

ABHYUDAY BHARAT MEGA DEFENSE CLUSTER LLP.	STATEMENT OF TECHNICAL REQUIREMENT FOR OILY WATER SEPARATOR	SOTR NO.	ABMDC/RFI/0102
		REV. NO.	Initial issue
		DATE	13/11/2021

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ACRONYMS

AV	-	Anti Vibration
DCHQ	-	Damage Control Headquarters
EHM	-	Equipment Health Monitoring
FAT	-	Factory Acceptance Test Trials
FMT	-	Final Machinery Trials
HAT	-	Harbour Acceptance Trials
HMI	-	Human Machine Interface
IHQ	-	Integrated Headquarters
ILMS	-	Integrated Logistics Management System
IMCS	-	Integrated Machinery Control System
IPMS	-	Integrated Platform Management System
LOP	-	Local Operating Panel
NBCD	-	Nuclear Biological and Chemical Defence
N & V	-	Noise & Vibration
OBTS	-	On-Board Training System.
OEM	-	Original Equipment Manufacturer
PSI	-	Propulsion System Integrator
SAT	-	Sea Acceptance Trials
SCC	-	Ship Control Centre
SOTR	-	Statement of Technical Requirement
SRPM	-	Shaft RPM
STW	-	Setting to work
S & V	-	Shock & Vibration

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01 – TECHNICAL & MATERIAL SPECIFICATION

Scope:

- (a) This specification relates to the design, manufacture, supply, installation & commissioning assistance, test and trials of **‘Type Approved’** Oily Water Separator along with pump, starter, control panel etc. which shall be fitted in ships with its associated auxiliaries & ancillaries. OEM shall be responsible in totality, on turn-key basis for undertaking detailed design, manufacture, test, supply and commissioning assistance of the OWS considering general and environmental specification of the ship given in chapter 01 and detail technical specification and scope of supply brought out in the subsequent chapters, meeting the ship’s requirement. Single point responsibility of proving the equipment supplied, & its interfacing with other ship system shall be borne by the vendor.

Scope of supply: The list of equipment’s to be supplied along with accessories and instruments are as follows:

- (a) **‘Type Tested’** oily water separators along with pump, starter, control panel etc. which shall be fitted in ships with its associated auxiliaries & ancillaries complete with SV mount and foundation bolts.
- (b) Built-in control & monitoring panel for each OWS with provision for interface with IPMS. Only the electronic local control panels are to be included in the OEM scope of supply. The LCP must be provided with instruction plates for start stop procedure. All control panels must be provided with necessary mounts as applicable to meet noise & vibration requirements stipulated in subsequent sections.
- (c) Accessories: the OWS are to be supplied with all necessary accessories such as (but not limited to) pressure gauges, control valves, flexible hoses, couplings/counter flanges for suction/discharge ends, relief valve and any other accessories & instruments required for satisfactory functioning of the plant.
- (d) Instruments: Safety, control and monitoring devices are to be fitted on equipment as per requirement. All miscellaneous items are to be fitted as per functional requirement of the system.

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Applicable Standards

The equipment should adhere to the latest Class Rules. The following documentation or their latest issues in effect is to form a part of this specification to the extent specified herein, except where a specific issue is indicated. In case of a conflict between the contents of this document and the applicable portions of the referenced documents, the contents of this document shall take precedence.

(a)	NES1004	Requirements for the design and testing of equipment to meet environmental conditions.
(b)	MEPC 107(49) MEPC 159/55	IMO MARPOL resolution
(c)	MIL-STD-167-1(A)	Mechanical Vibration
(d)	MIL-STD-740-2 (SH) MIL-STD-1474-E	Airborne and Structure borne Noise measurements and acceptance criteria of shipboard Equipment
(e)	NSS-II	Requirements for high impact shock tests, Shipboard Equipment and systems
(f)	JSS55555	Environmental Test methods for Electronic & Electrical Equipment.
(g)	ISO12063(1987)	Classification of Degree of Protection provided by enclosures of Electrical
(h)	DGS251	Painting
(i)	DME405(R1)	Instrumentation specifications
(j)	DME424	Electrical Indicator specifications
(k)	DME452	Documentation specifications
(l)	DGS252	Electrical systems-design, manufacturing and testing
(m)	DEFSTAN-61-5	Electrical power supply system
(n)	DEFSTAN-07-55	Standard electrical and environmental tests
(o)	SES18	Electronic equipment
(p)	SES19	Static conversion equipment
(q)	DEFSTAN-02-501	General Requirement for the Design of Electro Technical Equipment
(r)	BS5424	Control Gear voltage up to and including 100V AC, part-1 Contractors
(s)	EED-Q-071(Rev.4)	Electrical Specification for AC Motors
(t)	DGS/EED/VI/1535/R6 or BS 6121/EN 624440-2013	Cable Glands
(u)	NES632	Requirements for AC and DC Motors
(v)	DME 303 D	Guidelines for acceptance trials of main and auxiliary machinery of new construction ships (Indian Navy guidelines).
(w)	NES 360	Valves
(x)	NES 723	Tally plates
(y)	DME 423	Pumps & Eductors
(z)	NES 322	Oil pollution prevention shipboard arrangement
(aa)	MIL-STD-461F	EMI/EMC requirement

