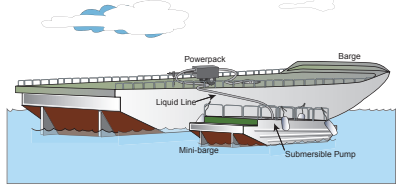
MARINE-BASED STORAGE & TRANSFER OF OILY LIQUIDS

OBJECTIVE & STRATEGY

MST

Marine-Based Storage and Transfer is used to relocate recovered oil and wastes that have been collected in primary storage during Marine Recovery, Open-water Free-oil Recovery, or Shoreside Recovery into marine-based storage devices for transportation to disposal.



The general strategy is to:

1. Identify the transfer site and assess the conditions.
2. Determine the appropriate transfer and storage systems based on oil type, site conditions, and vessel capabilities.
3. Mobilize and deploy transfer and storage equipment to the site.
4. Transfer recovered oil from on-scene primary storage to on-water tanks, bladders, or barges.
5. Man and monitor the system as appropriate.

TACTIC DESCRIPTION

Marine-based storage and transfer requires vessel crews and technicians skilled in mooring and anchoring techniques. Vessel-to-vessel transfer presents significant safety concerns for personnel and equipment and requires planning and training to execute properly. The equipment used in the storage and transfer should be adaptable to the specific site considerations and waste types being handled. Components include pumps, hoses, fittings, fendering, and storage systems consisting of storage tanks, bladders, or barges. Site considerations include the operating environment and the distance and elevation the liquid has to be moved.

Components should be selected to maximize safety and efficiency and transfers should be kept to a minimum to reduce the risk of secondary spills.

Follow the requirements of the incident specific Waste Management Plan and review the Waste Management Checklist in Section A of this document. Waste considerations include explosive potential, debris content, and viscosity of the fluids.

Pumping Systems

Pumping systems should be configured to meet the requirements of the task. Consideration of the abilities and weaknesses of a pumping system and the site specific conditions will inform responders of the best pump for the job. Refer to the Pumping Oily Liquids tactic for further review of pump systems and procedures.

Storage Systems

The two options for marine-based storage are onboard tanks and towable on-water storage. Onboard systems include tankers and deck tanks. These are subject to significant regulation and require prior inspection and approval by the US Coast Guard. Towable on-water storage includes barges, bladders, and open storage devices. A brief description of each follows.

Tank vessels – This onboard option should be considered for larger spills and when lightering operations may be necessary. Depending on vessel size, drawbacks include high freeboard, deep draft, and lack of immediate availability in most spill scenarios.

Deck tanks – Use of these onboard systems requires extreme caution as vessel stability can be significantly altered. Onboard oil storage systems can be on deck or below deck, with both types subject to numerous US Coast Guard regulations and inspection.

Barges – For most recovery scenarios, barges are the preferred on water storage devices. Consideration must be given to the amount of freeboard when pumping from small skimming systems. Barges containing less than 250 barrels of storage volume (sometimes called mini-barges) are considered equipment and do not require a US Coast Guard inspection or a US Coast Guard Tankerman's document.

Bladders and Tanks – Flexible tow tanks (dracones) must be towed at slow rates and can be fragile. They may be difficult to handle in high seas.

Open Storage Devices – These inflatable barge type devices provide some freeboard and protection from seas.

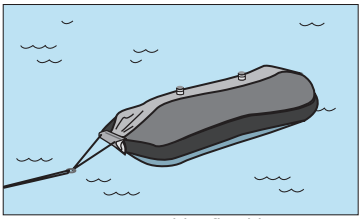


Figure MST-1. Towable, flexible storage device.

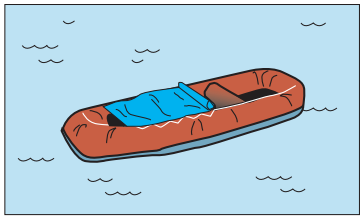


Figure MST-2. Towable open storage device.

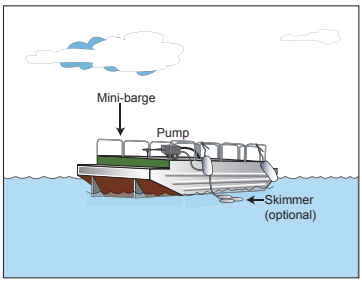


Figure MST-3. Towable mini-barge storage device.

