N/A
System flushing requirements	3.6.4	4.4	N/A
Back flow prevention	3.6.5	4.4	4.4
Flexible hoses	3.6.6	4.4	4.4
Operation and controls	3.6.7	4.5.5	N/A
Automatic mode	3.6.7.1	4.5.3	N/A
Manual mode	3.6.7.2	4.5.3	N/A
Standby mode	3.6.7.3	4.5.3	N/A
Controller	3.6.7.4	4.5.3	N/A
Alarms	3.6.7.5	4.5.3	N/A
Indicator panel	3.6.7.6	4.5.3	N/A
Remote machinery monitoring system signals	3.6.7.7	4.5.3	N/A
Data logging	3.6.7.8	4.5.3	N/A
Sensors and instruments	3.6.7.9	4.5.3	N/A
Emergency stop	3.6.7.10	4.5.3	N/A
Secondary treatment	3.6.8	4.5.3.3	N/A
Interface requirements	3.7	N/A	N/A
External (ship) interfaces	3.7.1	N/A	4.4
Functional interfaces	3.7.1.1	4.4, 4.5.3	4.4
Physical interfaces	3.5.19.2	4.4, 4.5.3	4.4
Hydrostatic integrity	3.8	N/A	N/A
Reliability and maintainability	3.9	N/A	N/A
MTBCF	3.9.1	4.5.4	N/A
Failure	3.9.1.1	4.5.4	N/A

TABLE II. Requirements and verifications methods – Continued.

Requirement Title	Requirement	First Article Inspection	Conformance Inspection
Maintenance ratio	3.9.2	4.5.5	N/A
MaxTTR	3.9.3	4.5.6	N/A
Accessibility	3.9.4	4.4, 4.5.3	N/A
Special tools	3.9.5	4.4	N/A
Special handling provisions	3.9.6	4.4	N/A
Safety	3.10	4.4, 4.5.3, 4.5.6, 4.5.7	4.5.7
Workmanship	3.11	4.4	4.4
Human factors	3.12	4.5.8	N/A

TABLE III. Classification of defects.

Categories	Defects
Critical Defects	
001	Materials not as specified or allowed (see 3.3)
002	Environmental considerations not as specified (see 3.4)
003	Performance not as specified (see 3.6)
004	Hydrostatic integrity not as specified (see 3.8)
Major Defects	
101	Design not as specified (see 3.5)
102	Interfaces not as specified (see 3.7)
103	Size and weight not as specified (see 3.5.7)
104	Reliability not as specified (see 3.9 and 3.9.1)
105	Maintainability not as specified (see 3.9, 3.9.2, 3.9.3, and 3.9.4)
106	Safety not as specified (see 3.10)
107	Human factors not as specified (see 3.12)
Minor Defects	
201	Identification plates and other markings not as specified (see 3.5.12 and 6.2)
202	Special tools not as specified (see 3.9.5 and 6.6)
203	Special handling provisions not as specified (see 3.9.6)
204	Workmanship not as specified (see 3.11)

4.5.2 Environmental verification tests.

4.5.2.1 Shock test. The centrifugal OWS (including centrifuge, valves, strainers, tanks, pumps/motors, and inter-connecting piping) shall be shock tested for grade B, class I, type A shock, in accordance with MIL-DTL-901.

4.5.2.2 Environmental vibration. The centrifugal OWS shall be tested for environmental type I vibration in accordance with MIL-STD-167-1.

4.5.2.3 Mechanical vibration. The centrifugal OWS shall be tested for type II vibration in accordance with MIL-STD-167-1.

4.5.2.4 Airborne noise. The centrifugal OWS shall be tested for airborne noise for grade E equipment in accordance with MIL-STD-1474.

4.5.2.5 Structureborne noise. The centrifugal OWS shall be tested for structureborne noise for type II equipment in accordance with MIL-STD-740-2.

4.5.2.6 Electromagnetic interference. The centrifugal OWS shall be tested to determine conformance with electromagnetic emissions and susceptibility requirements in MIL-STD-461 for auxiliary equipment operating in a machinery space of the intended ship or class of ship.

4.5.2.7 Temperature. In lieu of testing, the manufacturer shall provide an analysis of the equipment's ability to meet the temperature requirement specified in 3.4.7 and 3.4.8, as specified (see 6.2). Additionally, the manufacturer shall note components that have temperature control requirements for storage.