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Technical requirements:

Design and Supply:

Design Overview: Oily Water separator having capacity 2.5 m³/hr. with 2.5 Kg/cm² discharge pressure complete with 15 ppm Bilge Alarm, oil content monitor, indicators, alarms, 3-Way Valve / Automatic Stopping Device for treated water Overboard / Recirculation, bilge pump, motor and starter and all other requisite accessories, mountings, instruments for satisfactory operation of the unit on board are required to be supplied in fully automatic modular design. The pump of the equipment should be capable of producing min. suction lift of 5 MWC (Vacuum) satisfactorily with respect to the suction interface point at the equipment boundary and it should be of self-priming type. Oily water separator along with all accessories should deliver treated water having less than 15 PPM and conforming the latest IMO MEPC resolution 107(49) and should automatically stop treated water discharge to overboard when oil content of the effluent exceeds 15 ppm and divert the effluent to designated bilge tank of the vessel. One in No. each compound gauge and pressure gauge with cocks should be provided in the suction and delivery end of the pump respectively. One in no. Manual Three Way Test Valve for Harbour Inspection According to IMO Resolution MEPC 107(49) to be supplied by the firm duly fitted on the equipment. Equipment to be supplied with one no. Oil Level Detector duly fitted on the Equipment. One in no. Solenoid Valve for automatic Oil discharge to be supplied duly fitted on the Equipment. The solenoid valve will sense signal from Oil Level Detector and operate accordingly. Equipment should be capable of operating continuously for at least 24 hrs. Air vent valve, drain valve etc. as required are to be provided for various chambers of the Separator as per OEM standard. The POL for the equipment should be preferably from the list of INCATed POLs already in use in the *IN*.

15 PPM Bilge Alarm:

- (i) The 15 ppm Bilge alarm to comply IMO MEPC Resolution 107(49).
- (ii) The alarm to be supplied duly fitted on a common base frame along with Oily Water Separator.
- (iii) The alarm should resist corrosion of marine environment.
- (iv) The 15-ppm bilge alarm is to provide a ppm display.
- (v) The response time of the 15 ppm Bilge Alarm, that is, the time which elapses between an alteration in the sample being supplied to the 15 ppm Bilge Alarm and the ppm display showing the correct response, should not exceed 5 seconds.
- (vi) The 15 ppm Bilge Alarm should be fitted with an electrical/electronic device which should be pre-set by the manufacturer to activate

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when the effluent exceeds 15 ppm. This should also operate automatically if at any time the 15 ppm Bilge Alarm should fail to function, require a warm- up period or otherwise be de-energized.

Tank Level Switch:

Level switch with manual override suitable for mounting on tank top should be supplied. Level switch will be fitted on Bilge tank for Auto Stopping of oil bilge water separator to avoid dry run.

Strainer:

Suitable GM strainer complete with MS (Galv.) mating flanges conforming to BS 4504 PN 10 STD should be supplied loose for fitment in ship Builders suction line of OWS, Size (NB) of GM strainer is to be indicated in Technical offer.

Assembly: The equipment is to be of modular design to facilitate easy dismantling, shipping, unshipping. The OEM is to indicate the dimension & weight of the largest component. Not exceeding overall dimension (in mm) is as follows. Final limiting dimensions will be discussed during TNC.

