

Annex V of the VAC

Technical Specifications for the Equipment

Enclosed to Procurement Procedure No. EMSA/CPNEG/2/2017 concerning Service Contracts for stand-by oil spill recovery vessels

Competitive procedure with negotiations

Phase II - Invitation to Tender

All the costs related to the purchase and transport of additional equipment and transportation and servicing of the transferred equipment in line with this Annex and as per below requirements have to be included in the “equipment costs”

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1. General description

The oil pollution response equipment comprises, as a minimum, two different at-sea oil recovery systems and an oil slick detection system. The primary system will consist of two rigid sweeping arms, one on each side of the vessel, specially designed to recover medium to high viscous oils. The second system will be based on a boom and skimmer for the recovery of light to medium viscous oils. Those systems will be installed on board when operating as an oil spill recovery vessel although they will not be used at the same time.

The sweeping arms, skimmer, boom and ancillary equipment are dismantable and able to be stored in appropriate facilities for quick installation and operation in case they cannot permanently be installed on board. The storage of the full set of equipment during at-sea operations will be made in a safe way with sea fastenings where appropriate.

When flexible hoses are used, they should maintain the maximum grade of integrity in shape and shall not be exposed to wear and tear against sharp corners or similar.

The Contractor will receive the set of equipment as listed in Section 4 and described in detail in Section 5 of this document. However, the Contractor will be responsible for the correct functioning of the equipment according to the parameters of its technical specifications. Accordingly, if additional items need to be purchased to make the equipment function properly the associated costs shall be borne by the Contractor although they can be pre-financed or reimbursed by EMSA.

1.1. Equipment Set Transferred

The contractor will receive from EMSA the equipment listed below. The contractor will need to undertake the necessary pre-fitting works in order to install:

1. Lamor Power Reel and Umbilical Hose System for High Capacity Skimmer
2. Lamor Free Floating High Capacity Offshore Skimmer
3. Spare parts for high capacity skimmer system
4. Hydraulic Power Pack Block Electric, LPP 2x90
5. Lamor Single Point Inflatable Offshore Oil Boom
6. Oil Slick Detection System MIROS
7. Portable cleaning machine
8. VHF aerial band

All tenderers will have the opportunity to visually verify the condition of equipment in the stockpile in Ferrol, Spain at request. In principle the visit will be organised in week 33. The visit details will be arranged with the requesting party.

Technical issues were experienced in the past with some equipment items, as listed below:

- March 2015: problem with the internal spiral hose of the boom – repaired by the manufacturer;
- March 2016: hydraulic oil leak from the boom reel – fixed by the contractor.

1.2. Servicing

The equipment that will be transferred to the Contractor was purchased in 2013. At the moment of transfer the age of the equipment will be 5 years. It is generally in good condition. It has never been used to recover oil and it has been deployed a few times per year for the purpose of drills and

exercises (in average 4 quarterly drills and 1 exercise per year). The equipment has been categorised and appropriately labelled. It has undergone regular maintenance according to the manufacturer's specifications. The maintenance was closely monitored by EMSA. The working condition of the equipment is regularly verified by the Agency during drills.

Nonetheless, taking into account that during the new contractual period (4+4 years), the Contractor will be responsible for the safe, reliable and sustainable operational use of the equipment, the Contractor should arrange overhauling/servicing to the equipment after the handover but before expiration of the Preparation Phase. In such a case, each tenderer will include in its financial offer regarding the oil pollution response equipment, the estimated servicing costs. This estimation will be considered as the ceiling that EMSA will reimburse in relation to the equipment servicing.

Detailed report of the service(s) actually carried out on the equipment item(s) shall be included by the Contractor as part of the Completion Report. This report should include as a minimum list of works performed, list of parts replaced and/or repaired, photos, etc.

The servicing might be performed by a third party subcontracted by the contractor.

1.2.2. Equipment to be serviced by the Contractor

The contractor should arrange servicing to the following equipment:

1. Lamor Power Reel and Umbilical Hose System for High Capacity Skimmer
2. Lamor Free Floating High Capacity Offshore Skimmer
3. Lamor Single Point Inflatable Offshore Oil Boom
4. Hydraulic Power Pack Block Electric, LPP 2x90

The servicing should include the following:

- Check and replace, if necessary, the hydraulic and oil hoses and couplings;
- Check and replace, if necessary, the crane cables, lifting wires, ropes, etc.;
- Check of power packs, change the engine and hydraulic oil, coolant liquid, filters (oil, air, fuel);
- Check the brushes of the sweeping arms/free floating skimmer;
- Check and servicing of the pumps, if necessary;
- Check the paint and repaint, if necessary.

1.3 Additional Equipment

Tenderers will need to purchase/deliver the following equipment:

1. Rigid Sweeping arms

The sweeping arms will be constructed in such a way that they can recover any type of surface pollutant which has a density lower than water and which can pass through the inlet. The sweeping arms must be of rigid type.

Diagrams showing the position on the vessel of the arms as well as the deployment and recovery manoeuvre must be included in the bid.

Each rigid sweeping arm system shall consist of a steel fixed sweeping fence with oil resistant rubber fenders, which can be towed at an angle alongside the vessel, with a built-in weir type skimmer.

However, it must have interchangeable skimmer heads of brush and weir type. The arm will also have a submerged pump in the hull's nearest edge to transfer, via a semi-rigid hose, the recovered mixture to a tank or hopper onboard the vessel. The steel structure shall have at least 4mm of thickness. Although it will depend on circumstances, the usual towing angle will be 60° on the basis of a sweeping speed of 1.5 to 3.5 knots.

The vessel will have one sweeping arm located on each side of the vessel (total two), which length will depend on the size of the vessel and the available space on deck. A minimum length of 12 metres is required although 15 metres is **preferred**.

The sweeping arms will be handled and deployed by cranes placed on board. The necessary hoisting eyes in the arms shall be welded to the arms structure in order to hoist and deploy the sweeping arms safely and shall be provided with towing chains to which a towing wire can be fastened.

Where possible, the arms can be executed with foldable ends to reduce the overall dimensions and facilitate the transportation.

A hoisting gear with a manually operated winch for pump cleaning is to be provided.

Each sweeping arm will have an adjustable overflow (when the sweeping arm is working with a weir skimmer installed) and a pump capable of processing the thickest oil-water mixture. A remotely controlled self-cleaning grating will be provided to avoid interference from debris at the suction side.

Once the arms are in their operational position, a cable system, manned from the bow windlasses or winches, will keep them in an appropriate position.