4.5.2.8 Humidity. In lieu of testing, the manufacturer shall provide analysis of the equipment's ability to meet the humidity requirement specified in 3.4.9, as specified (see 6.2). Additionally, the manufacturer shall note components that have humidity control requirements for storage.

4.5.2.9 Pitch and inclination. In lieu of testing, the manufacturer shall provide analysis of the equipment's ability to meet the pitch and inclination requirement specified in 3.4.10, as specified (see 6.2).

4.5.2.10 Water spray. Compliance with 3.4.11 shall be demonstrated by either analysis or the water tightness test. The water tightness of the system shall be tested with the system powered off by exposing all parts of the system to a water hose down test as specified in NEMA 250.

4.5.3 Operational test (first article). This test shall demonstrate that the first article centrifugal OWS meets the processing capabilities and operational modes specified herein. The following tests shall be performed at an ambient temperature between 10 °C and 27 °C (50 °F and 80 °F) in a facility that will simulate all the shipboard interfaces in table I: Witnessing of the operational test shall be as specified (see 6.2).

a. Operate the system for 16 runs in accordance with table IV for a total of approximately 153 hours of operation.

b. In order to demonstrate a 400-hour MTBCF with a 90-percent confidence level, in accordance with 3.9.1, the system shall be operated for a total of 922 hours without critical failure. Following the performance tests from table IV, the system shall undergo reliability testing for the remaining approximately 769 hours. For every 100 hours of processing potable water, the OWS shall process a mixture of Navy Standard Bilge Mixture (NSBM) #4, solids, and fibers for 10 hours to demonstrate non-degraded performance. Table V summarizes the influent conditions and test durations for these reliability and non-degradation tests.

c. During all test runs, the system shall process 38 to 45 liters per minute (10 to 12 gpm) of oily waste influent in accordance with table IV. The test mixture shall contain constituents (as defined in 4.5.3.1 and in accordance with table IV) in potable water connected at the centrifugal OWS influent supply interface for all 16 test runs. A DoD Component Technical Authority-approved OCM shall be used to continuously monitor effluent oil levels. Physical effluent samples shall be collected and analyzed during each test run in accordance with 4.5.3.2 and at sampling intervals defined in table IV and table V. Ninety-five percent of the OCM readings and samples must meet the oil removal capabilities specified in 3.6.2 to be considered successful.

d. Following each test run, verify the system performs an automatic waste oil and sludge discharge process as specified in 3.6.3 and a system flushing process as specified in 3.6.4. In order to meet the waste oil volume requirement in 3.6, the OWS shall demonstrate that, on average, only 1 percent of processed influent is sent to the WOT under the conditions of the first article test.

e. If the system uses externally provided compressed air, the test setup shall have a meter installed at the air supply connection to verify that the amount of compressed air consumed by the centrifugal OWS after 24 hours of operation does not exceed that specified in 3.5.13.

f. Power consumption shall be measured at least once during each test run to verify consumption rates do not exceed that specified in 3.5.8.

g. Verify that the control system functionally operates in accordance with 3.6.7 and all subparagraphs, effluent discharge capability in 3.6.2, waste oil and sludge discharge capability in 3.6.3, system flushing capability in 3.6.4, and ship functional interface requirements in 3.7.1.1. All warning and alarm conditions described herein shall be simulated to verify that all centrifugal OWS warning indicators, alarms, and data logging capabilities function correctly. All sensors and instruments shall be supplied with a source to verify sensor calibration and displayed value on the system's message display unit.

TABLE IV. Operational test conditions and sampling frequency.

Test Number	Test		Influent Mixture	Test Duration	Sampling Frequency (at t = x hrs.)
1	Oily water		200-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
2	Oily water		1,000-ppm NSBM #4	10 hours	Effluent –two samples (t=4, 9)
3	OWHT transition test	1% Oil	1% NSBM #4	6 hours	Effluent (1% test) – one sample (t=4)
		Interface	50% NSBM #4	10 min	
			50% water		Effluent (50% test) – one sample (t=10 min)
		Bulk Oil	100% NSBM #4	30 minutes	
4	Oily water & mixed detergent		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm detergent Mix #4		
5	Oily water & detergent		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm Type 1 detergent		
6	Oily water, mixed detergent, & particles		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm detergent mix #4		
			100-ppm (m) Arizona test dust (coarse)		
			0.70-ppm (m) cloth fibers (lint mostly 25 to 150 microns in length)		
7	Oily water & simulated seawater		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			35,000-ppm(m) synthetic seawater		
8	Oily water & AFFF		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm AFFF solution (6%)		
9	Oily water		200-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
10	Oily water		1,000-ppm NSBM #4	10 hours	Effluent –two samples (t=4, 9)

TABLE IV. Operational test conditions and sampling frequency – Continued.

