

ENQUIRY TECHNICAL SPECIFICATION AND SCOPE OF SUPPLY OF MAIN ENGINES FOR 2 Nos. 50 T BOLLARD PULL TUGS FOR KANDALA PORT TRUST VESSEL NOs. – 11173-74

NOTE : FORWARDING OF COMPLIANCE FOR ENQUIRY TECHNICAL SPECIFICATION PART -A [GENERAL] , PART- B [MACHINERY] AND PART- C [ELECTRICAL] IS A MANDATORY REQUIREMENT BY HSL WITHOUT WHICH OFFERS OF FIRMS SHALL BE CONSIDERED AS INCOMPLETE AND ARE LIABLE TO BE IGNORED.

- [A] BIDDING FIRM'S NAME :
 [B] BIDDING FIRM'S OFFER NO :
 [C] AUTHORIZED SIGNATORY OF THE FIRM :

PART A - GENERAL PART

Clause No.	Description of technical specification	Vendors Reply: Complied & cost included in offer mentioned above At [B]
1.	Requirement: Quantities specified in attached Part B &C are for One (1) Vessel. Total requirement is for Two (2) Vessels.	
2	Rules, Inspection and Certification by Class	
2.1	Classification Rule : The Tug shall be built for Classification with Indian Register of Shipping to obtain + SUL + IY TUG [Restricted Service] FIFI AGNI I of I.R.S., i.e. Restricted sea going vessel and machinery built and installed under supervision of the Surveyors of I.R.S. to the Rules of Indian Register of Shipping and has an External Fire Fighting arrangement to IRS AGNI – I standard . The vessel shall comply with latest IMS Rules as applicable to this type of vessel [Class XII] and with the Inland Vessels act.	
2.2	Type approval : The manufacturing and production of complete equipment shall be type approved by Class& relevant certificate shall have validity for 3 to 5 years from the date of issue of Purchase Order.	
2.3	Testing : The complete equipment shall be tested in presence of Class in manufacturer's workshop and test certificate shall be produced. Each engine shall be assembled at maker's workshop for tests in presence of classification surveyors.	
2.3.1	Main Engines : Two months advance notice shall be given about shop test data. Following tests are to carried out: a) Load test: Load 25% 50% 75% 90% 100% 110% Duration: ½ Hr ½ Hr 1 Hr 2 Hrs 4 Hr 1 Hr b) Fuel consumption to be measured at 100% and 90% loads. c) Peak pressure measurement at all loads d) Starting test	

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	e) Governor test f) Idle speed test g) Over speed test h) Testing of alarms and shut down sensors mounted on engine i) Others as per manufacturer standard & Classification society's requirement j) Engine parts shall be opened for inspection after testing as per classification society rules	
2.4	Inspection and commissioning : Inspection and commissioning of complete equipment onboard shall be carried out in presence of Class, Ship owners and HSL. Onsite service engineer assistance for startup and commissioning For Main Engine - 20 Days in 3 trips	
2.5	Electrical installations to conform to latest classifications / IEC regulations.	
2.6	Vendor has to directly contact classification / statutory authorities as required for approval of drawings, testing, inspection certification etc. and arrange the same to fulfill class requirement.	
2.7	Class approved Certificates, drawings and documents in triplicate (one original + 2 Copies)	
3.	Documents to be submitted after order	
3.1	Torsional Vibration Calculations (TVC) shall be supplied within four (4) weeks from receipt of complete TVC data. Whirling and Shaft alignment calculations shall be supplied within (8) weeks from order. Vendor shall arrange TVC, whirling and shaft alignment calculations duly certified by IRS.	
3.2	Shop test data duly signed by class / owners for SRP, shafting, bearings, Main Engine, PTO, accessories etc as required immediately after shop trials	
3.3	Class approval Drawings as applicable within 8 weeks after contract and the same shall be updated within four(4) weeks after approval. The list of alarm monitoring points shall be approved by class.	
3.4	List of Alarm Monitoring Points, controls and instrumentation system details as per class requirements are included in the IPI and same shall be supplied within 4 weeks from the order and receipt of all technical data from HSL including approval of thruster arrangement drawing	

