



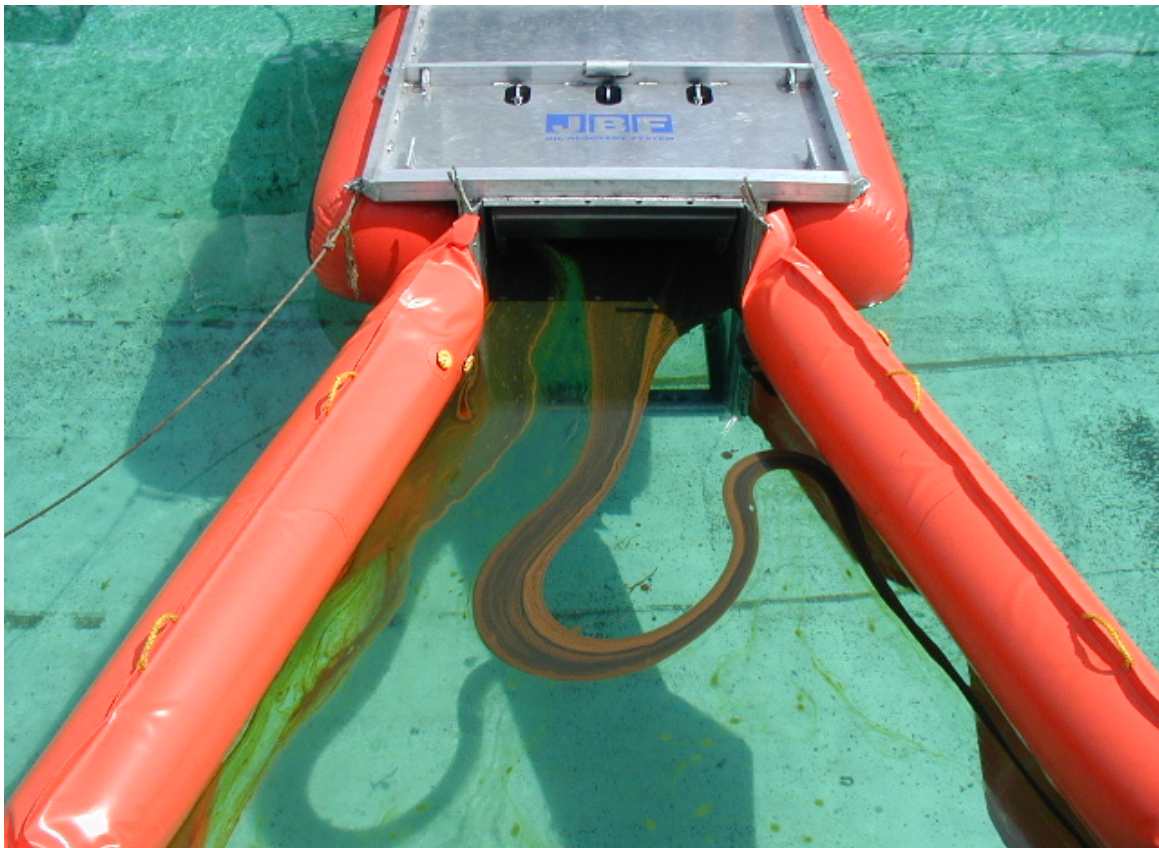
**ENVIRONMENTAL
TECHNOLOGY**

Division of SLICKBAR PRODUCTS CORPORATION

JBF DIP 500

SKIMMING SYSTEM

OPERATION AND MAINTENANCE MANUAL



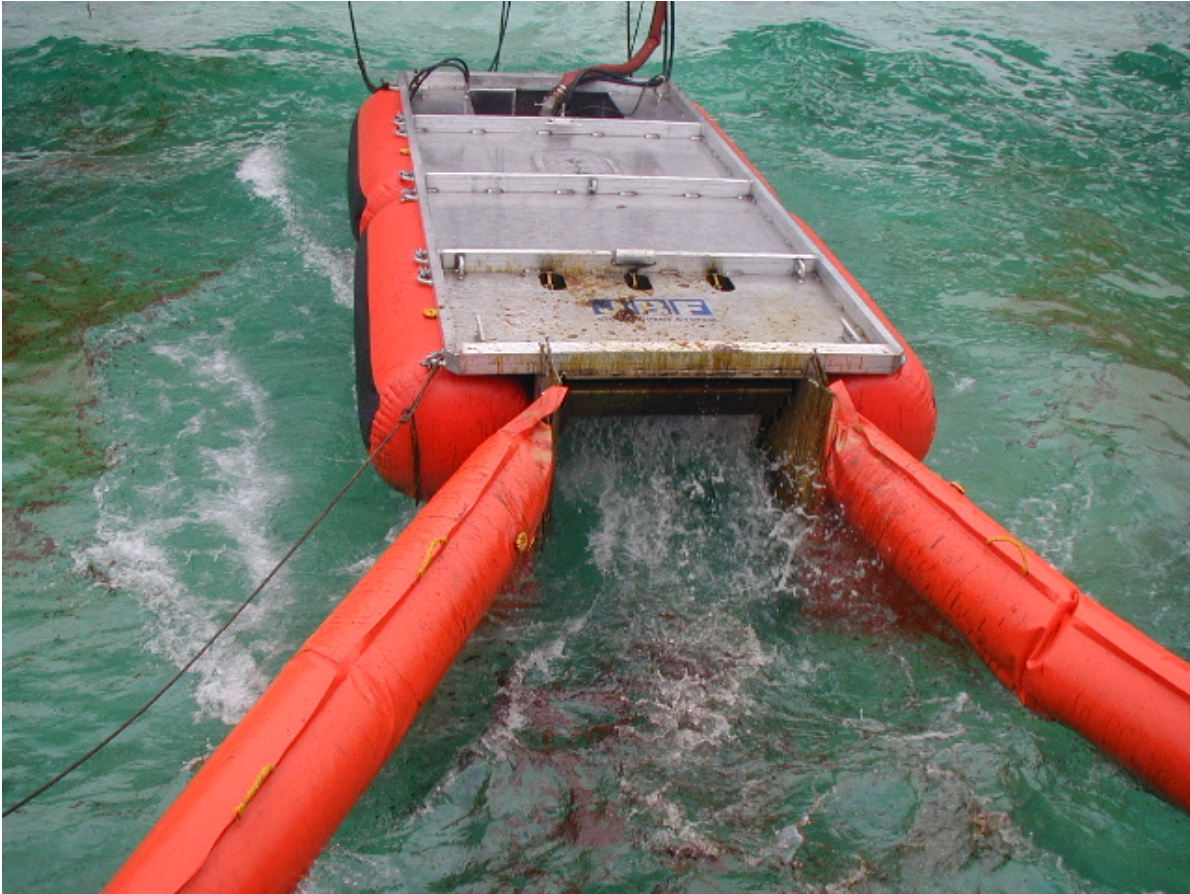
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PREFACE

This manual contains comprehensive description of the JBF DIP 500 Oil and Debris VOSS Skimming System and instructions for efficient operation and maintenance.

Manufacturers manuals for the various components are included.



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1 CHAPTER I - INTRODUCTION

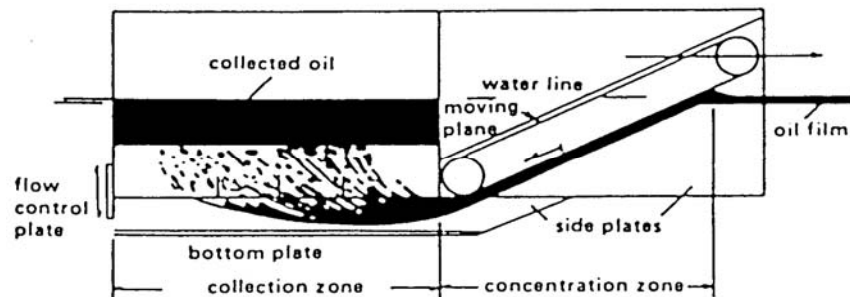
A JBF DIP 500 SKIMMING SYSTEM

i) Explanation of the skimmer / DIP principle

(1) The JBF Dynamic Inclined Plane DIP 500 Oil and Debris Recovery Skimmer System is designed to harvest oil and debris from the surface of the water, separate out the water and pump the harvested products directly from the collection well into oil storage. The skimmer is equipped with a hydraulically driven moving plane and one or two cargo pumps.

ii) JBF DIP concept

(1) The system is based on the concept of collecting oil and debris beneath the surface of the water, thus reducing the effects of waves. As the system moves through the water, oil and debris is forced to follow the surface of a moving inclined plane into a collection well within the unit. Buoyant forces cause the oil and debris to surface in the well, forcing water out the bottom. When a sufficiently thick layer of oil has collected, the oil is pumped into a storage tank. Large debris is removed manually from the front of the skimmer and the collection well. Separation occurs naturally and virtually no free water is collected.