The two sweeping arms will direct the oil/water mixture to be recovered to a collection chamber where submerged hydraulically driven pumps are installed. The model of the pump chosen will have been specially designed to pump high viscous oils or emulsions. However, the specific pump model must be selected according to the following classification:

- a. In case the vessel proposed has at least three tanks interconnected of similar size or when the storage capacity is bigger than 2,500 m³, then specially designed centrifugal pumps are recommended with a capacity not less than 300 m³/h of water at 6 bar or equivalent allowing the mixture of oil-water to be transferred into the storage tank or hopper.
- b. In any other case of tank configuration and capacity, or when the arm has a brush skimmer head installed, Positive Displacement Archimedes Screw Pumps are recommended with a capacity not less than 125 m³/h of water at 7 bar or equivalent allowing the mixture of oil-water to be transferred into the storage tank or hopper.

It is **preferred** that both types of pumps are provided (a pair of each type). Nevertheless, it will be possible to install both types of pumps in the arms. In any case, the maximum discharging pressure will be at least 10 bar and the diameter of the discharging hose will be of at least 6 inches. A radial current system of hot water injection in the inlet and outlet of the pump or equivalent where appropriately justified, will be installed in order to facilitate the flow of the oil to the storage tanks.

The oil recovery hoses will be semi-rigid and as short and wide as possible. Once the recovery hoses reach the vessel, they will be connected to loading pipes of a diameter of at least 8 inches to direct the recovered product to the cargo tank(s) or hopper. The recovery hoses should not be longer than 20 m although 10 m is expected. The height from the water line to the connection to the loading pipe should be less than 6 m.

The whole system will be operated from a control desk on the crane with the necessary safety mechanisms, alarms and emergency stops. The control desk will have good visibility of the sweeping

arms manoeuvring. From the control desk it shall be possible, as a minimum, to remotely deploy and hoist the sweeping arms.

When no oil recovery operations are being carried out with the sweeping arms, they will be stowed in such a position where they are safe from the sea and/or from other operations. Alternatively, they will be stored onshore in the "home" port, ready for quick installation.

The sweeping arms will be able to operate safely at least until a sea state of Beaufort 5 conditions.

Cranes for Sweeping Arms

The rigid sweeping arms shall be deployed using two cranes. Each crane shall have its own hydraulically driven winch and hydraulic cylinder for moving the rigid sweeping arm from the inboard to the outboard position of the vessel. The cranes shall be welded or bolted to a deck foundation. They shall be equipped with a double hook. The first hook will be on the reaching limit of the crane and the second hook will be located at 5 meters (approx.) from the fixed arm reaching limit. The cranes will have adequate capacity to hoist and deploy the sweeping arms.

The rigid sweeping arms shall be secured by sea fastenings to the deck of the vessel.

Each crane shall be remotely controlled from a control desk from which the operator must have good visibility of the overall manoeuvring operation with the arms. The cranes should, in any case, be suitable for operation of vessels at sea. If necessary, the cranes shall be approved by a Recognised Organisation in accordance with Regulation (EC) No 391/2009 and/or Flag Authorities.

Ancillary Equipment Sweeping Arms

The sweeping arm system shall comprise all the necessary power packs, hoses, cables and tools to:

- a. Stow the sweeping systems and ancillary equipment on board in a safe way while sailing. Should the length of the hoses be such that the safety of the operations is somehow hampered when the arms are deployed or during the deployment or hoisting manoeuvre, then a galvanised steel reel should be installed to stow such hoses.
- b. Deploy the sweeping systems on the water surface.
- c. Tow the sweeping arms in a safe manner with a secure system to avoid their loss, and maintain the appropriate sweeping angle.
- d. Hoist the sweeping arms to their onboard stowing position as soon as the operation has finished.
- e. Couple the oil recovery hose to the storage tanks inlet or oil/water separator when applicable.

Two diesel hydraulic power packs must be provided in order to operate the two sweeping arms and the transferred Lamor skimmer (each system separately and not simultaneously), according to their technical specifications.

2. Flashpoint of the arrangement: If the tenderer could offer an arrangement able to collect and store oil with a flashpoint below 60°C, then additional items may need to be purchased or replaced (e.g. for the power packs, remote controls, etc.) in order to maintain that class notation during OPR operations.
3. Slick Detection System: The Oil Slick Detection System must be upgraded and updated. The tenderer has to check with the manufacturer (the relevant contact address is provided in Section 5, point 5.6) or an authorised representative whether the existing radar and antenna on board the vessel are compatible with the slick detection system provided by EMSA. In

case of incompatibility, then the transferred antenna and radar should be installed. The tenderer should foresee the necessary space in the bridge to install it.

The system must be upgraded regularly throughout the duration of the contract.

4. Flow-meter: to be used during drills and recovery operations to measure the flow of the pumps installed in the sweeping arms and skimmer.
5. Communications Devices: At sea oil recovery operations require a number of different actors at different locations. In particular, the vessel will be able to communicate with aircraft, so one VHF radiophone, aeronautic band, will be foreseen for recovery operations or exercises (another one will be transferred from EMSA).
6. Interface Detection System: When the oil/water mixture is stored in the tanks, the water and the oil is naturally separated due to the difference in density. The tenderer shall provide adequate equipment (fixed or portable) to detect the interface border between the oil and the water so that the quantity of actual oil stored is known.
7. Gas Detector: It will be needed to check the presence of explosive gases.
8. Flashpoint Tester: This device will be used to determine the flashpoint of oil before starting oil recovery operations.
9. Portable Cleaning System: In order to clean the equipment and deck after the first stage of operations, two portable high pressure hot water cleaning sets shall be provided with a flow range of at least 0.18-0.72 m³/h at 20-100 bar (another one will be transferred from EMSA).
10. Sampling Mini-Lab: The vessel will be equipped with a portable mini-lab and a sampling device to analyse, at least, the density and viscosity of the recovered product. The range of the minilab will be enough to measure a specific density from 0.80 to 1.2 and a kinematic viscosity of at least 100,000cst. The results of the analysis will be expressed in international units.
11. EMSA logo on equipment: At least one EMSA logo must be attached/painted on a visible position on each sweeping arm and crane, skimmer frame (if possible), boom reel, power pack, storage containers. The dimension of the logos shall be in proportion to the items to be marked.

The Contractor will purchase the above listed additional oil pollution response equipment items and will obtain and conserve ownership of them until the Clearance of the Preparation Phase is completed. All provisions of the Contract including article IV.4.3 (transferable call option) shall apply to the additional oil pollution response equipment items.

