JBF ENVIRONMENTAL TECHNOLOGY
Division of SLICKBAR PRODUCTS CORPORATION

JBF DIP500 VOSS

OFF- SHORE/COASTAL

HIGH SPEED VESSEL OF OPPORTUNITY SKIMMING SYSTEM

28 April 2004

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TECHNICAL SPECIFICATIONS

DIP500 HS VOSS

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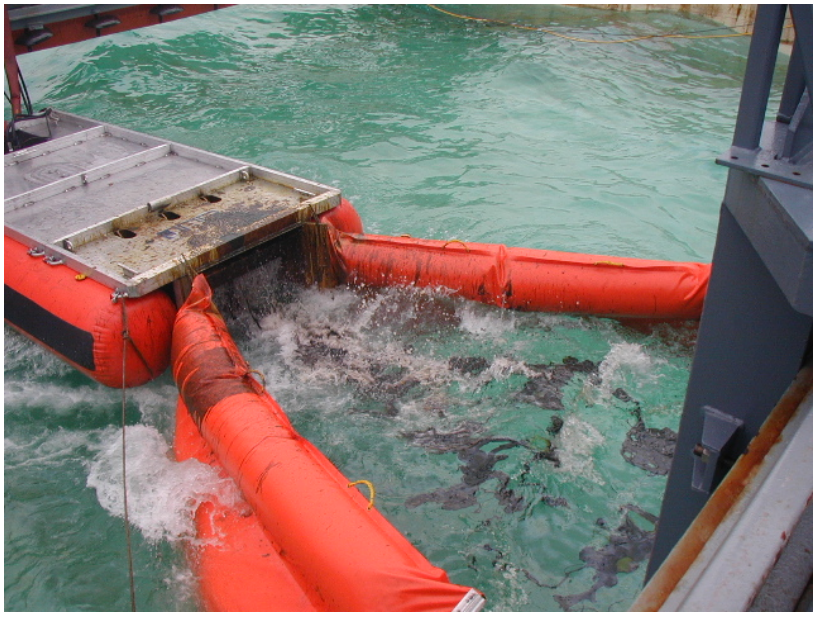
SUMMARY

The purpose of this proposal is to describe JBF's High Speed Vessel of Opportunity Skimming System or (HS VOSS) unit containing a model DIP500 oil recovery module, side sweep rigging system, oil transfer pumps, and hydraulic power supply.

The JBF DIP500 skimming system enables the conversion of an existing vessel of opportunity into an advancing oil recovery vessel. The unique design of the DIP500 skimmer allows simple air transport to the spill site. The DIP500 incorporates independent flotation which enables the skimmer to operate in waves independent of the vessel of opportunity. Additional sweep width can be obtained using JBF's extended sweep system or by use of additional containment boom and a second tow vessel. The skimming module incorporates either one or two positive displacement screw pumps for transfer of recovered oil to storage tanks. Full details, including equipment, training, testing and spare parts are included in the proposal.

A formal quotation for the complete DIP500 VOSS system components with various options will be provided upon request. The system can be provided in a variety of configurations to adapt to a particular vessel.



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I INTRODUCTION

The DIP500 oil recovery system is unique, in that the collection process separates oil from the water at high oil recovery and throughput efficiencies. This allows the skimmer's transfer pump to transfer primarily water free oil to the vessels on board storage tank or to barges or storage bladders in tow.

The rugged DIP500 module and the high speed sweeping system are designed to operate efficiently at skimming speed of 1-5 knots. In addition, the DIP500 system can be towed by the vessel while deployed in transit at 7-8 knots.

The DIP500 skimmer is designed to operate at high efficiencies even in adverse conditions, such as waves, wind, thin sheens, etc. The DIP500 skimmer enables the operator to collect oil at the encounter rate during a spill. The maximum oil recovery capacity of the DIP500 skimming system is 150 tons/hour.

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II GENERAL DESCRIPTION

A. COMPONENTS

The proposed DIP500 VOSS consists of the DIP500 Module, transfer pumps, and V-sweep boom system. The hydraulic power supply will be supplied by barge. The VOSS with the rigid V-sweep system operates at skimming speeds of up to 5 knots using only four mooring lines.

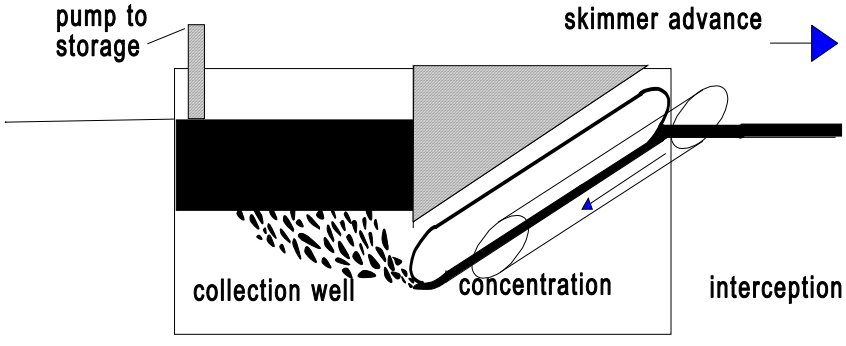
The skimming system is deployed over the side, from an available vessel (like the barge) by use of a crane or davit. By the combination of the DIP500 skimming system and a recovered oil storage tank, the vessel of opportunity can operate as an efficient, high speed, advancing skimmer.