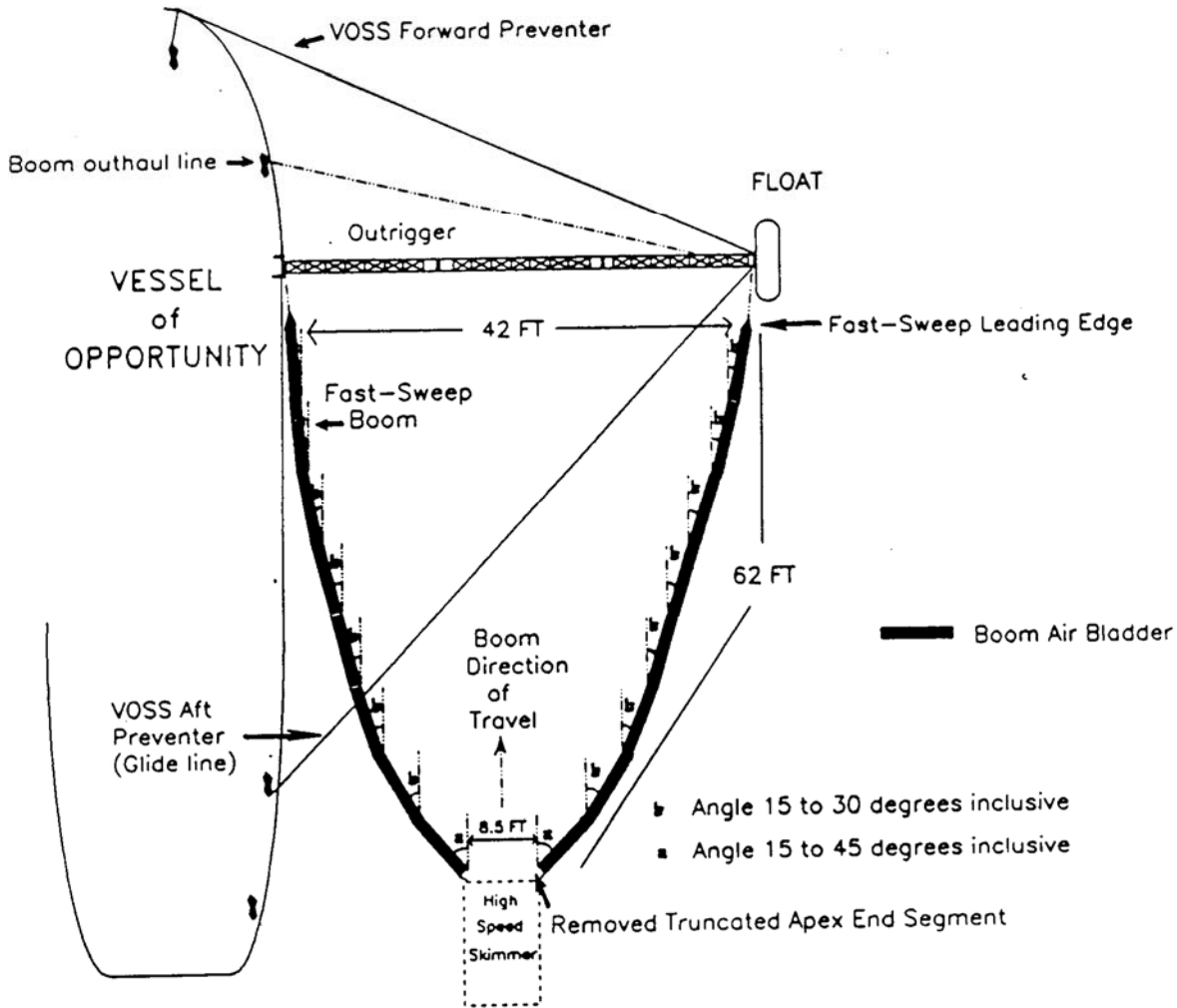
iii) IN-LINE ADVANCING SKIMMER

(1) The DIP 500 skimming system is designed to be operated with a ship (commercial leased vessel 60 to 400 feet long), turning it into an efficient oil recovery platform. The vessel must only be capable of operating at speeds from 1 to 3 knots during oil spill recovery operations. The vessel may also operate at speeds up to 6 knots for transiting and maneuvering with the DIP 500 fully deployed. One or two DIP 500 units can be used by deploying them on the port and starboard sides of the vessel.

(2) When using inflatable booms, two ends of the booms with their standard connectors are attached to the Transition Booms of the DIP 500 which is equipped with a tension chain to hold the aperture to 8 feet. As the vessel moves forward the outrigger arm (28 and 42 foot are available) holds the forward ends of the sweeping boom in a “V” geometry. The mooring lines hold the DIP 500 from the side of the vessel. These configurations can be towed at relative speeds between 1 and 4 knots up to sea state 4.

VOSS Single Ship Fast-Sweep

(not to scale)



This drawing is a sample of what the system should look like when it is deployed. Actual lengths and sizes of boom and outriggers will vary.

Figure 1 DIP 500/ BOOM CONFIGURATION

iv) SELECTION OF THE DIP 500

- (1) The DIP 500 was chosen by the State of Maine because of the increased speed (3 knots for oil recovery and 6 knots for transiting along side the vessel of opportunity). Oil recovery tests at OHMSETT and first article tests confirmed these additional capabilities. It is well known that realistic oil recovery must operate at 3 knots or faster in order to maintain the vessel's headway and to maneuver in a typical sea state 3. It is also desirable to transit alongside at higher speeds and sea states while heading for well dispersed oil slicks

v) INTERFACE WITH PUMPS AND HYDRAULIC POWER UNITS

- (1) The DIP 500 is designed to operate on DOP 250 pump. These pumps are mounted on their own mounting plates which are bolted on to a common fixed plate in the collection well of the skimmer. Safety grates are installed on both sides of the fixed plate for easy accessibility for each installation. The pumps are then controlled by control stands powered by HPUs.

vi) OIL RECOVERY PERFORMANCE

- (1) The operator stationed at the hydraulic control stand decides how to set the belt speed and pumping rates to obtain the optimum method of recovering oil in a given situation.
- (2) If there is a limited amount of storage available, the operator should tell the vessel's Captain to operate the vessel at its minimum speed (2 knots or less). This allows the skimmer operator to make sure that he has a full collection well before pumping to storage and to operate the pumps at a rate as close to the collection (intercept) rate as possible. This is accomplished by matching the skimmer's belt speed to the speed of the vessel and pump

rates to the estimated operation results in a relatively slow recovery rate but maintain a high oil recovery efficiency and a high throughput efficiency.