Test Number	Test		Influent Mixture	Test Duration	Sampling Frequency (at t = x hrs.)
11	OWHT transition test	1% oil	1% NSBM #4	6 hours	Effluent (1% test) – one sample (t=4)
		Interface	50% NSBM #4 50% water	10 minutes	Effluent (50% test) – one sample (t=10 min)
		Bulk oil	100% NSBM #4	30 minutes	
12	Oily water & mixed detergent		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm detergent Mix #4		
13	Oily water & detergent		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm type 1 detergent		
14	Oily water, mixed detergent, & particles		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm detergent mix #4		
			100-ppm (m) Arizona test dust (coarse)		
			0.70-ppm (m) cloth fibers (lint mostly 25 to 150 microns in length)		
15	Oily water & simulated seawater		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			35,000-ppm(m) synthetic seawater		
16	Oily water & AFFF		1,000-ppm NSBM #4	10 hours	Effluent – two samples (t=4, 9)
			100-ppm AFFF solution (6%)		

TABLE V. Operational test conditions and sampling frequency.

Test	Influent Mixture	Test Duration	Sampling Frequency (at t = x hrs.)
Reliability: Water	100% potable water	90 out of every 100 hours	N/A
Reliability Non-Degradation: Oily Water and Mixed Particles	1,000-ppm NSBM #4	10 hours out of every 100 hours	Effluent –two samples (t=4, 9)
	100-ppm (m) Arizona test dust (coarse)		
	0.70-ppm (m) cloth fibers (lint mostly 25 to 150 microns in length)		

4.5.3.1 Test mixture. The test mixture shall neither be heated nor cooled, and it shall be fed into the system in such a way as to ensure complete mixing is reached. Discharges as defined in 3.6.2 shall not be reused in the system feed. All the test mixtures listed as percentages are by volume. The test mixture shall consist of NSBM #4 specified in 4.5.3.1.1, detergent mix #4 specified in 4.5.3.1.2, and contaminants specified in 4.5.3.1.3 in accordance with table IV.

4.5.3.1.1 NSBM #4.

a. Diesel fuel marine conforming to MIL-DTL-16884; 50 percent by volume
b. 2190 TEP steam lube oil conforming to MIL-PRF-17331; 25 percent by volume
c. 9250 diesel lube oil conforming to MIL-PRF-9000; 25 percent by volume

4.5.3.1.2 Detergent mix #4.

a. 50 percent by volume general purpose non-ionic detergent conforming to MIL-D-16791
b. 25 percent by volume commercial detergent 2X “Ultra Tide” original scent (liquid), or equal
c. 25 percent by volume degreasing solvent conforming to MIL-PRF-680, type III

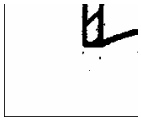
4.5.3.1.3 Contaminants.

a. AFFF, 6 percent, MIL-PRF-24385
b. Arizona Test Dust, ISO 12103-1, A4 – Coarse
c. Cloth fibers, lint mostly 25 to 150 microns in length
d. Simulated seawater: salinity - 35,000 ppm ±5 percent

4.5.3.2 Oil sampling. Two effluent samples shall be collected during each performance and reliability non-degradation test. For tests planned for 10 hours, samples shall be collected at t = 4 and 9 hours. For tests that are stopped early due to oil levels in the effluent greater than 15 ppm, as determined by the OCM, samples shall be collected at t = 2 and 4 hours. For the transition test, effluent samples shall be collected at t = 4 and 6 hours (10 minutes into the 50 percent oil test). At least 10 percent of all samples shall be quality control standards per EPA Method 1664. Quality control standards shall be prepared with concentrations of 15-ppm or 100-ppm NSBM #4. An NSBM #4 stock solution (NSBM #4 in hexane) shall be spiked into potable water when preparing the standards. Per batch of samples (expected to be 10 to 15 bottles) sent for analysis at an independent test laboratory (see 6.10.9), a set of triplicate samples (three times the normal sample volume) shall be collected. These samples will be collected to allow for analytical laboratory-generated quality control spikes. The triplicate samples will be collected in three sample bottles and labeled as triplicates.