12. Vessel Model: At the end of the preparation phase, the Contractor will deliver to EMSA, at its premises in Lisbon, a model(s) of the Vessel(s) at (approximate) scale 1/100. All oil pollution response equipment will be displayed, in the appropriate scale, on board the model(s). In particular, one system must be deployed, simulating recovery of oil with the option to display the alternate system (sweeping arms or boom/skimmer systems). The model(s) should be as detailed as possible, preferably made of plastic or metal. The model(s) remains the property of EMSA, only to be used by the Contractor upon request with the agreement of EMSA. Any cost related to the production of the model and its transportation costs shall be borne by the Contractor¹.

¹ The model price should be indicated in the bid for information only.

2. Handover procedure for equipment transferred

The conditions of handover, transportation, storage and insurance of the equipment are described below. If any part of the equipment delivered is not used by the Contractor due to the fact that it is not suitable for the vessel offered, the associated costs for the storage, insurance and maintenance shall be borne by the Contractor unless another solution is agreed with the Agency.

2.1. Date and place of the handover

Prior to the handover, the Contractor shall designate a representative whose name and position shall be communicated in writing to EMSA. The Agency may also designate a representative to witness the handover process.

The oil pollution response equipment items listed in point 1.1 above will be made available for handover and ready for transportation at their storage location in Gdansk (Poland) at a time to be mutually agreed between EMSA and the Contractor. The handover of this equipment shall not take place earlier than the day following the date of signature of the Contract by the last contracting party and not later than **15 March 2018**.

On the handover dates, the Contractor representative shall be present and verify the delivery of the equipment in question.

An equipment delivery/receipt statement prepared by EMSA will be used in order to acknowledge handover of all the oil pollution response equipment items. By signing the equipment delivery/receipt statement on the handover date, the Contractor representative accepts the equipment in its current condition.

2.2. Transportation of equipment listed in point 1.1. above

The Contractor shall bear all risks involved in transporting (including loading and unloading) for the equipment under 1.1. from the handover place to the new storage facility.

The Contractor shall arrange the packing and preparation of the items for transportation, provision of stevedoring services and lifting resources (e.g. forklifts, mobile cranes, etc.) and all necessary shipment.

The costs related to the transportation (including insurance) of the equipment must be paid initially by the Contractor. However, these costs are, within the contract budget ceiling, reimbursed by EMSA as part of the oil pollution response equipment purchase. Accordingly, the tenderer shall include in its financial offer the estimated transportation costs for the oil pollution response equipment.

2.3. Storage and insurance of equipment

Prior to the equipment handovers, the Contractor shall arrange for the appropriate storage and insurance of all the oil pollution response equipment.

For the purpose of taking out the full risk insurance policy covering the transferred oil pollution response equipment items as listed in the table in Section 4 and described in details in Section 5, the equipment value shall be the equipment purchase value which is in the range of 1.5 million EUR (one million five hundred thousand euro).

3. Installation of the oil pollution response equipment on-board the vessel

The vessel must be pre-fitted in order to allow installation on board of any of the above listed oil pollution response equipment, taking into account the standardised containers/flat racks for storage.

The equipment that must be installed/carried simultaneously on board must include as a minimum the following:

- the sweeping arm system,
- the boom system (2 x reel),
- the skimmer system,
- the oil slick detection system,
- other equipment (minilab, cleaning machines, gas detector, flashpoint tester, etc.)

and their relevant power packs and ancillaries.

The general requirements to be considered for installing the equipment are included in Annex IV - Technical Specifications for the vessel/pool of vessels. In addition, point 1 of this document also includes general guidelines.

4. List of Transferable Equipment

Category	Item	Item Brand	Item Model	Length (m)	Diameter (")	Power (kw)	Additional info	ID Code
HC Skimmer	Storage reel	Lamor	HC LWS 1300				UMBILICAL HOSE REEL LUT 90, WITH TELESCOPIC CRANE ARM, TURNTABLE and 20' FLAT RACK, UMBILICAL HOSE LUH 6 50, 9 Ch Mk II	CQSI353401
	Oil hose(s)			10.0	6		RIGID RUBBER OilRig, CAMLCK F/M	CQSI263801
	Cover						CANVAS FOR UMBILICAL HOSE REEL	CQSI120001
	Remote control						RADIO REMOTE CONTROL 3-5 FOR SKIMMER SYSTEMS	CQSI290001
	Remote control						RADIO REMOTE RECEIVER BOX (NON EX)	CQSI290002
	Weir module	Lamor	HC LWS 1300				WEIR SKIMMER Mk II / MSP150 WITH HYDRAULIC THRUSTERS	CQSI314401
	Brush module	Lamor	HC LWS 1300				BRUSH ADAPTOR	CQSI310701
	Cover						CANVAS FOR BRUSH ADAPTOR LBA	CQSI120002
	Pump	Lamor	GT A 140				PDAS	CQSI280001
	Pump ancillaries	Lamor					WATER INJECTION KIT INLET 3/4", GT A 115/140	CQSI280201
	Cover						CANVAS FOR WEIR SKIMMER LWS 1300 Mk II	1777
	Control desk						REMOTE CONTROLLED HYDRAULIC VALVE BLOCK INTEGRATED in LUT 90	CQSI110001
	Pump	Mariflex	MSP 150				WITH SS IMPELLER FOR UMBILICAL HOSE SYSTEMS	CQSI280002
	Spare parts						REPAIR KIT RUBBER ADHESIVE, FOR UMBILICAL HOSE LUH	CQSI343101
	Spare parts						SPARE PART KIT 1 OIL TRANSFER PUMP GT A 115/140	CQSI343102
	Spare parts						SPARE PART KIT 1 OIL TRANSFER PUMP MSP 150	CQSI343103
	Spare parts						SPARE PART KIT 11 WEIR SKIMMER LWS 1300 Mk II	CQSI343104
	Spare parts						SPARE PART KIT 1 FOR BRUSH ADAPTER	CQSI343105
	Power pack						1250 L OIL RESERVOIR LOCATED IN ENGINE ROOM	CQSI270201
	Power pack					90	ELECTRIC MOTOR 1500 rpm, U = 380 V / 50 Hz.	CQSI270001
Power pack					90	ELECTRIC MOTOR 1500 rpm, U = 380 V / 50 Hz.	CQSI270002	
Boom	Segment PVC	Lamor	LSP 1900	250.0			SINGLE POINT INFLATION	CQSA073801
	Segment PVC	Lamor	LSP 1900	250.0			SINGLE POINT INFLATION	CQSA073802
	Towing lines set						TOWING ROPE FOR LSP 1900	CQSA374201
	Towing lines set						TOWING ROPE FOR LSP 1900	CQSA374202
	Towing lines set						TOWING ROPE FOR LSP 1900	CQSA374203
	Towing lines set						TOWING ROPE FOR LSP 1900	CQSA374204
	Towing bridles set						TOWING BRIDLE FOR LSP 1900	CQSA370601
	Towing bridles set						TOWING BRIDLE FOR LSP 1900	CQSA370602
	Towing bridles set						TOWING BRIDLE FOR LSP 1900	CQSA370603