- (3) If there is ample storage in the form of towed bladders or towed barges, the operator should tell the Captain to operate the vessel at a high oil recovery speed (2 to 4 knots). Normally, this is the case where the oil spill is large and calls for the fastest possible oil recovery rate. The operator matches the belt speed to the vessel speed and the pumps are operated at a rate as close to the intercept rate as possible by adjusting the hydraulic flow control valves on the control stand.
- (4) When operating in the 1.1.6.2 mode above the operator may notice oil losses flowing out the rear of the skimmer. Do not be alarmed by these losses since they are small relative to the amount of oil that is intercepted and collected which results in the maximum amount of total oil recovered over time.

2 SYSTEM DESCRIPTION AND CHARACTERISTICS

A GENERAL DESCRIPTION

The DIP 500 DEPLOYMENT PACKAGE is an in-line advancing skimmer system designed to recover oil at speeds from 1.5 to 3 knots in seas up to 3 feet. It consists of a hull with attached fender flotation, moving plane assembly and one cargo pump. It is designed for use alongside vessels of opportunity, in lakes, rivers, inner harbors and off shore. It can be transported quickly to oil spill sites and can be used in both stationary and dynamic skimming modes. The unit is supplied with an on board oil handling pump, transition booms and connectors that increase the aperture from 4' to 8'. Standard boom can be attached to the transition booms and rigging to further increase the aperture. (See Figure 2.)

The complete system consists of one DIP 500 unit that is operated through its own hydraulic control panel which controls the hydraulic power to the moving plane assemblies and the DOP 250 pumps.

The module is constructed of two longitudinal bulkheads with an oil pump compartment and forward compartment. These form the forward tunnel for the moving plane and aft collection well.

The hull is constructed of .25 thick 5052 aluminum alloy with aluminum tube stiffeners. The fender/floatation system is attached to the sides of the module. The module has lift sling points welded to the longitudinal bulkheads along with oil boom connection points located on the forward rigging.

The DIP 500 System is supplied with 4 inflatable fenders that provide primary floatation to the unit. (FIGURE 3.)

Table 1 SPECIFICATIONS

DIP 500 SKIMMER			
FULLY DEPLOYED		READY FOR STORAGE	
Length	15 ft 7 in	15 ft 7 in	
Beam	7 ft	7 ft	
Draft	4 ft in		
Freeboard	2 ft 4.5in		
Displacement	5500 lbs	6000 lbs	
MOVING PLANE ASSEMBLY		OIL TRANSFER PUMP	
Belt Material:	Reinforced PVC w/ SS chain	Pump:	'DESMI' Screw Pump
Belt Width:	3 ft 0 in	Model:	DOP 250/A-02
Belt Drive:	10 cu. In. hydraulic motor	Capacity:	440 gpm

Table 2 PERFORMANCE SPECIFICATIONS

Skimming Velocity:	0 to 3.5 knots
Wave Height:	3 ft Swells; 3 ft Short Crest Waves
Collection Well Volume:	375 gal (U.S.)

OPERATING CONCEPT AND LIMITS

i) Transportation & Storage

The DIP 500 can be transported over land using a truck and flatbed trailer capable of hauling 6000 lb, air transport or an ocean going vessel with deck space of 8 feet by 16 feet to the scene. The units have 4 stacking pins located in each topside corner that match 4 holes located in the 4 corner feet of the unit so that they can securely be stacked 2 high during storage. The unit has fork lift slots and lifting bridles for loading and deploying operations.

ii) Deployment time & Configurations

The DIP 500 can be easily transported to the scene at top transit speed. Using 4 people the unit can be assembled and deployed in less than 50 minutes from the deck of the support vessel

iii) Oil Recovery

The DIP 500 is capable of recovering oil at speeds from 1 to 3.5 knots with extremely high throughput efficiencies. The DIP 500 doesn't require thick layers of oil in contained pools, in order to be efficient. The DIP 500 operates equally well in thin slicks and thick oil and in light refined products or high viscosity oils.

iv) Speed limitations

Trials were conducted with the DIP 500. The unit was towed with boom connected at 3 knots in sea state 1 conditions with winds up to 7 knots for 4 minutes. No damage occurred to the unit. The unit is capable of

operating at 3 knots with the fast sweep boom in place.

v) Sea state limitations

Sea state limitations for towing the DIP 500 without any boom attached is 4. (It is not recommended to tow in sea state 4 for long periods of time.) Efficient skimming conditions with boom can be achieved at sea state 1 to 1.5.

vi) Debris handling

A debris rake is installed on the front of the DIP 500 to prevent large debris from entering the unit. Accumulated debris will have to be removed manually. The vessel may be able to back down and free the debris from the mouth of the boom configuration and maneuver around the debris. Smaller debris passing through the debris rake will be ground up by the cutter knives in the DESMI pump and pumped to the holding tank. Larger pieces of debris that the pump can't handle will float to the top of the collection well and will have to be removed manually and placed in a suitable container.