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3.5	All installation and Arrangement Drawings, foundation, dimensional drawings, piping, instrumentation and final Electrical schematics / wiring/connection drawings are included in the IPI (Installation Planning Instructions) and same shall be supplied in 3 sets within 4 weeks from order. Indicative preliminary list shall be supplied within 2 weeks after order	
3.6	Heat Balance diagram showing heat dissipation , cooling water requirements of various accessories are included in IPI and same shall be supplied within 4 weeks from order.	
3.7	Final Drawings in IPI shall be supplied in three (3) sets in hard copies and one (1) C.D's. in AUTOCAD 2004	
3.8	Classification, Type approval and manufacturer Test Certificate reports in triplicate (1 Original + 2 copies) shall be supplied along with each equipment	
3.9	All installation, foundation, piping and Electrical line, wiring, terminal connections, dimensional drawings, material lists, sensor/ switches installation details, list of alarm monitoring points etc., shall be supplied in 3 sets for HSL approvals within 2 weeks after order.	
3.10	Final Drawings shall be supplied in three (3) sets hard copies and 1 set of reproducible transparencies and in soft DWG format (AUTOCAD 2004) in C.D ROM. In within 2 weeks after approval from HSL	
3.11	Six (6) sets of instruction, operation, maintenance, parts list and spare parts manual for Machinery, Electrical and electronic equipment within 12 weeks after order.	
3.12	Manufacturer Test Certificates and reports for complete equipment. Calibration certificates for parameter monitoring components in triplicate (1 Original + 2 copies) shall be supplied along with each equipment.	
4	Tools and fittings required for Installation of equipment :	
4.1	Foundation bolts and nuts, other fasteners, flanges, counter flanges, unions for screwed connections, class approved flexible hoses etc. for inlet and outlet connections of equipment supplied	

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4.2	One set of lifting devices with jack screws for positioning the Engine during erection	
4.3	All approved water tight cable Glands and terminal boxes as required shall be supplied for electrical installation	
5	Owner recommended Spares inclusive of class spares: Refer clause no 12 of Part B and clause no. 11 of Part C.	
6	Tools : Refer clause no 13 of Part B.	
7	Supplier should confirm that they will provide product support for a minimum period of 10 Years from the date of delivery of the vessel for complete Machinery & Electrical equipment being supplied by them.	
8	Onboard Training : The manufacturer shall provide training to technical crew onboard regarding operation and maintenance of the equipment supplied for Mechanical, Electrical & Electronic part. Training program will be conducted at HSL. Training shall be imparted by service Engineer at the time of commissioning.	
9	Systems and features not included in the specification, which vendor deem necessary for satisfactory operation of the supplied system, same shall be supplied free of cost even if observed during installation/ commissioning.	
10	Weight is one of the most important criteria for selection of the equipment and therefore ,total weight of two main engines with accessories and spares should be within 30.2 Tonnes. [2 nos Main engines with on built Engine Driven pumps, Stand by Motor Driven pumps , 2 nos. silencers, 2 nos air Receivers , 4nos couplings connected to Engine crank shaft drive & FW expansion Tank.] The dry and wet weight of all items supplied shall be included in the weight study and shall be furnished along with the offer.	
11	Following drawings are enclosed for reference : [1] GA Drawing no. 50018 CC [2] Lines Plan dtd 22-6-2011	
12	Documents to be submitted along offer	
12.1	Technical leaflets, catalogues and reference lists of installation for the quoted equipment	
12.2	G.A drawing showing foundation and dimensional details with weight including the Steerable Rudder Propeller, Shafting , Main Engines , PTO Gear Boxes etc.	
12.3	Installation drawing indicating Foundation details and procedure and space constraints for withdrawal of various accessories of all the offered machinery and equipment shall be furnished.	

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12.4	Schematic drawing for Piping and Instrumentation diagrams indicating size of the connection pipes, pipe fittings, valves etc., for F.O, L.O, Hydraulic, F.W & S.W cooling ,Starting Air, Exhaust Gas System etc.	
12.5	Electrical schematics and cable diagrams of each system and arrangement of controls / instrumentation system in Bridge, Engine Room, ECR etc as offered	
12.6	Project guides for installation and work execution of the equipment offered in 2 sets.	
12.7	List of Lubricants (Brand & Grade) recommended for the equipment offered shall be indicated in the offer. Equivalent lubricants available with Indian Oil companies shall also be indicated in the above list.	
12.8	List of alarm monitoring points (preliminary).	