Boom	Towing bridles set					TOWING BRIDLE FOR LSP 1900	CQSA370604
	Towing bridles set					TOWING BRIDLE FOR LSP 1900	CQSA370605
	Towing bridles set					TOWING BRIDLE FOR LSP 1900	CQSA370606
	Towing bridles set					TOWING BRIDLE FOR LSP 1900	CQSA370607
	Towing bridles set					TOWING BRIDLE FOR LSP 1900	CQSA370608
	Towing bridles set					CROSS BRIDLE FOR LSP 1900	CQSA370609
	Spare parts					SPARE PART KIT FOR LSP 1900	CQSA343101
	Air hose(s)					4 x AIR SUPPORT HOSE 15 M, FOR LSP 1900 (between reel and boom)	CQSA053801
	Air hose(s)					4 x AIR HOSE 15 M, FOR LSP 1900 f (between compressor and boom)	CQSA053802
	Storage reel					HYDRAULIC BOOM REEL 10 M3 FOR LSP 1900	CQSA353401
	Storage reel					HYDRAULIC BOOM REEL 10 M3 FOR LSP 1900	CQSA353402
	Hydraulic hose(s)					SET FOR 10M3 BOOM REEL FOR LSP 1900	CQSA223801
	Air blower					AIR BLOWER HYDRAULIC, HC 4100 WITH FRAME	CQSA030009
	Air blower					AIR BLOWER HYDRAULIC, HC 4100 WITH FRAME	CQSA030010
	Power pack					HYDRAULIC POWER PACK, DIESEL LPP 35/L/38cc	CQSA270001
	Cover					CANVAS FOR HC 4100	CQSA120001
	Cover					CANVAS FOR HC 4100	CQSA120002
	Cover					CANVAS FOR LPP 35	CQSA120003
	Hydraulic hose(s)					SET FOR AIR COMPRESSOR HC 4100	CQSA223802
	Hydraulic hose(s)					SET FOR AIR COMPRESSOR HC 4100	CQSA223803
Air hose(s)					2 x AIR HOSE10 M FOR AIR COMPRESSOR HC 4100	CQSA053803	
Power pack spare parts					SPARE PART KIT FOR HYDRAULIC POWER PACK LPP 35/L/38cc	CQSA343102	
Slick detection	Computer	Miros				WAVEX/OSD WITH KEYBOARD AND TRACKER BALL,	CQSJ201001
	Monitor					19" FLAT PANEL DISPLAY	CQSJ202701
	Interface					NMEA INTERFACES TO GYRO, GPS, WIND SENSORS	CQSJ203701
	Video digitizer					MIROS RADAR INTERFACE UNIT EM -129 INTEGRATED VIDEO DIGITIZER	CQSJ202301
	Software					USER LICENSE FOR MIROS OSD SYSTEM SOFTWARE	CQSJ330001
	Radar					FURUNO FAR-2117 X-BAND	CQSJ203302
	Antenna					6,5' ANTENNA FOR RADAR	CQSJ200301
Cleaning	Cleaning machine					PORTABLE CLEANING SYSTEM	CQSB090001
Communication	VHF Portable					VHF AERIAL BAND	CQSC390001

5. Description of equipment

5.1 Lamor Power Reel and Umbilical Hose System for High Capacity Skimmer

Manufacturer:

Lamor Corporation Ab

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06450 Porvoo

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Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi

Year of purchase: 2013

5.1.1 Umbilical Hose Reel LUT 90, with Telescopic Crane Arm, Turntable and 20' Flat Rack

The telescopic crane arm is built according to NOFO standards. At max reach of 7.5 m it has a lifting capacity of 1.9 tons and a maximum lifting capacity of 3 tons is reached at 40° angle of the arm with reach of 5.8 m. The whole unit is built on 20' flat rack with turntable and the hose reel can be rotated 360°.

The Oil Transfer and Hydraulic hoses are connected to manifold at the hub of the reel with pump-through swivel joints to allow the hoses to be energized continuously and at any deployed length. Maximum reel rotation speed approximately 2.5 rpm.

The reel is powered by a hydraulic motor with hydraulically released brake. Hydraulic flow rate and pressure inlet regulators are included. Controls consist of forward/neutral/reverse, brake release, and counter balance valve.

The reel is furnished with one (1) 6" Stainless Steel rotary swivel mounted in the reel drum and one (1) Carbon steel rotary swivel with (1) 1-1/2" x (1) 1-1/4" x (1) 1/2" x (1) 3/8" hydraulic ports, mounted in the reel drum on the opposite side of the 6" Swivel.

The reel is equipped with 50 m 6" umbilical hose the weight of the total system is approx. 12,000 kg.

TECHNICAL SPECIFICATIONS

- Length: 8940 mm
- Width: 2700 mm
- Height: 3690 mm
- Light weight ca.: 10600 kg
- Capacity hose: 90 m
- Load at standard reach: 1900 kg
- Standard reach, total: 7,5 m
- Lifting capacity: @ 40deg. 3 tons
- Rotation: 360 deg
- Rotation torque: 40 kNm
- Hydraulic flow: 25 l/min

- Hydraulic pressure: 210 bar
- Power requirement: 15 kW
- Base: 20' flat rack

Fig.1 Umbilical Hose Reel LUT 90, with Telescopic Crane Arm



5.1.2 Umbilical Hose LUH 6 50, 90 Ch for LWS 1300 Mk II

The umbilical hose is 50 m long. The Oil Transfer and Hydraulic hoses are connected to manifold at the hub of the reel with pump through swivel joints to allow the hoses to be energized continuously and at any deployed length.

Minimum bend radius for the umbilical hose is 36" Nominal weight / meter is 27 kg (18.0 lbs./foot) with hoses empty, minimum reserve buoyancy 20 % with all working hoses filled, floatation material closed cell foam. High-grade Neoprene hose cover resistant to ageing, abrasion, weathering, sunlight, tearing, oil, and seawater permeation. Skimmer end of hose cover vulcanized to steel termination plate for waterproof seal. The Umbilical hose and its Handling Reel are engineered to permit safe lifting of the Skimmer using only the Umbilical hose.