B MAJOR COMPONENTS

i) Moving plane assembly

The moving plane assembly consists of an aluminum frame supporting two rollers over which the collection belt is carried. The assembly mounts in the front of the unit. The belt is a heavy-duty material made of reinforced PVC. In order to achieve a positive drive and to avoid any possibility of slipping and poor tracking, special SS roller chains are attached to the edge of the belt. These chains engage sprockets on the head and tail rollers through which the belt is driven. The tension and drive loads are taken directly by the roller chains, while loads on the belt are only those associated with its own inertia and motion through the water. Oil and debris being collected is held against the belt by a combination of dynamic, buoyant, and cohesive forces as it moves downward and aft into the collection well.

ii) Belt Motor

The belt is driven by a low-speed, high-torque, 10 cu. In. hydraulic motor through a direct drive.

iii) Collection Well

The collection well is located in the aft of the DIP 500 and is made from .25 thick 5052 aluminum alloy. The well has a capacity of 375 gal. (US).

iv) Oil Transfer Pumps

Installed in the aft compartment of the DIP 500 (Above the collection well) is a DESMI DOP250 oil transfer pump. The pump is used to transfer harvested oil and debris from the collection well to the on-board tanks or to auxiliary holding tanks alongside. The compartment is designed to accommodate 1 pump. The pump should run in the 'forward' direction. The maximum hydraulic input to the DOP 250 pump is 42 gpm. Pump speed is controlled by varying the position of the speed control knob from 0 to full flow.

v) pontoons

The DIP 500 is supplied with 4 inflatable fenders that provide primary floatation to the unit. The fenders are inflatable, each has 1 air chamber. Bladders are constructed of urethane which provides a tough abrasion resistant surface. The fenders are installed on the side and under a protruding lip with a series of shackles. The fender/floatation construction has the advantage of light-weight construction and the ability to reduce the size of the unit for shipping.

vi) Control Stand

The purpose of the control stand is to operate all hydraulic motors and pumps and enable the State of Maine to use their existing HPU units with the DIP 500.

The control stand ensures operational compatibility between the HPUs, the DIP 500 and the pump. It should be where the operator has a clear view of the skimmer and the apex of the boom configuration used.

vii) Transition booms

The transition booms are inflatable and have standard ASTM boom connectors on each end and are equipped with a tension chain to hold the aperture to 8 feet.

viii) Debris Rakes

There are 4 rods evenly spaced in front of the skimmer mouth. The rods prevent large debris from entering the mouth of the skimmer. They also are used to lock the storage in place.

ix) Belt Wiper

The wiper is mounted in the collection well and is fabricated of reinforced PVC. Its primary function is to insure that collected oil is removed from the belt. Its secondary function is to prevent debris from lodging between the bottom of the forward compartment and the top of the belt.

CAUTION

Adjust wiper position to insure no undue pressure is on the belt.

C COMPONENT DESCRIPTION AND CHARACTERISTICS

i) Hand winch

The winch is a hand operated come-along style. The winch is used to lower and lift the moving plane assembly into place during disassembly and assembly

DOP 250 pump

The DESMI pump is used to pump collected oil from the collection well to the storage tanks. It should run in the 'forward' direction as indicated at the directional control valve located on the control panel. The maximum hydraulic input to the pump is 42 gpm, which is set at the flow control valve. Pump speed is controlled by varying the position of the directional control valve handle from 0 to full flow. Operate the pump in reverse for 5-10 seconds to clear the piping and pump before terminating skimming operations and to prevent water from freezing in the pump cavity.

3 STORAGE AND TRANSPORT

A Storage

The DIP 500 can be stored inside a building, outside in a secure area, on the deck of a sea going vessel or in the cargo hull compartment of the vessel. The units have a protective cover. The units have 4 stacking pins located in each topside corner that match 4 holes located in the 4 corner feet of the unit so that they can securely be stacked 2 high during storage.

B Transportation

The DIP 500 can be transported over land using a truck and flatbed trailer capable of hauling 6000 lb, military air transport or an ocean going vessel with deck space of 8 feet by 16 feet to the scene. The unit has fork lift slots and lifting bridles for loading and deploying operations.

4 ASSEMBLY AND DEPLOYMENT

A DIP 500 ASSEMBLY

i) Assemble DIP 500 Unit

(1) Remove the cover from the skimmer

- (2) Remove equipment from storage bin.
 - (a) Remove all other equipment and sort out on deck.
 - (b) Take control stand out.

- (3) Remove the upper safety grate from the oil collection well / pump compartment.
 - (a) Loosen the locking dog bolts in each corner.
 - (b) Using 2 people lift the grate up and lower over the end to 2 people on the deck.
 - (c) Stow in storage.

- (4) Inflate the pontoons.
 - (a) Remove the cover from the pontoon valves.
 - (b) Make sure the valve is closed by turning the valve $\frac{1}{4}$ turn counter clockwise.
 - (c) Use the air pump with the special adapter inflate pontoons to 2 psi.
 - (d) Replace the valve caps.