Influent samples shall be collected during the 1000-ppm oily water, oily water and AFFF, and mixed detergent (detergent mix #4) tests. Influent samples shall be collected at the halfway point of each test. Influent samples shall be collected in 500-milliliter sample collection bottles.

Samples shall be collected from the test apparatus isokinetically, using a nozzle sampler or pitot tube design, as depicted in figure 2. The nozzle sampler or pitot tube shall be allowed to flush for at least 60 seconds prior to collecting a sample via a sample bottle. During sample collections events, the sampler valve shall not be actuated while the sample bottle is collecting fluid. Samples shall be collected in clean, solvent-rinsed glass bottles with clean, solvent-rinsed, Teflon-lined caps provided by the independent test laboratory. Samples will be preserved with 10 normal sulfuric acid (10N H2SO4) to a pH of less than 2 and refrigerated at 4 °C. Effluent samples shall be measured for oil concentration using the regulatory EPA Method 1664, HEM and SGT-HEM. OCM readings shall be noted during each sampling event.



A Distance A, not greater than 400 millimeters

B Distance B, sufficient to insert sampling bottle

C Dimension C, straight length should be not less than 60 millimeters

D Dimension D, pipe thickness should be not greater than 2 millimeters

E Detail E, chisel-edged chamfer (30 degrees)

FIGURE 2. Diagram of isokinetic sampling port arrangement.

4.5.3.3 Secondary treatment. The ability of the secondary filter or polisher, if used, shall not require replacement during the first article operational or functional tests and shall meet the requirements of 3.6.8.

4.5.4 MTBCF. The operational test in 4.5.3 shall demonstrate the centrifugal OWS complies with the MTBCF requirement specified in 3.9.1. For testing purposes, a critical failure is defined as any fault, failure, or malfunction which causes or may cause:

a. Failure to commence operation, cessation of operation, or degradation of performance below specified levels.

b. Damage to the centrifugal OWS by continued operation.

c. Safety hazard to personnel.

4.5.5 Maintenance ratio. The scheduled and unscheduled maintenance shall executed as specified (see 6.2). In addition, it shall be timed, accumulated, and converted to a maintenance ratio during first article testing (see 4.5.3) to verify compliance with the requirement in 3.9.2. Only scheduled maintenance in the manufacturer's recommended maintenance schedule shall be permitted.

4.5.6 MaxTTR. Compliance with the MaxTTR in 3.9.3 shall be verified by analysis using test data obtained for corrective maintenance (see 6.10.2) performed during operational testing or, if necessary, during a maintainability demonstration where common repair events, the centrifuge bowl cleaning, and the drive belt replacement are simulated. The observed MaxTTR shall include time (if applicable) for maintenance preparation, fault location and isolation, fault correction, adjustment, and calibration, as well as follow-up check-out time. The observed MaxTTR shall not include the time required for normal shutdown and start-up of the system or time lost due to administrative or logistical delays.

4.5.6.1 Repair demonstration. The replacement of five items selected by the DoD Component Technical Authority from the supplier recommended list of onboard spare parts shall be timed.

4.5.7 Safety. The centrifugal OWS shall be evaluated throughout testing for safety requirements in 3.10.

4.5.8 Human factors. The centrifugal OWS shall be inspected and evaluated throughout testing for human factor requirements in 3.12.

4.6 Cybersecurity. Any cybersecurity measures required herein (see 3.5.17) shall be verified by the applicable procedures of ANSI/ISA 62443-4-1. Additional cybersecurity verifications may be specified (see 6.2).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 centrifugal OWS described in this specification is intended for use onboard Naval ships to process shipboard generated bilgewater to consistently produce an effluent containing less than 15-ppm oil content. The overall intended service life of the centrifugal OWS is 30 years minimum with an operating life expectancy of 20,000 hours minimum. See figure 3 for the recommended shipboard for centrifugal OWS configuration.