THE BIDDER SHALL ENSURE THAT THE OFFERED MACHINERY /EQUIPMENT PERFORM TO UNDER MENTIONED SERVICE CONDITIONS :

MAIN PARTICULARS OF SHIP AS PER GA DRG. NO 50018 CC , PROJECT REF : DP-424	
LOA	: 33.0 M
LBP	: 32.000 M
Breadth [Mld]	: 10.80 M
Depth [Mld] Main hull	: 4.50 M
Draft [Bottom of Appendage]	: 3 M
Speed at 90 % MCR	: 12 Knots
Bollard pull at 90 % MCR	: 50T at trial displacement of 50% Load of fuel & fresh water at calm sea
MCR power	: 1875 KW x Two Engines
Propulsion	: Twin Stern mounted Steerable Rudder propulsion.
SERVICE CONDITIONS	
Sea water temperature	: 32 degree C
External temperature	: 40 degree C
Machinery spaces temp.	: 50 degree C
Humidity	: About 60% at 40 degree deg C

Manager[ED]

Dy. Manager[MEM]

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PART B - MACHINERY PART

Clause No.	Description of technical specification	Vendors Reply: Complied & cost included in offer mentioned above At [B]
1	Main Engines with Accessories:	
1.1	<p>Two (2) nos. : Non-reversible, water cooled, four stroke Marine high speed inline cylinder Diesel Engines. Capacity =1875 KW x two engines to match the two SRP propelling units for meeting the requirement of 50 Tons Bollard Pull at 90 % MCR and 12 knots speed at 90% MCR with anti-clock wise direction of rotation looking to the flywheel. Each Engine shall be coupled to SRP through a shafting. <u>Proposed Specification of each Engine [To be furnished by vendor].</u></p> <p>Make : Type : Cycle : 4stroke, single working Number of cylinders : Bore : Stroke : Swept vol. per cylinder : Total swept volume : Compression ratio : Engine nominal speed : Idling speed : Engine nominal torque : Break mean effective pressure : Maximum continuous rating[MCR] : 1875 KW x 2 Engines Specific fuel oil consumption at Full load : Specific lube oil consumption at Full load : Propulsion : SRP</p> <p>Direction of rotation looking to Engine fly wheel: Anti clockwise</p>	
2	<p>Fuel Oil system (Built on Equipment) Fuel oil booster pump, gear type, engine driven pump (ship's fuel oil tank located at height of 500 mm from crank shaft center line). Hence booster pump shall be suitably designed</p>	

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2.1	1 no. Diesel oil transfer pump, motor driven (capacity 5 cu.m/hr at 3 bar) with necessary starter, suction and discharge pressure gauges shall be provided for the pump.	
2.2	1 nos. electric motor driven fuel oil standby pumps with starters. Suction and discharge pressure gauges shall be provided for the pump.	
2.3	Duplex fuel oil filter with change over valve on pump delivery side (filter mesh – 7 microns)	
2.4	Fuel oil flow meters	
2.5	Fuel oil pressure regulating valve	
2.6	Fuel injection pumps, one for each cylinder	
2.8	High pressure fuel oil pipes	
2.9	Fuel injection nozzles including holder	
3.0	Lubrication system: Engine driven lubrication oil pump of gear type complete with built in pressure relief valve / regulating valve. Capacity of lubricating oil pump shall be indicated.	
3.1	2 nos. electric motor driven lubricating Oil pump with starter. Same shall be used as priming pump also. Suction & discharge pressure gauges shall be provided for the pump.	
3.2	Valve gear lubricating oil system shall consist of lubricating Oil filter, lubricating oil pump (tandem pump with the fuel oil pump) and lubricating oil tank.	
3.3	Lube oil filter duplex type with two way valve (10 micron filter mesh paper cartridge)	
3.4	L.O By pass filter centrifugal type.	
3.5	Lubricating oil sump with suction pipe and strainer.	
3.6	Lube oil dip rod with marks (min / max)	
3.7	2 nos. lubricating oil coolers of conventional tubular type . The capacity of the coolers shall be suitable for cooling ME lubricating oil.	
3.8	2 nos. lubricating oil thermostatic valve for automatic temperature regulation of lubricating oil	
4.0	Centralized cooling water system:	
4.1	High temperature (HT) cooling water system : Jacket cooling for cylinders, cylinder covers, turbo chargers and charge air cooler shall be provided with fresh water as cooling medium.	
4.2	Low temperature(LT) cooling water system : Charge air cooler and LO cooler shall be provided with fresh water as	