- (5) Connect the transition boom.
 - (a) Unroll the boom making sure the boom is right side up.
 - (b) Place one person on top of the skimmer and one on the ground.
 - (c) Hand the boom-connector to the person on top.
 - (d) The person on top slides the ASTM boom-connector into the ASTM boom-connector on the front of the skimmer having the person on the ground help by guiding it into the channel.
 - (e) Align the pin connector holes and lock in place with the connector pin.
 - (f) Inflate boom until firm. (2 psi)
 - (g) Repeat steps 3 through 7 for the other side.
- (6) Install the pump. (If not already installed)
 - (a) Install the safety grates on both sides of the collection well.
 - (b) To install the cargo pump, lift the pump with the lifting slings over to the

collection well area.

- (c) Align the pump mounting frame with the 4 holes in the pump chamber.
- (d) Install the 4 bolts and tighten using the 4 Nylock nuts.
- (e) Remove the lifting slings.
- (f) Clean the 3 hydraulic fitting on the lines and the pump.
- (g) Connect the required length of 1" supply lines (2each) to the pumps and the other ends to the control panel.
- (h) Connect the required length of ½" case drain line to the pump and the other end to the control panel.
- (i) Connect the oil discharge hose to the pumps..
- (j) Remove the safety grates and stow in storage.

(7) Connect hydraulic motor supply lines.

- (a) Clean all hydraulic fitting on the lines and connection plate.
- (b) Connect the two short ½" supply lines to the motor.
- (c) Connect the required length of ½" supply lines to each of the fittings (2) on the top inside of the collection well.
- (d) Connect the other ends of the supply lines to the control panel.
- (e) See figure 22 for hydraulic connectors on control panel.

ii) Assemble Outrigger Arm

- (1) The DIP 500 VOSS utilizes a deflection boom collection system which is unique in the way that it is configured and deployed. The assembly procedures are as follows place all the arm rigging on deck. The flotation bouy should be on the outside and the mounting plate on the inside. Assemble with the provided hardware and secure to side of vessel, with the flotation bouy on the outside of the system

lii Deployment of DIP 500 .

- (2) The design of the DIP 500 VOSS enables it to be deployed with or without the side sweeping containment boom and 15 foot outrigger arm (See manual for boom and outrigger arm deployment) The skimmer is deployed as

follows:

- (a) Remove two ½” mooring lines from storage box.
- (b) Connect slings to the 4 lift points at each corner of the DIP 500 skimmer using 4 shackles.
- (c) Securer 2 mooring lines (from the storage box) to the inboard side of the skimmer one forward and aft.
- (d) Attach the crane hook to the DIP 500 lifting slings. Remove the deck lashing from the unit and have at least two individuals on deck for spotters and line handlers for deploying the skimmer. (use mooring line for tag line)
- (e) Lash all hydraulic and discharge lines in a neat manner to the center cleat on the DIP 500.
- (f) From the point that the lines are attached to the center cleat measure out about 10 or 12 feet and lash the lines together again making a loop in the line capable of accommodating the on board crane hook.
- (g) Attach a short tag line to the lifting ring of the DIP 500 lifting sling assembly so that it can be secured to a deck cleat next to the skimmer.
- (h) Lift and deploy the skimmer alongside the vessel and secure.
- (i) Operate the DOP pump (See 4.3.1) and observe the discharge from the 4 inch hose. The discharge hose can now be connected to the storage tank connection.
- (j) Disconnect the crane hook from the lifting ring and connect it to the lashed hoses.
- (k) Adjust crane to hold lines so that they don't interfere with the skimmer being towed evenly and do not interfere with the containment boom being used.

5 SKIMMING OPERATIONS

A PREPARATIONS FOR SKIMMING

The steps to be taken for operating the DIP 500 units are as follows.

- i) Operation

To operate the pump, connect the hose between the pump discharge connection on the VOSS and to the cargo tanks or the overboard tank.

Perform the following procedures:

- (1) Activate the hydraulic power system.
- (2) Open the valve to the cargo tank.
- (3) Station a lookout at the cargo tanks or overboard tank. Monitor the discharge and the tank level gauges.
- (4) Operate the pump hydraulic directional control valve in "FORWARD" to pump from the collection well.
- (5) Operate the pump hydraulic valve in "REVERSE" to clear the hoses, pump and to clear debris blocking the pump intake.

NOTE

When pumping heavy, viscous oils, operate the pump slowly to achieve a steady stream of oil at the discharge of the hose. Gradually increase the speed of the pump while maintaining a steady flow of oil and hold at that speed for maximum transfer rate. Speed adjustment can be made at the Parker flow control and also by throttling the directional control valve actuator handle.

CAUTION DO NOT DEAD HEAD DISCHARGE LINE

- ii) Connect applicable boom system and rigging.
 - (1) Connect the selected boom to the transition boom ASTM boom-connector.
- iii) Hydraulic control stand
 - (1) Position a person at the hydraulic control stand to operate the DIP moving plane and the pump.
 - (2) The control stand consists of 2 lever controls on the top flat face of the unit labeled;
 - (3) **BELT** (forward - neutral - reverse),
 - (4) **PUMP** (forward –neutral – reverse),
 - (5) The tuning knobs in front of the levers control the hydraulic flow to each component.