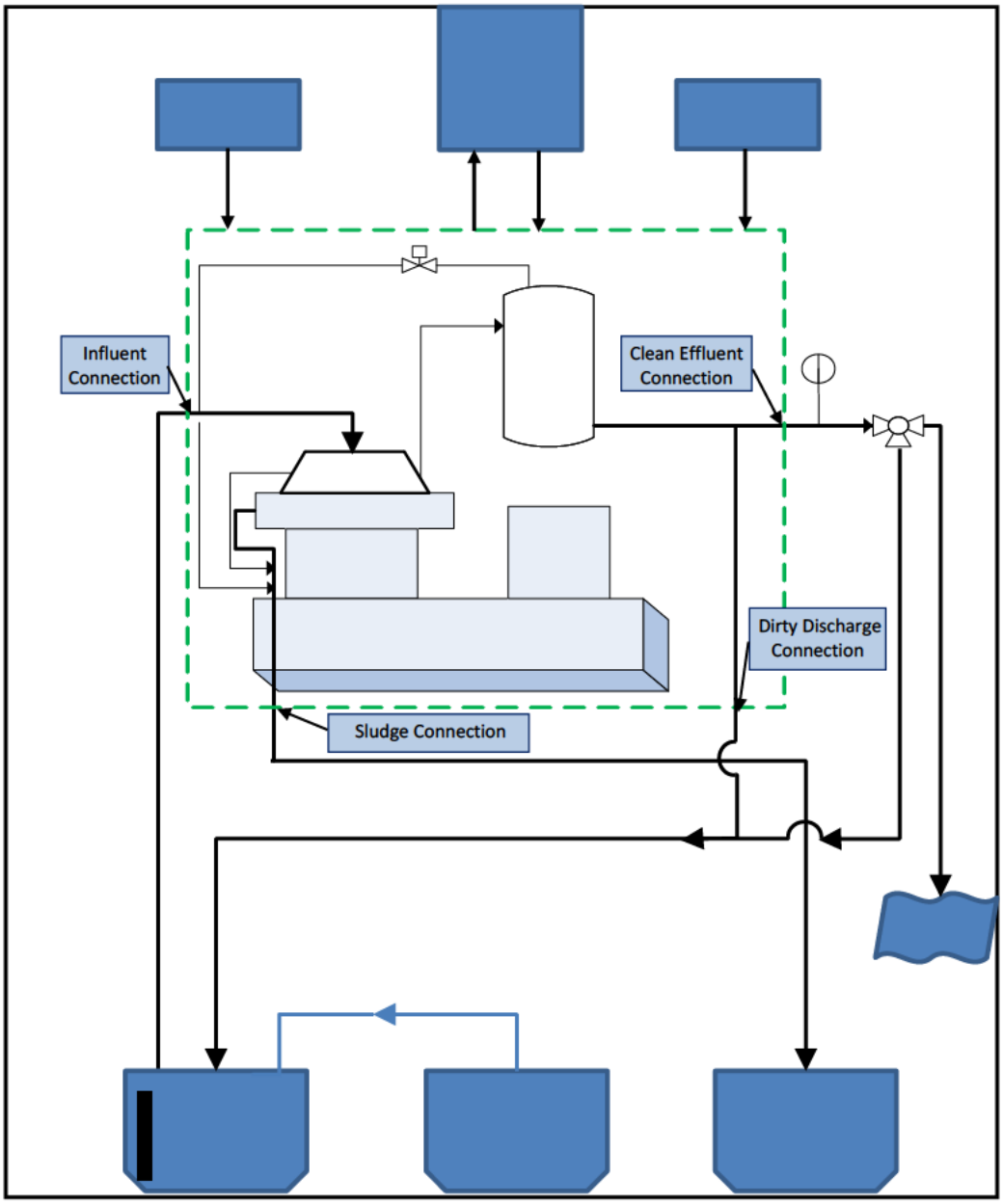


FIGURE 3. Recommended centrifugal OWS configuration.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. When first article is required (see 3.1).

c. Environmental considerations (see 3.4).

d. Ship or class of ship, or specific application for which the centrifugal OWS is intended, electromagnetic emissions and susceptibility requirements (see 3.4.6), maximum cable length under 15.24 meters (50 feet) for remotely mounted controllers (see 3.6.7.4), interface connection specifications (see table I), and remote machinery monitoring system interface specifications (see table I).

e. Requirements for inclusion of NSN on identification plate or label, if needed, and the NSN to be used (see 3.5.12).

f. Flange size, rating, specification, and surface finish for piping connections (see 3.5.15).

g. Motors (see 3.5.19).