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	cooling medium. Water pre heating unit shall also be provided.	
4.3	The cooling water systems shall be dimensioned for the engines maximum continuous rating (MCR)	
4.4	HT and LT pumps, centrifugal type, with flexible bellow on the suction pipe connection.	
4.5	The FW cooling water pumps as per engine maker's standard.	
4.6	HT and LT water pipes suitable for marine usage .	
4.7	2 nos. conventional tubular type coolers to cool fresh water using sea water as cooling medium shall be provided.	
4.8	2 nos. thermostatic valves for jacket water temperature control with fixed setting	
4.9	2 nos. thermostatic valves for LT water	
4.10	1 no. jacket cooling water standby electric motor driven centrifugal pump with starters and spares. (capacity to suit one engine)	
4.11	1 no. LT cooling water standby electric motor driven centrifugal pump with starters and spares. (capacity to suit one engine)	
4.12	2 nos. sea water pumps motor driven, self priming centrifugal type with starters and spares. Capacity of each pump shall be sufficient to cater cooling capacity of two main engines. Material of sea water pump : Casing : Bronze ; Impeller : Al Bronze; Shaft : stainless steel	
4.13	Suction and discharge pressure gauges shall be provided for all electric motor drive sea water pumps.	
5.0	Starting Air system :_Compressed air starting device shall work in conjunction with remote control system	
5.1	Engine shall be started with pressurized air 30 bar directly in cylinder	
5.2	Explosion protection for starting air pipe on engine as per class rules	
5.3	A starting air valve for remote control & push button for emergency start	
5.4	2 nos. pressure reduction and filtration station with built on pneumatically operated equipment.[pressure reduction from 30 bar to 7 bar]	
5.5	2 nos. starting air receivers,500 Ltrs each , with safety valve, non return type, inlet valve, four outlet valves, drain valve, pressure gauge etc. Note :Capacity of the air receivers shall be decided by OEM to fulfill requirement of air for 12 starts as per IRS latest regulations.	
6.0	Charge air system	
6.1	Engine shall be turbocharged and equipped with charge air coolers.	

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6.2	Turbocharger make shall be furnished	
6.3	Turbocharger shall be equipped with water washing equipment on exhaust side for cleaning of turbine blades and turbocharger casing.	
6.4	Necessary thermometers shall be provided before and after sea water side of charge air cooler and charge air after cooler.	
7.0	Exhaust gas system (300 mm WG)	
7.1	Exhaust valves in SICR alloy steel with ‘ Satellite 12’ welded on hard seat facing	
7.2	Turbochargers with air filters	
7.3	Exhaust pipes on engine shall be thermally insulated and tagged along expansion joints between cylinders and exhaust gas manifold up to turbochargers	
7.4	2 nos. necessary transition pieces with bolts and nuts for exhaust at turbocharger	
7.5	2 nos universal type expansion joint with counter flanges , bolts, nuts and gaskets for turbocharger outlet connection to suit above discharge pipes	
7.6	Four more expansion bellows [2nos per engines x 2 Engines] per ship with counter flanged , bolts, nuts, and gaskets required for fitting in ME exhaust pipe line.[Excluding one no fitted with each engine]	
7.7	2 nos. silencers with spark arrestor , combined reflection and absorption silencer , attenuation : 25 dB(A). Length shall be short as possible.	
8.0	Governing System	
8.1	Speed Governor with automatic speed setting, electric shut down, start limitation & overload control provision for constant & variable engine speed shall be provided	