- (6) A pressure gage is located on the angled face of the front panel ..
- (7) The flow rate of the belt is observed through the P.S.I. gage.
- (8) The flow rates for the pump is also observed through the P.S.I. gage.
- (9) The connections for the power supplies and case drain are located on the lower left-hand side of the control stand.
 - (a) The connections for **PUMP** and **BELT** motors are also located on the lower back of the control stand.
- (10) After the hoses are securely attached and the system is launched, open the pressure and return lines to the panel.
- (11) Check that the hydraulic directional control valves are in the neutral position.
- (12) Check that the control panel gage is indicating pressure (2000-2500psi).
- (13) During skimming operations keep the belt running.
- (14) Ship should advance at 1 to 3 knots depending on sea conditions.

CAUTION

The ½ inch case drain hose must be attached at all times from the off loading pump to the case drain fitting on the control panel and from the control panel to the power pack. Failure to do so will result in damage to the pump and flow gages.

B OPERATION OF MOVING PLAN ASSEMBLY

- i) Running the belt
 - (1) The DIP assembly (moving plane) should be running in both the stationary and active skimming modes. Operate the belt at approximately 2-4 feet per second which equates 1.2 to 2.4 knots. The speed can be set by adjusting the hydraulic flow control. MAXIMUM setting for the belt speed should not exceed 6 feet per second. The belt length is 23 feet so it will take 23 seconds for 1 revolutions of the belt to have a belt speed of 1fps, 16 seconds for 1 revolutions of the belt to have a belt speed of 2 fps and 12 seconds for 1 revolutions of the belt to have a belt speed of 3 fs.
- ii) If the DIP belt becomes jammed or stops running.

- (1) Reverse belt direction in an effort to clear away debris. Move the vessel astern, backing away from the debris. DO NOT increase relief valve pressure to free a jammed belt. If the belt still will not run, you may continue skimming since the system will continue to collect oil (at reduced efficiency) with the belt stationary if the vessel is moving through the spill at between one and three knots. Remove the system and belt assembly to determine the problem when skimming operation is ended.

6 RETRIEVAL & LAYUP

A Retrieval of the DIP 500

- i) Bring the support vessel to a stop.
- ii) Disconnect the crane hook from the hydraulic and discharge lines.
- iii) Attach the crane hook to the lifting sling.
- iv) Loosen the mooring lines, spring lines and outrigger arm guy lines.
- v) Lift the DIP 500 out of the water.
- vi) Swing the DIP 500 unit in over the rail and position it so lashing can be installed. Insure that line handlers keep hydraulic hoses, mooring lines and discharge hose clear from beneath the skimmer prior to setting it on deck.
- vii) Lash the DIP 500 unit to the deck.
- viii) The action of lifting the skimmer on deck will cause whatever boom equipment that is being deployed with the system to be pulled in alongside the vessel.
- ix) The DIP can be unhooked from the transition boom on deck or in the water using a small boat, before DIP 500 is retrieved.

B Disassembly of the DIP 500

- i) Unlash the hydraulic and discharge lines from the center cleat on the DIP 500
- ii) Install lower safety grates in pump compartment.
- iii) Disconnect all hydraulic and discharge lines from the pumps and belt motor.
- iv) Deflate and disconnect transition boom from DIP 500.

- v) Remove all mooring lines.
- vi) Remove pumps.
- vii) Wash down or decontaminate the DIP 500 unit and all associated parts.
- viii) Repack components into storage box.

C Lay-up of DIP 500

- i) Repack components into storage box.
- ii) Remove the debris rods.
- iii) Deflate the pontoons.
- iv) Repack storage box and place back in mouth of skimmer.
- v) Reinstall debris rods.
- vi) Reinstall the pumps.
- vii) Install upper pump compartment safety grate.
- viii) Cover DIP 500 with tarp.

D TROUBLESHOOTING & REPAIR

D GENERAL

This section describes operating and maintenance procedures for the JBF DIP 500 Skimming System. The maintenance instructions specific to the DIP System are described and reference is made to the manufacturer's manuals.

The VOSS system contains the moving plane assembly, belt drive motor, and oil transfer pump.

E Installation and Removal Belt Box Assembly

- i) Remove the belt hydraulic motor as follows:
 - (1) The hydraulic motor is located inside the head roller. It contains no user serviceable parts. All repairs should be done through Slickbar Products authorized personnel.

- ii) Remove the belt assembly and box structure as follows:
 - (1) To remove the 4 debris rods in front of the collection belt, position one person on the skimmer to pull the rods out of their slots from their “T” shaped top.
 - (2) Remove the storage box if stored in skimmer.
 - (3) Remove winch from storage box. Attach the winch to the support frame that is aft of the center access hole on the front center topside of the DIP 500. Mount so the cable is centered over the access hole.
 - (4) Connect the hook of the winch to the tab eye and shackle on the front center of the belt box (This is accessible through the deck hole behind the winch).
 - (5) Take a strain on the winch and loosen and disconnect the two turnbuckles (with a wrench) on each side of the belt box. They are accessible through two holes located on each side of the deck.
 - (6) Using the winch lower the belt box to the bottom of the skimmer module.
 - (7) Disconnect the winch cable.
 - (8) Using the same lifting shackle on the belt box, attach to the crane or fork lift cable and carefully pull the belt box out of the skimmer making sure to keep the belt box parallel to skimmer module. Once belt box is out of unit, it may be moved with a forklift or a crane.