TECHNICAL SPECIFICATIONS

- Length: 50 m
- Weight: (total operational) 27 kg/m
- Total weight: 1350 kg

Fig.2 Umbilical Hose LUH 6 50, 90 Ch for LWS 1300 Mk II



5.1.3 Oil Transfer Hose, Rigid Rubber OilRig 6" L-10m Camlock F/M

TECHNICAL SPECIFICATIONS

- Inner diameter: 150 mm
- Outer diameter; 176 mm
- Minimum thicknes: 13 mm
- Weight: 10500 g/m
- Bending radius: 750 mm
- Working pressure: 16 bar
- Length: 10 m

Fig.3 Oil Transfer Hose



5.1.4 Canvas for Umbilical Hose Reel

TECHNICAL SPECIFICATIONS

- Color: blue
- A4 side pocket
- 2 open corners
- rope in sleeve
- Lamor logos on both long sides

5.1.5 Radio Remote Control 3-5 for Skimmer Systems

Remote control system for oil recovery equipment 24V includes:

- 1 pc remote terminal MC-3-5
- 1 pc electric control terminal
- Base unit RX (6xproportional, 4/7xON/OFF, antenna Dipol)
- charger 230VAC and 24 VDC
- cable for emergency use if error with remote control 5 m
- DNV-Ex certificate

Controls:

1. On/Off Switch of the remote Control unit
2. Activate the operation by pressing START
3. Controls for skimmer thrusters/flow impellers
4. Speed controls for Brush Conveyors/Brush Wheels
5. Reverse direction for the Brush Conveyors/Brush Wheels
6. Speed control for Oil Transfer Pump
7. Reverse direction for the Transfer Pump
8. Deployment of the side sweep
9. Emergency stop

TECHNICAL SPECIFICATIONS

- Length: 340 mm
- Width: 220 mm
- Height: 220 mm
- Weight: 2.3 kg

Fig.4 Radio Remote Control 3-5 for Skimmer Systems



5.1.6 Radio Remote Receiver Box (non EX)

Fig.5 Radio Remote Receiver Box



5.2 Lamor Free Floating High Capacity Offshore Skimmer

Manufacturer:

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Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi

Year of purchase: 2013

5.2.1 Lamor Free Floating High Capacity Offshore Skimmer Weir module

The Lamor Free-Floating Offshore Weir Skimmer LWS 1300 Mk II is a very high capacity weir skimmer designed for off-shore oil recovery operations. It is equipped with a floating weir lip to separate and collect the oil into the hopper. The floating weir lip has separate small ballast weights that can be independently adjusted for perfect floatation even in difficult sea conditions. The LWS 1300 Mk II is a Weir skimmer frame. It can be used as a normal weir skimmer together with optional oil transfer pump, typically like Lamor GTA 140 or MSP 150. The LWS HTh is a hydraulically operated thruster set for the Lamor LWS Weir skimmer-range. The skimmers are fitted with two thrusters to allow the operator to manoeuvre the skimmer.

The weight increase of the thruster arrangement on top of the skimmer and pump weight is approx. 130 kg.

TECHNICAL SPECIFICATIONS

- Length: 2850 mm
- Width: 2590 mm
- Height: 1830 mm
- Diameter weir: 1300 mm
- Weight: 250 kg
- Draft: 1100 mm
- Design capacity: 250 m³/h
- Capacity, certified ASTM: 112,2 m³/h
- Capacity, certified: max 360 m³/h

Fig.6 Lamor Free Floating High Capacity Offshore Skimmer Weir module



5.2.2 Lamor Free Floating High Capacity Offshore Skimmer LWS 1300 Mk II / MSP150 Brush Adapter

The skimmer can also be equipped with hydraulically operated Brush Adapter to increase the skimmers ability to collect medium to high viscous oils.

The Lamor Brush Adapter LBA 1300 Mk II is a brush-type oil recovery module designed to fit quickly and easily onto the hopper of the Off-Shore Weir Skimmer Lamor LWS 1300 Mk II. The purpose of the device is to improve the overall recovery efficiency (reduce free water recovered with oil) and to improve the performance in very high viscosity oils.

The three LBA brush banks are mounted within a sturdy aluminum frame with a center-lifting eye. The brushes are driven by two hydraulic motors, which are powered by a single hydraulic circuit. The LBA can be easily installed on the Lamor LWS 1300 skimmer hopper in place of the fluid oil adapter and is secured with stainless steel clamps.

TECHNICAL SPECIFICATIONS

- Length: 2050 mm
- Width: 1800 mm
- Height: 570 mm
- Weight: 220 kg
- Design capacity: 3x60 m³/h
- Capacity, certified ASTM: 3x74 m³/h
- Free water collected: < 5 %
- Hydraulic flow (skimmer ONLY): 20 l/min
- Hydraulic pressure: 170-200 bar
- Power requirement: 6.5 kW

Fig.7 Brush Adapter



5.2.3 Canvas for Brush Adapter LBA for Weir Skimmer LWS 1300 Mk II

Canvas cover for LBA 1300 Mk II, black/blue with yellow Lamor-logo. 900gsm fabric with A4 document pocket.

TECHNICAL SPECIFICATIONS

- Length: 2100 mm
- Width: 1805 mm
- Height: 575 mm

5.2.4 Oil Transfer Pump GT A 140 PDAS

The Lamor GT A 140 pump is a multi-purpose submersible Archimedes screw pump with a pumping capacity of 140 m³/h. This pump has been designed for use in skimmers and transfer or offloading pump applications and is able to pump a wide range of liquids ranging from water to the heaviest debris-laden viscous oils.

The GT A 140 pump can deliver a maximum of 12 bar outlet pressure, benefits from water/steam annular injection on the inlet as standard and debris cutting knife to handle solids such as seaweed, plastics and ropes.

Standard hydraulic connectors:

Pressure 3/4" TEMA 7511 (female)

Return 1" TEMA 10021 (male)

Drain 3/8" Aeroquip (male)

Standard discharge outlet: 5" Camlock, male

TECHNICAL SPECIFICATIONS

- Length: 500 mm
- Width: 300 mm
- Height: 598 mm
- Weight: 71 kg
- Pump capacity: 140 m³/h
- Discharge pressure: 12 bar
- Hydraulic flow: 160 max l/min
- Hydraulic pressure: 210 max bar
- Power requirement; 56 max kW

Fig.8 Oil Transfer Pump GT A 140 PDAS



5.2.5 Water Injection Kit ¾" GT A 140 inlet

The GT A PDAS pumps are equipped with a Water Injection Flange (AWIF). The hot/cold water AWIF significantly increases the pump's ability to deal with high and extreme viscosity oil. The injection flange facilitates the in-flow of very viscous products and the injected water reduces friction inside the pump and in the discharge line.

Each pump is manufactured with a plugged water injection port on the inlet side.

