



World Leaders in Oil Spill Control Technology . . . Since 1960

OPERATION AND MAINTENANCE MANUAL

SLICKBAR DISPERSANT SPRAY SYSTEM

GENERAL INTRODUCTION

Removal of spilled oil from the surface of the sea is, at best, a very difficult problem. Mechanical removal equipment, such as skimmers, work effectively when the oil slick is quite thick. However as the oil spreads, the oil becomes thinner and it becomes exceedingly difficult to remove the oil with mechanical equipment. This problem is further compounded by the mechanical equipment's tendency to pick up large quantities of water, causing the oil to emulsify, making ultimate disposal of the oil/water mixture extremely difficult. The final cleanup of the slick can be accomplished by the proper application of chemical dispersants if they are applied prior to the formation of oil/water emulsions and mousse.

Chemicals used in early oil spill incidents were industrial emulsifying agents. These were effective at dispersing oil, but because of their high hydrocarbon content, were harmful to the marine environment. These chemicals were applied to the oil slick in high concentrations, which rendered them not only ineffective in dispersing the oil, but caused severe damage to the marine life along the shore.

Many years of research and development have resulted in chemical dispersants that now are very low in toxicity, are self-mixing and biodegradable.

Application equipment has been improved to such a degree that it is now possible to apply the proper amount of dispersant to the slick in an efficient manner. The dispersant chemicals must be applied to the oil. Application to the water will have no effect and will result in misusing and wasting the chemical.

WHAT IS A DISPERSANT?

Dispersants consist of two components. One is a blend of surfactants comprised of emulsifiers and wetting agents and the other is a solvent system component that acts as a carrier for the surfactant. If the solvent is a hydrocarbon, it may be beneficial in reducing the viscosity of the oil into the water column in the form of oil droplets sufficiently small for them to remain below the surface and not reform as a slick. Natural water movement of the sea's surface ensures that the dispersed oil is diluted into the sea where it will more rapidly biodegrade.

HOW DO DISPERSANTS WORK?

The surfactant molecules cause the oil to break up into very small droplets. through the action of the water's surface, i.e.; waves. The droplets disperse into the water column extending to a depth of approximately 3 meters. The surfactant molecules prevent the droplet from again coalescing. The water near the sea's surface contains oxygen and bacteria that cause natural biodegradation of the oil. The dispersed oil entering the water column accelerates this process. However, it does have the disadvantage of increasing the oxygen demand, and could possible cause oxygen deficiencies in the area of the dispersed oil. This could be harmful to marine life in the immediate vicinity of the spill. Local environmental control authorities should be consulted before using dispersants.

DETERMINING APPLICATION RATE

The amount of dispersant to apply from spray equipment depends upon the thickness of the slick, swath width and boat speed. Slick thickness is very difficult to determine, but generally slicks that are treated with dispersants range in thickness from 50 microns (.05) to .25 mm. A rough guideline of appearance and the amount of oil present is as follows:

	Slick Thickness	Quantity	
		US Gal/ 1000 Sq M	US Gal/ Acre
A. Silvery Slick	.001 mm	.7	.74
B. Colored Patches & Rainbow Effect	.006 mm	6	6.4
C. Black/Dark Brown Streaks (Thinner at Edge)	.1 mm	100	106
D. Oil in Water Emulsion (Chocolate Mousse)	1.0 mm	1000	1069

The dispersant application rate depends upon boat speed and swath width. The spray system has a width of approximately 10 meters. A graph has been

prepared for this unit. There are two sets of curves in Graph A; one for a 20:1 oil to dispersant ratio and the other for a 10:1 ratio. It is recommended that a 20:1 ratio be used to test the dispersant's effectiveness on the oil slick. For example, if the boat speed is 8 knots and the spill slick thickness is estimated at 0.25 mm, using a 20:1 oil to dispersant ratio, the dispersant rate would be 30.8 liters per minute (approximately 8 gpm). There is a maximum limit of dispersant spray rate of 38 liters per minute. The spray system is designed to spray dispersant concentrates mixed with sea water. If the dispersant used is designed for neat spraying, the spray nozzles will require modification. A local representative or Slickbar Products Corporation should be contacted to obtain the parts needed for the modification.