(1) Voltage.

(2) Low noise application.

(3) When DC motors are to be provided (see 3.5.19.1).

h. Whether special tools are required and the necessary quantity (see 3.9.5 and 6.6).

i. Conformance requirements (see 4.3).

j. Material certificates (see 4.5.1).

k. Requirement for the analysis of the equipment's ability to meet temperature requirements of 3.4.7 and 3.4.8 (see 4.5.2.7).

l. Requirement for the analysis of the equipment's ability to meet the humidity requirements of 3.4.9 (see 4.5.2.8).

m. Requirement for the analysis of the equipment's ability to meet the pitch and inclination requirements of 3.4.10 (see 4.5.2.9).

n. Designation of who will witness operational testing (see 4.5.3) and who will perform scheduled and unscheduled maintenance during testing (see 4.5.5).

o. Additional cybersecurity verifications (see 4.6).

p. Definition of model of OCM that will be used in this system during ship installation, including all pressure and flow requirements for the OCM that would impact the OWS design and operation.

q. Packaging requirements (see 5.1).

r. Recommended documentation (see 6.3).

6.3 Recommended documentation. The following list of documentation is recommended to be requested as part of the acquisition (see 6.2) of any centrifugal OWS under this specification:

a. Engineering drawings and software logic. All revisions and changes to drawings, components, software, and logistics to tested models will be noted and tracked.

b. Materials listing.

c. Installation drawings.

d. Technical manuals in accordance with MIL-DTL-24784.

e. Test plan. Plans for all testing that include test methods, test setup, qualifications of testing facility and independent laboratory.

f. Determination of facility and performer for the first article testing.

g. Test reports. Reports on all testing performed. Conformance to 3.3, 3.4.7, 3.4.8, and 3.4.9 must be determined by inspection of contractor records, providing proof or certification that materials conform to requirements. Applicable records will include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data. In addition, at the end of the first article operational and functional tests, the test unit will be disassembled so components can be inspected for signs of corrosion, erosion, degradation, or failure.

h. Certifications. USCG Certificate, supporting IMO Certificate, if extended, and independent test support documentation must be provided. If the actual size or configuration of the unit was not tested, the basis of all assumptions made during certification must be provided. Changes to this system from the certified baseline to meet this specification must also be documented. Some commercial OWS systems possessing USCG and IMO approval can be equipped with a heater. Although this specification does not call for a heater, the procuring activity may invoke the option for one. In these cases, the equipment manufacturer should provide additional information for the heater, such as shock, vibration, and EMI approval status, power requirements, and any other information that might inform the procuring activity about the OWS's ability to meet this specification.

i. Onboard repair parts list.

j. Onboard consumables list.

k. Alignment procedures.

l. Technical repair standard (TRS).

6.4 Recommended test material. Commercial dryer lint can be used to simulate fibrous matter found onboard Navy surface ships.

6.5 Failure mode effects and criticality analysis (FMECA). The analysis should include analysis of possible failure modes, their frequency, causes and effects, and precautionary measures to eliminate or minimize the failure modes. The depth of the FMECA should include all equipment, assemblies, subassemblies, and components whose failure would cause the centrifugal OWS to fail to meet the requirements herein.

6.6 Special tools. One set of special tools as defined in 3.9.5 and 3.9.6 should be acquired for each ship's compartment in which centrifugal OWS are installed. The number of sets required should be established by the acquisition activity (see 6.2).

6.7 Recycled, recovered, or environmentally preferable materials. For the purpose of this requirement, recycled, recovered, or environmentally preferable materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces, and parts incorporated in the element may be newly fabricated from recovered materials to the maximum extent practical, provided the element produced meets all other requirements of this specification. Used, rebuilt, or remanufactured components, pieces, and parts should not be incorporated into the element.

6.8. Isokinetic sampling port. In order to approach isokinetic sampling, where the sample enters the sampling pipe at stream velocity, the sampling arrangement should be as shown in figure 2 and, if a cock is fitted, free flow should be achieved for at least 1 minute before any sample is taken. The sampling points should be in pipes running vertically.