F Belt Removal

- i) Remove belt box assembly and set on stands
- ii) Rotate the belt so that the connector lacing is on the front top of the head roller sprocket.
- iii) Loosen the catenary adjusting take-up located on each side (top end of the belt box that is accessible through cut outs in the belt box frame)
- iv) Back off the catenary adjusting take-ups (6 turns).
- v) Disconnect the master link on each side of the chain drive.
- vi) Remove the lock washer on one end of the lacing pin with pliers.
- vii) Take a pair of pliers, and grab the other end of the lacing pin and pull to remove it.
- viii) Pull back the long side of the belt and remove it from the tail roller assembly.

- ix) Remove the belt from the head roller assembly.
- x) Lift belt box off of the belt using the 4 lifting eyes or a forklift.
- xi) Inspect all chain for broken or worn links and the belt for tears or excessive wear.
- xii) Make sure that the lacing connector is not worn or broken.
- xiii) Check the belt box for broken welds and any excessive wear to the UHMW ware strips, drive sprockets and bearings.

G Head Shaft Removal

- i) Remove belt. See 7.3
- ii) Remove bearings and telescoper take up adjuster along with head shaft.

H Tail Shaft Removal

- i) Remove belt.
- ii) Remove lower bearings along with shaft.

I Removing the cargo pump.

- i) To remove the cargo pump, install the removable safety grates on either side of collection well.
- ii) Disconnect the 3 hydraulic lines from the cargo pump, if connected.
- iii) Disconnect the discharge hose, if connected.
- iv) Remove the 4 bolts from the mounting tabs on the pump mounting plate.
- v) Connect the lifting sling from the lifting device to the pump handles and lift the pump out of the collection well.

J Installing the cargo pump.

- i) To install the cargo pump, lift the pump with the lifting device used in step 5 over to the collection well area.
- ii) Align the pump mounting frame with the 4 holes.
- iii) Install the 6 bolts and tighten using the 4 Nylock nuts.

- iv) Remove the lifting slings.
- v) Clean the three hydraulic fitting on the lines and the pump and make all of the connections.
- vi) Connect the oil discharge hose.
- vii) Remove the safety grates and stow in storage box.

7 PREVENTIVE MAINTENANCE & ADJUSTMENTS

A BELT WIPER

- i) The wiper is located on the top bottom of the belt box assembly near the tail roller.
- ii) To check wiper blade climb to top of skimmer.
- iii) Carefully climb to the bottom of the oil collection well.
- iv) Once inside face the front of the skimmer. The wiper is on the front top of belt.
- v) Check and make sure that the adjustment is no more than 1/16" between the belt and wiper.

B CARGO PUMP

- i) The DESMI pump is used to pump collected oil from the collection well to the storage tanks. Maintenance for the Pumps is covered in the manufacturers' operation manuals.
- ii) If the suction line is clogged, follow the procedure for pumping from the collection well to overboard. With the discharge hose submerged reverse flow to provide back pressure. Provide several short bursts until intake is cleared.
- iii) The pump can be removed in the event that repair is needed. Hoses are to be disconnected at pump prior to removal. See manufacturer's operation and maintenance instructions for further details.
- iv) Emergency Shutdown Procedures and Spill Prevention (during cargo

handling it is important to prevent spills). Emergency pump shutdown is possible as follows:

- (1) Place pump hydraulic control lever in neutral.
 - (2) Shut down hydraulics.
 - (3) Close discharge valve.
- v) Operate the pump in reverse for 5- 10 seconds to clear the piping and pump before terminating skimming operations and to prevent water from freezing in the pump.

CAUTION

Before performing maintenance on the Desmi unit, shut down the hydraulic system.

C Belt Adjustment/Maintenance

- i) To adjust the tension on the belt use the following procedure:
- (1) Remove the forward pontoons to expose the belt adjustment slot in both sides of the hull.
 - (2) Measure the belt catenary from the bottom center of the belt to the bottom of the belt box structure.
 - (3) Unlock catenary adjustment screw locking nut.
 - (4) Adjust the catenary of the belt by turning the adjustment screws so that the gap is 1 inch +/- ¼ inch.
 - (5) Lock the adjusting nut.
 - (6) Refasten the forward pontoons in place.

8 APPENDICIES

A SPARE/REPAIR PARTS LIST

SPARE/REPAIR PARTS LIST

The following list of spare parts is our recommended "On Board Repair Parts" (OBRP'S)

ITEM#	SYSTEM	DESCRIPTION	QTY
1.	MOVING PLANE ASSEMBLY	BELT	1
5.	MOVING PLANE ASSEMBLY	P.B. BEARING	2
6.	MOVING PLANE ASSEMBLY	4-BOLT BEARING	2
6.	MOVING PLANE ASSEMBLY	CHAIN	1
7.	MOVING PLANE ASSEMBLY	HYD. MOTOR	1

Recommended Spare Parts for The DOP 250 Should be taken Directly From The Pump Operations Manual Included.

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