- (i) Length - 1600 mm
- (ii) Width - 1500 mm
- (iii) Height - 1550 mm

Manning Policy: The machinery should be able to be started, monitored & stopped from the local position. Additionally, the following signals for IPMS to be provided by OEM for remote monitoring:

- (i) OWS running
- (ii) Common fault indication
- (iii) PPM content of the overboard discharge
- (iv) Pump suction/ discharge pressure

Reliability: The OWS design should ensure high reliability, economy of weight / space, high mean time between overhauls and ease of maintenance. Reliability to be achieved by designing equipment, which is robust and simple. The equipment is to be designed for minimum maintenance and for ease of such essential maintenance as is required, incorporating facilities to allow ease of visual inspection so that the internal components are not disturbed to the extent possible.

Interchangeability: Interchange tolerance shall be such that all item parts having dimensions and characteristics permitted by the item specifications may

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be used as replacements without compromising equipment performance and shall be interchangeable between different units.

Lifting Arrangement: All components weighting more than 40 kg are to be provided with provisions for fitment of eyebolts, where there is a danger of transit damage due to freedom of a dry rotor to move within its casing, a suitable jacking or rotor locking device is to be provided.

Noise, Vibration & Zoning: Selection of OWS sets shall be carefully considered with a view to minimizing airborne noise, structure borne noise and vibration, thereby improving habitability. Vibration monitoring system is part of IPMS. The SOTR standards are to be adhered to in respect of noise and vibrations for the equipment along with its accessories (as applicable) during their FATs / Harbor trials / Sea trials.

Noise Damping: The reduction of airborne and underwater noise and structural vibration caused by machinery shall be regarded as an essential part of the installation. As far as possible, the noise and vibration shall be reduced at source. AV mounts, flexible pipes (IRS approved type) etc. to be used for reduction of noise and vibration.

Vibration recording & Equipment health monitoring: Fixed positions for mounting accelerometers/sensors for use when measuring vibration, is to be provided preferably by spot facing on equipment casing/base. Where it is required to monitor bearing health by means of bearing noise measurements, the bearing housing is to be arranged to accept the probe of a shock pulse meter. The offline health monitoring, measuring, recording, of vibration and health of equipment is to be provided by using suitable offline sensors provided by IPMS supplier. The vibration level at the sensors mounting location to be provided by firm.

EMI/EMC Standard: All equipment / systems being fitted onboard shall be MIL-STD-461F compliant. Test plans and Test Reports shall be forwarded to IRS. COTS equipment shall comply with IEC 60945 or IEC 60533 or equivalent standards. Grounding, bonding and shielding as per MIL-STD-1310H.

NBCD Requirement: INBR 312 to be complied (as applicable).

Interfacing Obligations: OEM to take care all the obligations and necessary action to overcome while interfacing with the other vendors.

Weights: Total weight of the equipment shall be indicated in the technical offer

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as well as on the GA drawing. In order to achieve maximum economy in weights, careful attention should be given to every part of the machinery and system with a view to limit its final weight within $\pm 5\%$ variation without prejudicing its reliability and efficiency. The manufacturer/supplier of the equipment shall indicate net weight on the packing case(s) and test report(s). The inspection authorities should countersign all such weight certificates. Weights of parts of supply shall be indicated by OEM along with binding drawing.

Material Specification: A component wise material specification list is to be provided by the manufacturer. Materials/ components capable to withstand NSS - II shock grade requirement and approved for use onboard Naval ships are only to be used. Any deviation from the material specified is to be indicated with reasons subject to condition that the material is fit for marine application.

Type test requirement: The first of each type of equipment is to be type tested and each successive unit is to be production tested at the manufacturer's works. In addition, extended endurance testing of prototype equipment is required to be carried out before approval of their use onboard. The supplier should also furnish data/information about the method/measurements carried out in evaluating the performance of the during trials. These type tests are applicable to equipment/parts/system which are newly introduced and are not proven earlier, including electrical equipment. Valid "Type Test Certificate" issued by competent authority, for the offered model is to be submitted along with the technical bid.

Shock standard: Equipment and its auxiliaries shall meet shock standards as per NSS II. When exposed to the specified shock condition, the equipment shall be operationally available without any time restriction, after exposure to shock. Shock test certification/qualification and information on the inherent shock withstanding capacity of the equipment shall be submitted by supplier along with the technical offer. Valid "Shock Test Certificate" issued by competent authority, for the offered model is to be submitted along with the technical bid.

Interfacing: Indication of plant operation and common fault are to be available through ship IPMS system and provisioning of sensor, switch etc. for IPMS integration are in OEM scope and type of the same to be clearly indicated in technical offer. In case the type of sensors is required to be modified to comply with IPMS requirement, same to be accommodated by firm.