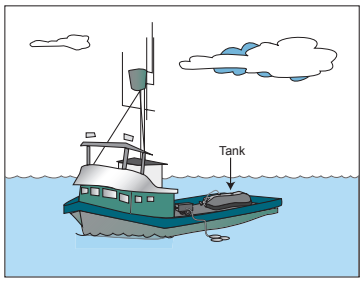


Figure MST-4. Deck tank primary storage device.

Operating Environments

Recommended operating environments for marine-based storage and transfer are protected and calm water. Operation may occur in open and fast water under safe weather and sea state conditions. Transfer operations in broken ice environments require careful consideration and planning.

MST-O OPEN WATER

A successful marine-based storage and transfer operation in open water requires safe weather and sea state conditions. Although possible, operations are not recommended in open water environments because of the potential for secondary

spills and the difficulty of vessel-to-vessel mooring. If the option is available, transfers and storage will be safer if moved to protected waters.

Components for open water operations should be able to withstand seas up to 6 feet and winds up to 30 knots while towing storage vessels.

MST-C PROTECTED WATER

Vessels used in protected water for storage and transfer should be able to withstand seas up to 3 feet and winds up to 25 knots. Vessels involved in marine-based transfer and storage may be deep draft or shallow draft, depending on the water depth.

MST-P CALM WATER

Marine-based storage and transfer systems operating in calm water are composed of vessels and storage devices that can operate in seas of 1 foot and in winds up to 15 knots. Vessels involved in calm water storage and transfer systems typically work in depths as shallow as 3 feet.

MST-F FAST WATER

Marine-based storage and transfer systems are not recommended for the fast water environment, where currents exceed 0.8 knots, because of the potential for secondary spills and the difficult of anchoring and mooring in this environment.

MST-I BROKEN ICE

Marine-based storage and transfer systems are difficult in the broken ice environment because of potential damage and loss due to ice encounters. If possible, transfers should take place in ice-free areas.

Deployment Configurations

As discussed earlier, the deployment configurations for marine-based storage and transfer will be largely dictated by the site considerations and the waste type. The placement of pumps will be determined by the head or suction needed, the transfer rates required and the receiving storage devices. For long distances, multiple pumps in a series may be required.

Figure MST-5 shows the most common option for mini-barge to large barge recovered liquid transfer. Figure MST-6 shows the most common option for mini-barge to shore tank recovered liquid transfer. Other configurations are possible.

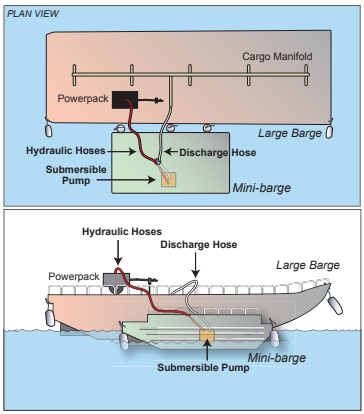


Figure MST-5. Transferring recovered liquids from a mini-barge to a large barge using a submersible pump energized by a power-pack on the deck of the large barge.

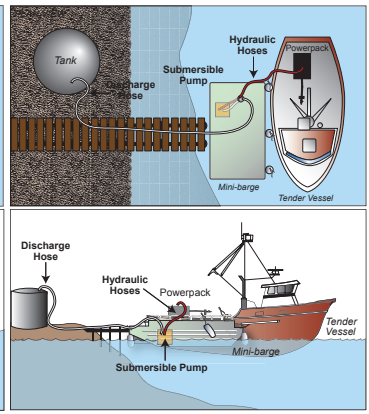


Figure MST-6. Transferring recovered liquids from a mini-barge to a shore-based tank using a submersible pump energized by a power-pack on the deck of the tender vessel.

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

SAFETY

- Daily weather evaluation is recommended, and should include distance to safe harbor, transit times and exposure of vessels.
- Mooring operations should be planned and discussed with the vessel and barge crews prior to execution. These should include emergency procedures and contingency plans.
- Consider vessel stability when placing equipment and recovered liquids onboard any vessel.
- Avoid free falling liquids, as static electricity may be produced.
- When explosive potential is present, ground and bond barges and equipment to dissipate static.