The skimming system can also be used in conjunction with additional, available containment boom and additional tow boats, to further increase the sweep width of the system. For example, sections of additional boom could be deployed in a large "V" configuration towed by two boats, or a “J” configuration by one boat, to funnel oil directly to the skimmer’s entrance. Use of the additional V-sweep, as above, can provide practical sweep widths of up to 300 feet (91 m).

B. THE OIL RECOVERY METHOD

The oil recovery method incorporated into the 500 VOSS unit is described below.

DYNAMIC INCLINED PLANE



The oil/water layer is redirected down the moving plane assembly to the collection well. In the collection well the bouyant forces of the oil cause it to rise to the surface. The deep layer of separated oil is then pumped to storage.

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The skimming system collects oil and solids under water using the Dynamic Inclined Plane (DIP) method. The oil and solids are taken down a moving inclined plane that is formed by an endless belt that moves in the same direction and speed as the skimmer or current. There is no relative velocity between the oil and solids on the belt, the moving belt itself, and the adjacent water. At the bottom of the belt, buoyant forces (specific gravity differences) cause the oil and solids to surface in the collection well displacing water out the bottom. The bottom of the skimmer is open and has free contact with the sea, river, or body of water. A deep pocket of oil forms at the top of the collection well. The virtually water-free oil is then pumped from the top of the collection well to storage tanks using a transfer pump.

The DIP method has been tested extensively and has shown it to be one of the most efficient and durable belt type skimmer systems available. The numerous controlled tests were performed by the US Environmental Protection Agency, Environment Canada, the US Navy and the US Coast Guard. The results of these tests are available in various U.S. Government publications through National Technical Information Service (NTIS) or directly through JBF.

III DIP500 OIL RECOVERY MODULE

The oil recovery module consists of a moving plane assembly and collection well that funnels the separated oil and smaller solids to the suction of either a single or two transfer pumps.

The waterline of the DIP500 VOSS is set to flood the intake to the transfer pumps so that heavy viscous oils can be easily transferred to storage.

A. MOVING PLANE ASSEMBLY

The moving plane assembly is located forward in the DIP500 HS VOSS Module. The assembly consists of a hydraulic motor, two roller subassemblies, bearing assemblies and brackets, and the belt. Belt tension is adjustable, as is the speed of the belt. The belt material is polyvinyl chloride. The JBF DIP belt system is unique in that it does not require replacement after normal use. These belts have been operating in over 200 JBF skimmers for the past 30 years. JBF customer's with weekly use, report that the belt's average life is over 10 years. This is in contrast to the various oleophilic type skimmers which require constant replacement during each use.

B. OIL TRANSFER PUMP

The DIP500 HS VOSS unit utilizes a DESMI heavy duty submersible modified Archimedes Screw Pump, Model DOP 250, to pump recovered oil and emulsions from the collection well to storage. A second pump can be added to increase the recovery capacity of the DIP500 skimmer. The DOP250 handles light, medium and extremely viscous liquids of up to 1,000,000 centistokes. The pump can operate at very slow speeds which allows

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it to transfer high viscosity oils without emulsification. Each pump can lift 24 feet (7.3 m), has a maximum capacity of 440 gallons per minute (100 tons/hour) and a maximum discharge pressure of 150 psi.

The DESMI DOP 250 or the GTA-50 Pump has been shown to be capable of handling cans, bottles, dead birds, and seaweed, line and plastic bags. The cutting knives can cut wooden sticks up to 1.5 inches (3.8 cm) diameter. Stones and other solids less than 2 inches (5 cm) will pass through the pump. If an object jams in the cutting knives or screw, reversing the pump will dislodge it. The pump casing is constructed of aluminum and the screw is constructed of stainless steel, with polyethylene sealing discs and heavy duty bearings.
(Full pump specifications can be found in the Attachments.)

C. HYDRAULIC REQUIREMENTS

The DIP500 requires hydraulic power to drive the transfer pumps and the moving plane assembly. Separate hydraulic motors are needed to drive each of the systems on the Model DIP500. One motor requiring 8 gpm (30 L/min) at 2000 psi (max) is needed to drive the belt assembly. Each transfer pump motor requires 22 to 42 gpm (83 to 158 L/min) at 2000 psi (max) to drive the DESMI DOP 250 or GTA-50 pump/cutter unit.

IV HYDRAULIC POWER SUPPLY

The DIP500 skimmer and transfer pump will be hydraulically driven by a portable hydraulic power supply from the barge. The power supply consists of a diesel drive engine, hydraulic pump, controls, and complete lift frame/enclosure. The JBF Hydraulic Power Supply supplies all required hydraulics to operate the skimming system and pumps. The power supply will include (supplied by JBF) flow controls to control the speed and direction of the belt and pumps.