5.2.6 Canvas for Weir Skimmer LWS 1300 Mk II

Canvas cover for LWS 1300 Mk II, black/blue with yellow Lamor-logo. 900 gsm fabric with A4 document pocket.

5.2.7 Remote Controlled Hydraulic Valve Block integrated in LUT 90

Fig.9 Remote Controlled Hydraulic Valve Block integrated in LUT 90



5.2.8 Centrifugal Oil transfer pump with SS impeller MSP 150 for Umbilical Hose

Manufacturer

Mariflex Group

Maassluissedijk 101,
3133 KA Vlaardingen.

The Netherlands.

Phone: +31 10 - 434 44 45

Fax: +31 10 - 232 95 00
E-mail: info@mariflex.net
<http://mariflexgroup.com/>

Year of purchase: 2013

The Oil Transfer Pump MSP 150 is a high capacity unit that has been designed for efficient handling of viscous liquids, bulky solids and shear-sensitive liquids. The Lamor MSP 150 centrifugal-screw pump is driven by a built-on axial hydraulic motor that provides a powerful suction and a high discharge pressure. It is suitable for operation in hazardous areas.

Both the stainless steel centrifugal-screw and brass drive flange are bolted and keyed onto the hydraulic motor shaft respectively, with the drive flange transmitting power to the centrifugal screw via a lock pin. Hydraulic oil flows into the motor through the flexible extension hose and circulates through via a separate hydraulic return hose. The pumps hydraulic connection is fitted with a non-return valve to permit free rotation of the pump when there is no hydraulic supply.

Standard connectors:

hydraulic: pressure 3/4" Tema 7511

return 1" Tema 10021

discharge: Camlock 6" male

TECHNICAL SPECIFICATIONS

- Length 490 mm
- Width 490 mm
- Height 610 mm
- Weight 83 kg
- Pump capacity 350 (@4 bar) m³/h
- Discharge pressure 6 (bar) bar
- Hydraulic pressure 200 bar
- Hydraulic flow 130 l/min
- Power requirement 50 kW

Fig.10 Mariflex Centrifugal Pump MSP150



5.3 Spare parts For high capacity skimmer system

Manufacturer:

Lamor Corporation Ab

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Year of purchase: 2013

5.3.1 Repair Kit rubber adhesive, for Umbilical Hose LUH

This minor repair kit is for small repairs and cosmetic patching of the umbilical rubber hose.

Contents of the minor Repair Kit for the Umbilical Hose Rubber Adhesive:

- 305 x 305 x 3.2 mm thick
- (12" x 12" x 1/8" thick) rubber sheet;
- 0.5 kg (1 lb) rubber putty adhesive compound kit;
- 0.1 kg (4 oz.) primer for rubber putty.

5.3.2. Spare part kit 1 Oil Transfer Pump GT A 115/140

The Lamor spare parts kit includes all necessary items for field repair and maintenance.

The parts included comprise:

- 9 Plate wheel sealing disc for GT A 115/140 03B03-A115-A401-B
- 1 Screw sealing ring for GT A 115/140 03B03-A115-A301-B
- 1 Hardened bushing for GT A 115/140 03B03-A115-A501-B
- 2 Sealing ring OmniSeal 23930 X1200 0331 C2-203914
- 1 Plate wheel wear ring for GT A 115/140 03B03-A115-A601-B
- 2 Plate wheel side wear plate for GT A 115/140 03B03-A115-A407-C
- 1 Plate wheel plain bearing for GT A 115/140 03B03-A115-A404-B
- 1 Grease nipple M6x1 AISI 304 C2-205950
- 2 Plate wheel slide bearing for GT A 115/140 03B03-A115-A405-B
- 2 Shaft oil sealing ring BABSL 55x72x7 FKM C2-205997
- 2 Shaft oil sealing ring BABSL 60x80x7 FKM C2-205998
- 1 V-sealing ring VITON VA-110 C2-205999
- 1 Shaft sealing ring ECOTAL A13_55x73x2 C2-206000
- 1 Lock nut DIN 934 M30 C2-206001
- 1 O-ring, plate wheel shaft NBR 24.2x3 C2-205979
- 1 O-ring, plate wheel shaft NBR 32.2x3 C2-205981
- 9 Hexagonal socket head screw HEX_SOC_M5X6-DIN912 C2-205984
- 1 O-ring, motor NBR 129.5x3 C2-206003
- 1 O-ring, motor NBR 124.5x3 C2-204010
- 1 O-ring, outlet NBR 132x3 C2-206005
- 1 O-ring, cover NBR 250x3 C2-206011
- 3 Hexagonal socket head screw HEX_SOC_M6X12-DIN912 C2-205996

- 1 Cutting edge for GT A 115/140 03B03-A115-A207-B
- 2 Heli-Coil 6mm, length 9mm C2-205967
- 2 Heli-Coil 8mm, length 12mm C2-205968
- 1 Hydraulic connector TEMA 7516 cap 3/4" C2-201054
- 1 Hydraulic connector TEMA 10026 cap 1" C2-201056
- 1 Hydraulic connector Aeroquip 3/8" C26914-06 cap C2-203946

5.3.3 Spare part kit 1 Oil Transfer Pump MSP 150

The Lamor spare parts kit includes all necessary items for field repair and maintenance.

5.3.4 Spare Part kit 1 Weir Skimmer LWS 1300 Mk II

1pc Bellows LWS 1300 Mk II C1-205815

1pc Locking band for bellows LWS 1300 Mk II C1-206395

5.3.5 Spare Part Kit 1 for Brush Adapter for Weir Skimmer LWS 1300 Mk II, LBA 1300 Mk II SS TEMAs

The Lamor spare parts kit includes all necessary items for field repair and maintenance

5.4 Hydraulic Power Pack Block Electric, LPP 2x90

Manufacturer:

Lamor Corporation Ab

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Fax: +358 (0)207 650 129

Email: info@lamor.fi, Website: www.lamor.fi

Year of purchase: 2013

The LPP 2x90 E Lamor Power Pack features a joint frame and a joint hydraulic oil tank. The hydraulic units can be used with cross connection for Starboard or Port side. The power unit is based on 1250 liter oil reservoir pump/motor base and motor starter units. There is a dip tray for protection against oil leakage. The reservoir, pump base and motor starters can be separated for transportation. All necessary hoses and other related equipment for connecting reservoir, pumps, motor starters and electrical components of power unit are included.

Connections:

- pressure 2 x SAE 1.1/2" Code 62
- LS-signals 2 x UNF13/16-12 ORFS male for 12 mm tube
- return lines 2 x SAE 1.1/2" Code 61
- DR-line UNF 1-14 ORFS male for 14-16 mm tube

- water 2 x G1”.