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Control, monitoring and Instrumentation:

Control and Monitoring:

- (a) The local control panel must have provision for starting, stopping, controlling and monitoring of the equipment. The control system is to be provided with a suitable provision for interface with IPMS. The equipment manufacturer will therefore be required to interact with the IPMS supplier. The control panel should be in compliance with class rule requirement for marine environment.
- (i) Emergency Stop facility (necessary push button, terminals and cable gland etc. in starter) to be provided for both local control panel & for remote stopping facility.
- (ii) Indication of equipment plant running status and plant parameters, alarms, trips as applicable are to be provided on the local control panel.
- (iii) For monitoring from ship's IPMS, the requisite inputs in the form of signals as per the IPMS vendor requirement would have to be made available. The control interface requirements are as follows:
- All analog control signals to be 4 – 20 mA
 - RTD signal shall be PT 100, three wire.
 - Potentiometer shall be excited by all external voltage sources
 - All binary indication signals shall be dry contact type
 - All binary contact inputs shall be compatible with switches and the signal from the control system.
 - Manual/hardwired Interface
- (iv) The logic of the control system should be clearly displayed on the OWS for compliance by the operators. Further, complex logic for operation of the OWS should be avoided.
- (v) The Local Control Panel must be designed with adequate ventilation system to avoid overheating of the PLC and microprocessor. The requirement of external ventilation, if any, should be clearly indicated by the supplier in the offer. The control system is to be designed with its own power supply system. Only 415V 50 Hz 3 phase 3 wire supplies will be provided from the ship's source.

Safety Devices: The system should have suitable safety devices and alarms. Minimum list of Indications, Alarms, Interlocks and Trips as recommended by OEM in accordance with class rule are to be provided by firm along with technical offer. Tentative list is furnished below for guidance which will be discussed and finalized during TNC.

- (a) **Interlocks:** Interlock requirement, if any, is to be proposed by OEM along with technical offer so as to disallow start of OWS.

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- (b) **Indications, Alarms, Trips:** Following minimum indication, alarm and trips are to be provided:

Indications

- (i) Power on
- (ii) OWS running
- (iii) Oil content monitor display
- (iv) Pump suction & discharge analogue pressure gauges.

Alarm

- (i) High Oil Content (15 ppm).
- (ii) Filter clogged

Trip

- (i) Filter clogging trip
- (ii) Motor protection trip
- (iii) Pump dry run trip
- (iv) Low bilge level trip

The above lists are indicative and may be changed as per IN/Class/OEM/shipyard recommendation. Same will be finalized during TNC.

Electric system/ specific electrical requirement:

- (a) **On wiring:** Wiring of all sensors, including terminal box with connecting cables, compensating cables and transmitter block for pressure measurement, temperature etc. and its connection in Terminal Box and transmitter block is to be done by OEM. Internal wiring to be done with LFH cable. Cable Glands conforming to BS 6121/EN 624440-2013 & DGS/EED/VI/1535/R6 are to be provided.
- (b) **Electric Power Supply:** The available power supply onboard is as follows:
- 415 V AC – 50 Hz – 3Phase – 3 wires
- Equipment to withstand Voltage and frequency fluctuations as per class requirement.
- (c) All gauges, sensors, electrical meters & overloads fitted are to be supplied duly calibrated and said calibration certificates are to be forwarded to indenter. The sensors/ gauges are to be re-calibrated post de-preservation and prior starting of the engine. Calibration certificate to this effect shall have to be issued to meet trial requirement.

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- (d) All gauges, Indicators, Sensors (both local & remote) shall meet Classification society requirement. All imported Gauges & instrumentations shall meet Class requirements. However, for indigenous instrumentations IN requirements shall be complied with.
- (e) **Motors:** The motors will have class 'F' insulation. The motors will be selected to suit load requirements of various auxiliaries. The motor manufacturer is to ensure completion of starter motor integrated trials and implementation of all required protections will be the responsibility of the motor manufacturer.

Starters shall be of following types depending of the rating of motors:

- DOL Starter with solid state motor protection devices for rating of motor up to and 10 KW.
 - Star/Delta Starter with solid state motor protection devices for rating of motor above 10 KW.
- (f) **Starters & Controllers:** Provisions for remote start/stop along with indications will be made as applicable. The control panel for various auxiliaries will incorporate necessary contactors control devices for efficient and sequential control of motors.
- (g) Equipment delivered loose per vessel – to be indicated by OEM.