If the vessel of opportunity utilized for deployment has available hydraulic power, JBF can supply a control stand with the required skimmer and pump controls that will interface the vessel's hydraulic power to the skimming system.

V FLOTATION AND RIGGING

The proposal offers inflatable flotation for the DIP500 VOSS system. The use of inflatable flotation enables the DIP500 to be and stored in a smaller space, than its deployed size. The DIP500 skimming module requires only 15 minutes to deploy from its stowed position.

A. INFLATABLE FLOTATION/FENDERING SYSTEM

The DIP500 HS VOSS is supplied with four detachable, inflatable floats that provide the primary flotation. Each pontoon is 10' (3.0 m) long and 30" (76 cm) in diameter. Air chambers in each float are inflated through type Munson valve.

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The standard inflatable flotation also functions as a fendering system for the skimmer module, for protection of the unit against the side of the vessel of opportunity.

B. EXTENDED V-SWEEP SYSTEM

The DIP500 VOSS can provide an extended sweep width by the use of JBF's Extended V-Sweep System. The system extends the sweep width to 28 feet by the use of an aluminum outrigger/float assembly and two 10 foot and two 30 foot sections of containment boom. The containment boom is deployed to provide a small angle, v-sweep configuration of deflection boom. The containment boom, with ASTM connectors, attaches directly to the mouth of the DIP500 module using universal C Slide connectors. The outrigger arm is attached to the hull of the support vessel using a universal joint goose neck system. Use of a hinge pin, enables the arm to be quickly attached to the vessel hull during deployment. The containment boom uses towing bridles and tow lines attached to the front of each the boom sections of the sweep.

VI STOWAGE AND HANDLING

The DIP500 HS VOSS is designed to be used with any vessel of opportunity which has adequate length, deck space, and deck crane capacity. Dimensions of the equipment and weights are listed below.

	Length	Width	Height	Weight
500 VOSS Stowed	15 ft. 9 in.	3 ft. 6 in.	6 ft. 0 in.	3300 lbs
500 VOSS Deployed	15 ft. 9 in.	4 ft. 6 in.	6 ft. 0 in.	3300 lbs

Additional equipment is provided with the skimmer which enables proper rigging of the unit to the vessel of opportunity.

This equipment includes:

1. Lifting Bridle for the VOSS Unit.
2. Cargo Hose, Skimmer to Storage.
3. Hydraulic Hoses, Skimmer to Hydraulic Power Pack.
4. Hydraulic Hoses, Pump to Hydraulic Power Pack.
5. Mooring Lines.

VII RELIABILITY AND MAINTAINABILITY

JBF designs, builds and tests all its equipment to highest quality standards. All systems such as hydraulic, electrical and pumping systems utilize the best components and design techniques obtained through over twenty seven years of experience.

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Experience with over 250 JBF skimming systems has shown our equipment to be very reliable and enduring. Users report years of operations with the JBF skimmers, including the belt systems, with virtually no problems with hydraulic or cargo handling systems. Good preventative maintenance procedures can extend the life of our skimmer systems to over 15 years. Currently, there are more than 50 JBF Harbor Skimmers in the US Navy that are over 25 years old, in continuous daily operation.

VIII TRAINING AND LOGISTIC SUPPORT

JBF will provide a training program for the DIP500 VOSS. A training engineer will provide hands on training for the VOSS units and classroom training with the use of visual aids (slides & video tapes.) Copies of these training slides and video tapes can be provided to the customer for future refresher courses.

Technical manuals, parts support and corrective maintenance assistance are provided by JBF. An experienced staff of engineers, naval architects and marine professionals are available to trouble shoot problems and provide maintenance support.

JBF facilities are located in Seymour, Connecticut, USA.

IX TEST AND EVALUATION

The DIP500 VOSS has been fully tested and evaluated at sea for typical skimming operations and maneuvers. Additional testing can be conducted in the presence of customer representatives, if required. Tests will be conducted off the coast of Maine, near our manufacturing facility. All production units are factory tested for proper operation and performance.

X DOCUMENTATION

Two (2) copies of the technical manuals, in the English language will be provided per unit. Manuals will be printed single side, with heavyweight covers, and GBC or equivalent binding.

The Manual will contain a complete description of operation, oil handling, retrieval, stowage and transport of the unit. It will also contain a complete description of all equipment that comprises the unit with procedures for operation of the individual equipment. It will contain schematic drawings of the systems, manufacturer's manuals, and preventive maintenance schedules.

Manuals will also include breakdowns of all constituent parts including detailed assembly drawings and parts lists of all major components and systems.

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XI SPARE PARTS

Due to the rugged design of the VOSS unit, no field spare parts are required for normal operation or for start-up. However, a suggested spare parts list for two years of operation of each VOSS is listed below:

ITEM	QTY
1. DIP Belt	1
2. Belt Hinge Pin	4
3. Hydraulic Hoses, Pump	1 Set
4. Hydraulic Hoses, Skimmer	1 Set
5. Flotation, Bladder	2
6. Linch Pins	10
7. Flotation, Valves	4
8. Pump Kit, DESMI or GTA (level 1)	1 kit

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