NRT-RRT Factsheet

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TEMPORARY STORAGE DEVICES - TOWABLE

A tool that fulfills an oil spill response need

SUMMARY

The purpose of this fact sheet is to provide information on the use of towable, temporary storage devices (TSDs) in oil spill response. The towable TSD can provide an immediate temporary storage receptacle, on-site. It can be used in situations, such as remote areas, where a conventional barge is unavailable or its use is impractical. The focus of this fact sheet will identify recent and ongoing R&D efforts as well as identify future R&D needs. Through enhanced operational design, protocols for use, user training, and cleaning methods, the use of TSDs can be an important and useful asset to response and cleanup operations.

Both the U.S. Navy, Supervisor of Salvage (SUPSALV) and the U.S. Coast Guard (USCG) maintain a Afleet@ of TSDs in their respective equipment stockpiles. Current R&D efforts are being conducted by SUPSALV and USCG to improve the functionality of bladders in oil spill response. In addition, recent tests sponsored by the U.S. Coast Guard have been completed by the Ohmsett test facility in Leonardo, New Jersey. These tests were designed to gather operational data on decanting techniques and to provide technical information on different types of TSDs for procurement purposes.

BACKGROUND

TSDs are made of rubber or polymer-coated fabrics of various weights and designs. Capacities of TSDs range from a few gallons to more than 300,000 gallons. There are three types of towable TSDs in use today. The first is a towable, rectangular-shaped, pillow tank, similar to those used on land (i.e., emergency potable water storage), but equipped with special tow rigging. The second type is a towable flexible tank, or "bladder," which is long and cylindrical in shape. When full, it is largely submerged and is characterized by flexibility along the length of the device. The third type of device is a towable open tank, inflatable barge-type vessel with an open-top storage bag suspended inside the main structure. A fitted roof with access ports prevents splash-over.

Towed TSDs were originally developed for bulk fuel transport and have been used for amphibious military operations. In such operations, clean fuel oil was generally used and cleaning of the TSDs was relatively simple. In oil spills, especially with weathered and persistent oils, TSDs quickly become contaminated and clogged with recovered oil and oily debris, making bladder cleaning a more onerous operation than it is with clean fuel oils.

The use of towed TSDs in actual spill operations has been controversial, usually because of lack of familiarity with these devices by On-Scene Coordinators (OSCs) and spill response managers. There are also well-founded concerns about off-loading and cleaning TSDs. Few response organizations have practical experience with towed TSDs. Therefore TSD use has been severely limited in actual spills and little experience has been gained in recent years.

SUPSALV and USCG operate towable TSDs as an oil spill response tool used in conjunction with emergency oil lightering and skimming systems. With these systems, recovered oil is transferred directly into a TSD in tow, allowing for continuous operations. The USCG has both towed flexible closed bladders and towed open barges in its inventory, while SUPSALV maintains the closed bladder-type of TSD.

ADVANTAGES

A primary advantage of a towable TSD is its transportability. It can be palletized and packaged into a relatively small parcel (see Table 1 below) to make it rapidly deployable. It can be delivered to a spill site by helicopter or fixed-winged aircraft, making it deployable in remote locations where conventional barges are not available or suitable.

Along those same lines, a towable TSD provides the benefit of decreasing the amount of warehouse space needed relative to its storage capacity.

Table 1: SUPSALV TSD Shipping Data Volume

Volume (gal)	**l x w x h (inches)**		**Cubic Weight* (ft3)**
290,000	201x 99 x 83	1430	18,630
136,000	240 x 96 x 72	960	13,670
50,000	126 x 67 x 68	332	7,720
26,000	96 x 96x 48	256	3,660
USCG TSD Shipping Data			
28,800	82 x 50 x 58	138	2,600

*The SUPSALV Aweight@ is the total weight of the TSD and a heavy duty shipping pallet. The USCG Aweight@ is the total weight of the TSD and shipping container.

TSDs can greatly extend skimmer recovery work time by increasing storage volume for the skimming system. Recovered oil then can be transferred from the skimmer to a barge or another recovery point. For emergency oil transfer in salvage situations, a towed TSD may provide the only suitable storage device in restricted waters. Depending on the load in a towed TSD, it may also have a shallower draft than a conventional barge.

DISADVANTAGES

Operational constraints with towable TSDs are associated with procedures that can potentially lead to secondary spills such as offloading of recovered oil and debris, cleaning, maneuvering/mooring, and venting/decanting. Secondary spills from a damaged bladder are a concern of OSCs and can be perceived as a significant limitation to the use of TSDs in emergency response situations.

Maneuvering/Mooring: Maneuvering a towed TSD in restricted waters can be difficult to control due to potential twisting and flexing of the TSD. Extended mooring of a TSD alongside a pier in tidal or current conditions can cause chaffing, leading to abrasions and possible leaks.

Cleaning: Cleaning of contaminated TSDs presents a post-operational problem. Proper cleaning is necessary to extend the life of the TSD to allow for safe transport and to assure external surfaces are clean for future deployment and use.