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9.0	Thermometer for charge air after charge air cooler, lubricating oil before engine, Jacket cooling water before engine, Jacket cooling water after engine, Jacket cooling water before air cooler, Jacket cooling water after air cooler, LT cooling water before air cooler, LT cooling water after air cooler.	
10.0	Accessories :	
10.1	Bed plate shall have perfectly fat machined bottom surface	
10.2	Flywheel with fastening bolts (shrunk fit)	
10.3	Torsional vibration damper (if required per calculation)	
10.4	Manual turning gear (mechanical cranking device)	
10.5	Necessary interlocking device shall be provided between engine starting and mechanical cranking device.	
10.6	Necessary indication lamps and alarms shall be provided for mechanical cranking device engaged / disengaged at local engine stand and at wheel house.	
10.7	Indicator cocks / valves . one for each cylinder shll be provided	
10.8	Rigidly / resin mounted diesel engine : All pipes on engine shall be provided with counter flanges complete with bolts, nuts and gaskets for connecting onboard piping system. Unions shall be provided, for screwed connections, if any. Protective conduit for electric cables on engine shall be provided.	
11.0	Couplings for Propulsion system:	
11.1	2 nos. flexible couplings between Main engines and MCD Clutch with necessary coupling bolts and nuts. Classification certificates shall be provided for couplings, bolts and nuts. PTO shaft details shall be furnished along with the offer.	
11.2	2 nos. flexible coupling for PTO end between main engines and gear boxes of fire fighting system with necessary couplings , bolts and nuts .	

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	Classification certificates shall be provided for couplings , bolts & nuts. PTO shaft details shall be furnished along with the offer.	
11.3	One set spare coupling bolts with nuts 5 mm allowance shall be provided on diameter of coupling bolts.	
12	Spare parts as per build specification Annexure – III inclusive of class recommended spares are as below:	
12.1	Cylinder head complete with all valves and mountings :08 nos	
12.2	Cylinder liner with rubber sealing rings :08 nos	
12.3	Inlet valve :16 nos	
12.4	Exhaust valve :16 nos	
12.5	Valve guides for inlet valve :16 nos Valve guides for inlet valve :16 nos	
12.6	Connecting rod :04 nos	
12.7	Gudgeon pin :08 nos	
12.8	Main bearings per crank shaft :02 sets for two engines	
12.9	Connecting rod bearings per crank shaft :02 sets for two engines [1 set comprise of bearings for one crank shaft]	
12.10	Sea water pump complete :02 nos	
12.11	Fresh water pump complete :02 nos	
12.12	Seal set per pump for sea water pump :08 sets Seal set per pump for fresh water pump :08 sets	
12.13	Cylinder head gasket :02 sets [A set comprise of no. of gaskets per engine]	
12.14	Water grommets [A set means no. of grommets per engine]:02 sets	
12.15	Engine top overhauling gaskets :02 sets	
12.16	Lube oil cooling element :01set/engine	
12.17	‘O’ rings and seals for lubricating oil coolers :4 sets	
12.18	Element fuel oil filter :50 nos	
12.19	Element lube oil filter :50 nos	
12.20	Air starter motor complete with pinion :1 no	
12.21	Pinion for air starter motor :4 nos	
12.22	Rotor vanes for air starter motor :2 nos	
12.23	Lubricating oil pump complete :1 no	
12.24	Cam shaft bushing :36 nos	

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12.25	Push rod assembly :12 nos	
12.26	Injector assembly complete :24 nos	
12.27	Piston assembly complete with gudgeon pin, circlip & rings:06 nos	
12.28	Piston ring set complete :06 nos	
12.29	Connecting rod bolts :12 nos	
12.30	Fuel pump complete :02 nos	
12.31	<p>Main Thrust block –The under mentioned class recommended components shall be included:</p> <p>Pads for one face of michell type thurst block : 1 set</p> <p style="text-align: center;">OR</p> <p>Complete white metal shoe of solid ring type : 1 set</p> <p style="text-align: center;">OR</p> <p>Inner and outer race with rollers , where roller thrust bearings are fitted. : 1 set</p>	
13	Tools :	
13.1	<p>Following tools for maintenance of the engines shall be provided with the engines.</p> <p>a) 1 no. Fuel nozzle testing equipment</p> <p>b) 1 no. Micrometer for ME crank pin</p> <p>c) 1 no. micrometer with adaptor for cylinder liners</p> <p>d) 1 no. crank shaft deflection gauge / alignment gauge</p> <p>e) 1 no. peak pressure indicator</p> <p>f) 1 no. valve spring removable tool</p> <p>g) 1 no. tools for turbocharger maintenance</p>	

Dy. Manager [MEM]