- Vessel masters should have experience in the prevalent and predicted sea and weather conditions. Local knowledge is preferred.
- Transfer hoses must be hydro-tested annually on vessels/barges with a cargo capacity greater than 249 barrels.
- Vessel master should use extreme caution when maneuvering storage devices around sharp or submerged objects and nearshore.
- Vessels, including skiffs, must have a minimum of two crew aboard.
- If possible, vessels in transit to/from an operation or staging area should transit in pairs.
- A communications schedule should be established and followed, between vessels in transit and the Operations Section or Radio Dispatcher.
- Response personnel should wear PPE as required by the incident-specific Site Safety Plan.
- Vessel stability documents should be reviewed prior to placing heavy equipment and recovered liquids in approved containers on deck. If a stability document is not available for the vessel, then extreme caution should be used when loading vessel.
- The storage device manifold system should be used at all times. Loading over the top through hatchways exposes personnel to vapors and create opportunities for personnel to step into hatchways.
- Transferring equipment to vessels using booms and cranes presents significant hazards. A safety briefing should be held before operations commence to ensure a safe operation. Items discussed in the briefing should cover: communication procedures, including hand signals; inspection of wire ropes, bridals, and straps; and the use of tag lines.

DEPLOYMENT

- During the transfer, the pump controls and manifolds should be manned with responsible crew with two-way communication present to ensure rapid response to any spillage or changing circumstances.
- Support and monitor hoses throughout the operation to ensure they are not under stress or chafing.
- Secondary spill response equipment and sorbent materials should be in place.
- For large barges, a load plan may be required. Follow vessel-specific transfer procedures.
- Be aware that there are US Coast Guard regulations pertaining to transfer operations from a barge or tank vessel with a capacity of greater than 249 barrels (10,458 gallons). Transfer procedures are not a requirement for a vessel with a capacity of less than 249 barrels, but they are encouraged.
- All tanks should be gauged and the information recorded in the unit log prior to any transfers.
- Portable containment should be placed under couplings, fittings, etc. to catch leaks or spills when fittings are disconnected.

REFERENCES TO OTHER TACTICS

Other tactics associated with Marine-based Storage and Transfer include:

- POL • Pumping Oily Liquids
- FO • On-water Free-oil Recovery
- MR • Marine Recovery
- SR • Shoreside Recovery

EQUIPMENT AND PERSONNEL RESOURCES

Commonly used resources for this tactic include pumps, hoses, couplings, storage devices, tow vessels, anchoring and mooring equipment. Specific equipment requirements will be determined by site consideration described earlier and outlined in the Pumping Oily Liquids tactic, and resource availability. Resource sets will need to be refined as requirements dictate.

Typical Marine-based Storage and Transfer System MST

Typical Equipment	Function	Quantity	Notes
Pump	Fluid transfer	Site-specific	Determined by distance and lift, fluid viscosity, debris content, explosive potential. See "Pumping Oily Liquids" for additional information.
Hoses, couplings, and portable containment	Fluid transfer	Site-specific	Ensure that the pump and hoses are compatible. Transfer hoses must be hydro-tested annually for vessels with a cargo capacity greater than 249 bbl.
Storage device	Receives fluids from the initial storage device	Incident and site specific	Tankers, barges, floating tanks (dracones), bladders, or deck tanks
Fendering	Making up one vessel to another	Vessel specific	Fenders vary in size depending on sea state and vessel/barge size
Typical Vessel	**Function**	**Quantity**	**Notes**
Class 2, 3 or 8	Maneuvering and towing of barges and tanks.	Minimum one per barge/tank	Depending on barge/tank volume, currents, and sea states
Typical Personnel*	**Function**	**Quantity**	**Notes**
Field Team Leader	Supervises operations	1	May not always be on-site
Vessel Operators, open water	Masters of tow vessels	2	Depending on number of vessels
Tankerman	Operation of the barge and director of transfer operations	1 to 2	Depends on the size of the barge
Skilled Technicians	Crew vessels and operate transfer equipment	2 to 4	Depending on number of vessels/ barges
General Technicians	Work under the direction of skilled technicians or vessel operators	2 to 8	Depending on number of vessels and transfer configuration

* Personnel required for this tactic may be the same personnel listed in another tactic.