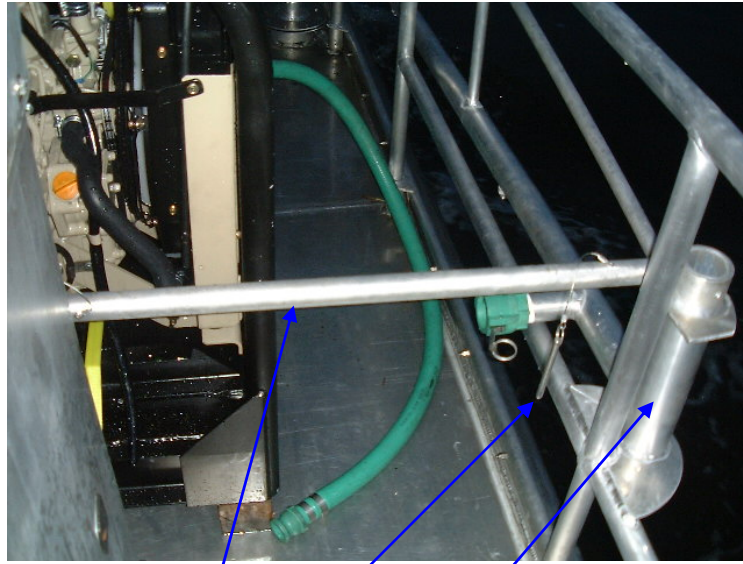
ASSEMBLY

The spray system components consist of the following:

- A. **Pump Unit** A single cylinder, electric start, diesel engine driving a fiberglass body centrifugal pump: suction size, 2 inches; discharge manifold with two 1 1/2 inch ball valves; dispersant flow meter; 1 inch dispersant pickup tube
- B. **Spray Arms** (two): Each approximately 5 meters long with five wide angle spray nozzles
- C. **Stabilizer Arms** (two)
- D. **Interconnecting Hoses:** Consisting of two 1 1/2 inch discharge hoses, one 2 inch suction hose, and one 1 inch dispersant pickup hose with quick disconnect couplings.

The spray arms must be inserted into the arm sockets located on the port and starboard sides of the boat, and secured with the stabilizer arm and toggle pins. (fig 1) The stabilizer arm fits over the spray arm and into a corresponding bracket located on the pilothouse.

Figure 1



Stabilizer Arm / Toggle Pin / Spray Arm Socket

The Engine Operator's Instruction Manual", which is included, should be read prior to starting the diesel engine. The engine lubrication and fuel should be checked and replaced as needed. **The engine should not be started at this time.**

The seawater pump should be primed by opening the 1/4-inch priming valve, closing the spray arm valves and dispersant valve. Then moving the pump handle up and down until water is discharged from the priming pump. The priming connection on priming pump suction valve should now be closed (fig 2).

Figure 2

Priming Valve/ Dispersant Valve

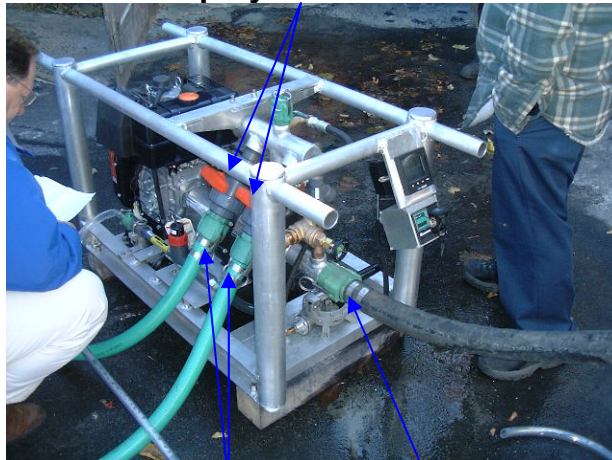


Priming Pump

Attach the two 1 1/2" spray arm hoses, the 2" sea suction hose. (fig 3)