Offloading: Practical experience in handling large towed TSDs is essential to accomplish safe offloading during a response operation. The device must accommodate large-inlet oil transfer pumps or suction hoses through which oil and debris can pass. Typically, submersible hydraulic pumps are used and attached to valved flanges on the bladder. For open top devices, a pump is lowered into the open bag for discharge. Careful handling of the pump and TSD is necessary to prevent damage or additional spillage.

To combat offloading problems, the USCG has taken delivery of six bladder offloading systems in early 1995 which are designed to offload viscous products. These systems remain secured to the stern flange of the bladder during recovery operations, providing a quicker turnaround of the TSD.

Positive displacement pumps allow for the most viscous material and debris to be offloaded. A remote controlled hydraulic valve ensures the product is safely transferred. Floats provide neutral buoyancy for the valve and pump. Manual cleaning methods have been the most successful. For large closed devices workers must enter the bladder to remove remaining oil residue and debris. This method is time consuming and expensive. Non-entry cleaning methods have been used with limited success, particularly with heavy oil contamination. With either method, an appropriate bermed cleaning pit is required in addition to adequate experience in handling and cleaning the TSDs. Inflatable barges with removable covers are easier to clean than bladders due to easy access.
Venting/Decanting: Gases, notably hydrogen sulfide and methane, can build up over time and require careful venting during discharge. The need for venting can usually be overcome by safe operating procedures. More data are needed to evaluate the benefits of special vent fittings on TSDs, since such fittings may increase the risk of secondary spillage while venting. Decanting of settled water can significantly increase oil storage

volume. Practically, however, installed water suction hoses usually become clogged with heavy oil and debris and quickly become useless. The discharging of settled water during a spill operation can be prohibited and is usually discounted from the total capacity of the bladder for planning purposes. Decanting is generally allowed during large spill responses. The USCG inflatable barges have a decanting hose which takes advantage of hydrostatic and gravitational properties of the situation so that pumps are not needed.

R&D EFFORTS

SUPSALV and USCG are currently working to solve some of the problems associated with TSDs:

Offloading: For offloading, SUPSALV is developing a pump adaptor system that will attach the pump to the TSD. Such an adaptor speeds offloading operations, allowing for the handling of more viscous and debris laden products. The adaptor will also reduce the chance of oil spills from the bladder itself. In 1994, the USCG tested bladders at Ohmsett to evaluate offloading high viscosity oils with the use of an experimental liner. It appeared that the viscous oil pulled the liner into the positive displacement pump making offloading extremely difficult. This was probably a function of the viscous oil and is expected to work better with lighter oils. Cleaning the TSDs proved to be difficult, awkward and expensive. After the bladder offloading tests, a half inch water inlet port was added to the bladder offloading pump (DOP-250). This inlet port would be used only for the most viscous oils to reduce discharge hose frictional head and accelerate pumping when the product contains no water.

Cleaning: SUPSALV is conducting tests with chemical cleaners/high pressure, hot water wash combinations to eliminate the need for bladder entry. Separation/decanting: The USCG also tested inflatable barges at Ohmsett to measure oil separation effectiveness and decanting ability. The principal finding was that the devices performed well as oil recovery barges. Specifically, the tests showed that oil separates quickly within the barge and that towing has little to do with the oil separation process. The decanting tube is effective in discharging fluid from the bottom of the barge, but fluid tends to come off in spurts rather than in a steady stream. Gauging devices: Methods and devices to gauge recovered volumes and drafts of TSDs are needed. A closed TSD can be over stressed in moderate to high sea states if 85% of its nominal capacity is exceeded. Jointly, SUPSALV and USCG are currently developing such a device for use with inflatable barges.

FUTURE NEEDS IN R&D

1) Perform towed TSD operational field tests and training to document standard procedures and develop field guides for spill response managers. Such a guide would include standard operating procedures and identification of conditions for use.
2) Develop improved venting devices.
3) Conduct standardized tests on current cleaning methods and agents, including analysis of the efficacy vs. chemical hazards vs. cost of different agents.
4) Perform tests on liners with lighter oils and chemicals to save cleaning costs and expand the use of TSDs to caustic chemicals. Although the liner presented problems at

the Ohmsett tests, inner liners still provide a promising mechanism for reducing cleaning costs and contamination/destruction of the external TSD material.

CONCLUSION

As with most response tools, there are certain conditions that favor the efficacy of one tool over another. For temporary storage devices, those conditions tend to involve situations where conventional, steel-hulled barges are not feasible, available or timely (i.e., remote locations and emergency lightering operations). TSDs can be air-deployed basically anywhere. For large spills, an OSC can rapidly acquire adequate temporary storage capability. Multiple TSDs keep skimming operations running by supplying a constant storage capability for skimmer systems. Most of the disadvantages associated with TSDs can be reduced through safe operating procedures and experienced personnel.

SUPSALV and USCG will continue to refine techniques and devices to reduce some of the other problems (cleaning and offloading) so that the federal asset of a large storage capability can be effectively used in future oil spill responses.

REFERENCES & TECHNICAL REPORTS

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Technical Points of Contact:

SUPSALV: Paul Hankins: ph: 703/607-2758, fax: 703/607-2757 e-mail: hankins_paul_f@hq.navsea.navy.mil
USCG: Ken Bitting: ph: 203/441-2733, fax: 203/441-2792.