With attached filtration system, ISO cleanliness class 17/15/12 will be achieved.

The power unit consists of following main components:

- 2 pcs electric motors 90 kW / 1500 rpm, U = 380 V / 50 Hz. The motors are equipped with standstill heating and thermistors.
- 2 pcs variable piston pumps, Parker PV180R1K1T1NZCC. $Q_{max} = 255$ l/min, $p_{max} = 210$ bar. The pumps are equipped with load sensing compensator with adjustable maximum pressure compensation and maximum input power limitation, $P_{max} = 90$ kW / 1500 rpm
- 2 pcs gear pumps attached to main pumps for filtering and cooling, $Q = 75$ l/min
- 2 pcs pressure relief valves, Parker R5V10 695, The valves are set to 240 bar
- 2 pcs pressure filters, Parker 70L405BT1KG241
- 2 pcs special manifolds including a large check valve and SAE 1.1/2”, code 62 shut off valve
- 4 pcs necessary shut off valves to connect pumps crosswise
- a special check valve manifold for connecting gear pumps to a seawater/oil cooler, the manifold includes also a pressure relief valve for cooling circuit and a shut off valve for oil filling
- a low pressure filter, Parker TTF1005QLBS1EG24
- an oil/seawater cooler Raja-Lovejoy BNZ-125-1225. Cooling capacity, when oil inlet temperature is 65 °C, seawater inlet temperature is 30 °C and water flow 4,5 m³/ h, is 66,7 kW
- a thermostat valve for water flow control, water circuit includes a water strainer
- a level switch
- a temperature switch for high oil temperature
- necessary equipment for pressure and temperature measuring
- 2 pcs oil level gauges
- 2 pcs air filters, Parker EAB20C015HC73-A
- 2 pcs motors starter units including following equipment:
 - main switches and emergency stop button
 - Parker 650VF/900 inverter drive, starting current of 90 kW motor will be less than 50 A
 - start and stop buttons
 - warning lights for low oil level, high oil temperature and filter clogging
 - a contact that is closed when motor is running
 - a general alarm contact which closes if : motor stopped, low oil level, high oil temperature or if a filter element needs to be replaced

TECHNICAL SPECIFICATIONS

- Length: 2230 mm
- Width: 2000 mm
- Height: 1920 mm
- Weight,dry: Approx 2500kg
- Hydraulic flow: Each 255 l/min
- Hydraulic pressure: 210 bar
- Power Each: 90 kW
- Oil tank capacity: 1250 l
- Speed: 1500 rpm
- Electrical supply: 400 (50/60Hz) AC

Fig.11 Power pack frame and electric motors 2 x 90kW



Fig.12 Hydraulic oil tank



5.5 Lamor Single Point Inflatable Offshore Oil Boom

Manufacturer:

Lamor Corporation Ab

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Fax: +358 (0)207 650 129
Email: info@lamor.fi, Website: www.lamor.fi

Year of purchase: 2013

The Lamor Single Point Inflation Offshore Boom LSP 1900 is manufactured as a continuous tube, 250 meters long and has been designed for quick response with the minimum of manpower requirements. The boom is stored on reels and can be deployed by one operator, which increase significantly the crew safety. In order to prevent the air from evacuating through a possible hole in the freeboard, the booms length is divided. This is done by using PVC fabric which is welded to the inside of the freeboard to form partition walls. These walls close off each chamber when the booms is floating, and also serve to drain water from the freeboard chambers during recovery.

The boom inflates automatically and up to 500 m can be deployed in less than 20 minutes. Storage volume of LSP 1900 is approx 10 m³/250 m.

5.5.1 Lamor Single Point Inflation Offshore Oil Boom LSP 1900 – PVC segment

TECHNICAL SPECIFICATIONS

- Section length: 50 m
- Freeboard: 853 mm
- Draft: 1063 mm
- Total height: 1916 mm
- Weight (total operational): 20 kg/m
- Ballast weight: 3 kg/m
- Combined tensile strength: 50 kN
- Working temp. range: -30 + 80 °C
- Base fabric: PVC
- Coating: PVC
- Buoyancy/Weight ratio: 30:1
- Efficient in waves: 5 m
- Inflation pressure: 6 bar

Fig.13 Lamor Single Point Inflation Offshore Oil Boom LSP 1900 – PVC segment



5.5.2 Towing Ropes for LSP 1900

The Towing Set includes all necessary parts for effective and safe deployment of the booms. All towing sets come complete with connectors, shackles, rope and buoy.

5.5.3 Towing Bridles for LSP 1900

5.5.4 Cross Bridle for LSP Booms

The LSP booms is equipped with a cross bridle that can be mounted on the boom to give it desirable shape if it is to be towed in a J-formation. The cross bridle towline allows boom to form a straight line 90 degree angle from reel/vessel to form the J- or U-sweep. The Cross bridle is used so that distance between boom and ship can be controlled

5.5.5 Spare part kit for LSP Booms

Components include all necessary items to effect field repair of damaged Single Point Inflation oil booms.

5.5.6 Air support hose 15 m, for LSP Booms (between reel and boom)

Ivalo IVA038 Air hose for the hydraulic compressor 1,5", Length-15m.

5.5.7 Air hose 15 m, for LSP Booms (between compressor and boom)

Ivalo IVA038 Air hose for the hydraulic compressor 1,5", Length-15m.

5.5.8 Hydraulic Boom Reel 10 m³ for LSP Booms

The Lamor Hydraulic operated Storage Reel for LSP Booms is designed to store up to 250m length of Lamor Single Point Inflation Offshore Boom LSP 1900. The reel frame is manufactured in steel and the spool in marine grade aluminum. The winder frame comprises fork lift channels and 4-point lifting points as standard for easy handling both on and offshore. Marine twist locks and container corner guides can be fitted as desired. The Lamor Storage Reel is driven by 2 high torque hydraulic motors, together with planetary reduction gears with high gear ratio. It is operated by a hydraulic power pack such as Lamor LPP 14, 16 or 19 kW which allows easy deployment and recovery using minimal manpower. The power required is dependent on the boom length, size and weight stored on the reel. Standard hydraulic connectors: 3/8" TEMA 3811/3821 & Aeroquip.

TECHNICAL SPECIFICATIONS

- Base frame dimensions (footprint): 3340 x 2030 mm.