6.9 Flexible hose assembly service life. The service life of a flexible hose assembly can also be considered during flexible hose material selection. NAVSEA S6430-AE-TED-010 offers an established service life for flexible hose assemblies constructed of MIL-H-24135 or MIL-H-24136 hose with MIL-F-24787 fittings. NAVSEA S6430-AE-TED-010, implementing the industry standard, also provides an established service life for hose assemblies constructed of metal, polytetrafluorethylene (PTFE), and other thermoplastic hose material.

6.10 Definitions.

6.10.1 Clean effluent. Discharge from the centrifugal OWS that has an oil content of less than or equal to 15 ppm as determined by the OCM.

6.10.2 Corrective maintenance. All actions performed as a result of failure to restore an item to a specified condition. Corrective maintenance can include any or all of the following steps: localization, isolation, disassembly, interchange, re-assembly, alignment, and checkout.

6.10.3 Critical failure. For testing purposes, a critical failure is defined as any fault, failure, or malfunction which causes or may cause:

a. Failure to commence operation, cessation of operation, or degradation of performance below specified levels.

b. Damage to the centrifugal OWS by continued operation.

c. Safety hazard to personnel.

6.10.4 Dirty discharge. Discharge from the centrifugal OWS that has an oil content of greater than 15 ppm as determined by the OCM.

6.10.5 DoD component technical authority. An official in a technical oversight office who approves systems and equipment for installation on ships and administers certification requirements as defined in DoDM 4715.6, Volume 2. NAVSEA 05S may be contacted to determine the appropriate Technical Authority for any given requirement related to equipment and systems of U.S. Navy ships and submarines.

6.10.6 Effluent. Clean water output from the centrifugal OWS.

6.10.7 Emergency shutdown. The emergency shutdown occurs when an alarm condition exists or the emergency stop is pressed. During an emergency shutdown, power is immediately removed from all motors and the system cannot resume processing until the alarm condition is cleared or the emergency stop is pulled out.

6.10.8 Feed. The influent stream to be processed by the centrifugal OWS.

6.10.9 Independent test laboratory. Independent laboratory certified by the American Association for Laboratory Accreditation (A2LA). A list of A2LA accredited laboratories is available online at www.A2LA.org or from the American Association for Laboratory Accreditation, 5301 Buckeystown Pike, Suite 350, Frederick, MD 21704.

6.10.10 Maintenance ratio. A maintenance ratio is a measure of the total maintenance manpower burden required to maintain an item. It is expressed as a ratio of the total active maintenance manhours (scheduled and unscheduled) to the total operating time.

6.10.11 Mean time between critical failure (MTBCF). The total amount of mission time divided by the total number of critical failures (see 6.10.3) during a stated series of missions.

6.10.12 Normal shutdown. Normal shutdown occurs when the OWS stops processing fluid from the OWHT due to tank level switches' and sensors' feedback or by the operator pushing the stop button. During a normal shutdown, the centrifuge should be flushed as needed with potable water prior to returning to standby mode.

6.10.13 Oil/water separator (OWS). Generally used to refer to any separation device that separates oil from water.

6.10.14 Oil content monitor (OCM). A device for real-time sampling and measuring of the oil content of OWS effluent. The oil content monitor used shipboard should be approved by the DoD Component Technical Authority.

6.10.15 Oily waste holding tank (OWHT). The OWHT receives oily waste from the ship's bilges. It serves as a settling tank and as the source from which the centrifugal OWS draws influent.

6.10.16 Preventive maintenance. All actions performed in an attempt to retain an item in specified condition by providing systematic inspection, detection, and prevention of incipient failures.

6.10.17 Processing. The centrifugal OWS is processing when the feed pump is taking fluid from the OWHT and pumping it through the centrifugal OWS processing stage(s).

6.10.18 Subsystem. A subsystem is a system within one of the defined systems.

6.10.19 Waste oil tank (WOT). The WOT receives separated oil (oily waste) and bulk oil from the centrifugal OWS for later disposal ashore.

6.11 Subject term (key word) listing.

Bilge water
Oil content monitor
Oil pollution abatement
Oily wastewater
Oily waste holding tank
OWHT
Waste oil tank
WOT

CONCLUDING MATERIAL

Custodians:
Army – MI
Navy – SH
Air Force – 03

Preparing activity:
Navy – SH
(Project 4330-2020-001)

Review activities:
Army – AV, CR
Navy – AS
DLA – CC
GSA – FAS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla mil.