Figure 3

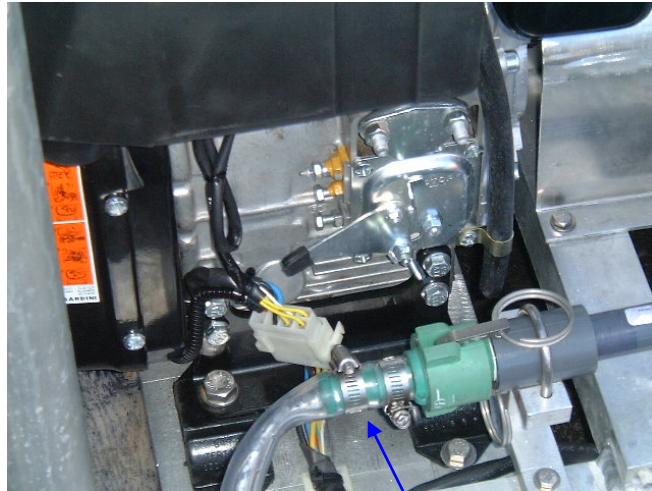
Spray Arm Valves



Spray Arm Hoses / Suction Hose

Attach the dispersant pickup tube and insert it into the dispersant container. (fig 4)

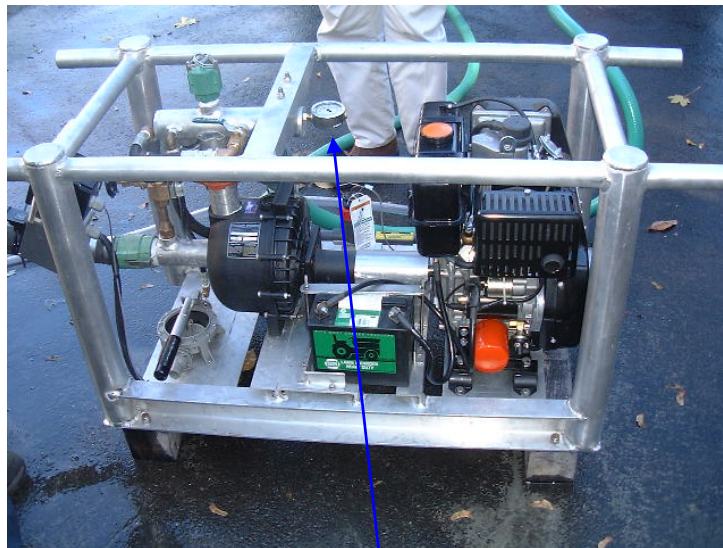
Figure 4



Dispersant Pick Up Tube

The diesel engine can be started now only after reading the "Engine Operating Instructions". Refer to the electric starting procedure. After the engine has been started let the pressure build to 30 psi.(fig 5)

Figure 5



Pressure Gauge

After pressure is built up, as indicated on the pressure gauge the discharge nozzles. If any nozzles are plugged, the flow to that spray boom should be discontinued and the nozzle(s) should be cleaned. Once it is determined that there us equal flow to each nozzle, the dispersant can be

introduced into the system. The sea water supply valve to the eductor should be opened, and the dispersant pickup control valve should be opened to the dispersant pickup line.(fig 6) manifold valves to the spray arms should be opened.(fig 3) At this point, sea water will be emitting from the spray nozzles. The spray booms should be examined to ensure that the spray is equally distributed throughout all

Figure 6
Seawater Supply Valve



Dispersant Pickup Valve

The dispersant flow meter reading should be observed, and the flow set by adjusting the dispersant pickup control valve to the desired rate as determined by boat speed and as indicated on Graph A.

The flow meter is set at the factory to indicate the rate of dispersant flow (in US gallons per minute). The meter can be reset to indicate liters per minute. If a change in the meter calibration is desired, the "Flow Meter Instructions" should be referenced.

SHUTTING DOWN

At the conclusion of the spraying operations, the dispersant spray pickup tube should be flushed and the flow meter and eductor filled with fresh water. This can be done by placing the pickup tube into a drum of fresh water and allowing the water to be pulled through the system. The seawater pump should be drained and flushed with fresh water and the nozzles checked to ensure that they are not clogged. The pump engine should be serviced in accordance with the "Engine Operator's manual.

Component Instructions

Individual Instruction sheets (Manuals) are included with this Instruction book. Refer to these for specific information on each major component.