Fig.14 Hydraulic Boom Reel 10 m³



5.5.9 Hydraulic Hose Set for 10m³ Boom Reel for LSP Boom, SS TEMA & Aeroquip

5.5.10 Air Compressor Hydraulic, HC 4100 with frame

The Lamor Hydraulic Compressor 4100 produces an effective high flow up to 8 bars pressure. The system is designed to run from a standard Lamor Diesel Hydraulic Power Pack and comes complete with all necessary hydraulic and air filling hoses. The compressor uses the rotary vane block principal with a cooled lubrication system, oil separator and relief valve on the air intake. The system has been designed to provide continuous operation with low noise emissions. Pressure switch and off-load valve are included.

TECHNICAL SPECIFICATIONS

- Length: 980 mm
- Width: 630 mm
- Height: 980 mm
- Weight: 285 kg
- Capacity: 4100 l/min
- Pressure: 8 bar
- Hydraulic flow, nominal: 113 l/min
- Hydraulic pressure: 200 bar
- Power requirement: max 38 kW
- Noise level: 99,98 dBA

Fig.15 Air Compressor Hydraulic, HC 4100 with frame



5.5.11 Hydraulic Power Pack, Diesel Driven LPP 35 L/38cc

The Lamor Power Pack LPP 35L/38cc is powered by a 4 cylinder, water cooled Lombardini 35 kW diesel engine and serves as a multipurpose power pack designed for the flexible operation of many types of hydraulically operated oil spill clean-up equipment e.g. a skimmer and oil transfer pump consecutively.

The Lamor LPP 35L is containerized within a steel frame designed to ensure a good circulation for the water cooled diesel engine. The LPP 35L is equipped with electric start and incorporates an easily accessible control panel and hydraulic oil cooler into the framework. The Lamor LPP 35L utilizes a Sauer-Danfoss Proportional Hydraulic Valve System. For safety the hydraulic pump is equipped with an automatic shut-down system.

Standard hydraulic circuits: 2 pcs + drain

- 25 l/min (6,6 gal/min) 3/8" TEMA 3811 (female/return), 3821 (male/pressure)
- 65 l/min (17.2 gal/min) 1" TEMA 10011 (female/return), 3/4" TEMA 7521(male/pressure)
- Drain: Aeroquip 3/8" FEMALE

TECHNICAL SPECIFICATIONS

- Length: 1330 mm
- Width: 800 mm
- Height: 1000 mm
- Weight; 570 kg
- Hydraulic circuits: 2 pcs
- Hydraulic flow: 110 l/min
- Hydraulic pressure: 180 bar

- Power: 35 kW
- Hydraulic oil tank capacity: 70 l
- Fuel tank capacity: 25 l
- Speed: max. 2800 rpm

Fig.16 Hydraulic Power Pack, Diesel Driven LPP 35 L/38cc



5.5.12 Canvas for LPP 35 and HC 4100

TECHNICAL SPECIFICATIONS

- Color: Blue (optionally black)
- A4 side pocket
- 2 open corners
- Rope in sleeve

5.5.13 Hydraulic hose set for Hydraulic Air Compressors HC

5.5.14 Air hose 10 m, for Hydraulic Air Compressors HC

Ivalo IVA038 Air hose for the hydraulic compressor 1,5", Length:10m.

5.5.15 Spare part kit SPK 1 for Hydraulic Power Pack, Diesel driven LPP 35 L

The Lamor spare parts kit includes all necessary items for field repair and maintenance.

The parts included comprise:

- 2 pcs Air Filter
- 2 pcs Fuel Filter
- 4 pcs Oil Filter
- 1 pc Complete Gasket set
- 2 pcs Alternator Drive Belt
- 2 pcs Water Pump Drive Belt
- 2 pcs Danfoss PGV repair kit
- 2 pcs Rubber Feet for Power pack
- 1 pc 1" Male TEMA fitting
- 1 pc 1" Female TEMA fitting
- 1 pc 1" Male TEMA dust cap
- 1 pc 1" Female TEMA dust cap

5.6 Oil Slick Detection System MIROS

Manufacturer:

MIROS AS

Solbraveien 20

NO-1383 Asker, Norway

Telephone +47 66 98 75 00

Fax: +47 66 90 41 70

E-mail: office@miros.no

Year of purchase: 2013

The Miros oil slick detection (OSD) system is a ship borne remote sensing system for oil spill detection and surveillance. It processes radar images from an X-band navigation radar to give real time oil spill surveillance data. Onboard an oil recovery vessel, the system provides continuous oil spill detection during emergency response operations.

MIROS Oil Slick Detection System consists of:

- Miros Wavex Computer
- 19" flat panel display with keyboard and tracker ball
- NMEA Interfaces to Gyro GPS & Wind Sensor
- Wavex EM-129 Radar Video Digitizer
- Radar Furuno FAR-2117 X band
- Radar antenna

5.6.1 Miros Wavex Computer

This computer is a dedicated, type approved maritime computer with a built-in Miros Wavex Special Purpose Radar Data Acquisition Board.

The complete set of software that is required in order to use the hardware as a fully functional Wave Extractor system is pre-installed and consists (mainly) of the following:

- Microsoft Windows XP Operating system;

- Wavex version 5 system software;
- Custom applications.

Fig.17 Miros Wavex Computer



5.6.2 19" flat panel display with keyboard and tracker ball

Fig.18 19" flat panel display with keyboard and tracker ball



5.6.3 NMEA Interface unit to Gyro GPS & Wind Sensor

The SM-134 Interface Unit consists of a 4-channel RS422 serial to IP Interface, a LAN switch, power supply and terminal blocks. It is powered by 100 – 240 VAC through a 6 A fuse/ switch. The four RS-422 Interfaces are typically used for:

- Vessel track and time, typically NMEA-0183 VTG and ZDA from a GPS;
- Wind speed and direction, typically NMEA-0183 MWV from a wind sensor;
- Wavex data output, Miros generic NMEA format.
- Heading information, typically NMEA-0183 HDT sentence from a gyro.

The internal LAN switch is connected to the SM-135 Wavex Computer, the EM-129 Integrated Video Digitizer, as well as the internal serial line converter. The built in power supply may also power the optional Wind Sensor and GPS, if these are delivered as part of the Wavex delivery.

Fig.19 Radar interface Unit



5.6.4 Wavex EM-129 Radar Video Digitizer

The Miros EM-129 Integrated Video Digitizer is designed for the Miros Wavex Wave Monitoring and Oil Spill Detection (OSD) systems. It comprises a radar interface board and a powerful radar image processing board.

Fig.20. EM-129 Radar Video Digitizer



5.6.5 Radar Furuno Far-2177 X-Band

5.6.6 Radar antenna

5.7 Portable cleaning machine

Year of purchase: 2013

Fig.21 Portable claning machine



5.8 VHF aerial band

Year of purchase: 2013

Fig.22 VHF aerial band

