Final Report of

Coast Guard-AWO Safety Partnership
Quality Action Team

on
Preventing Operational Oil Spills from Towing Vessels

January 2015

Executive Summary

Coast Guard data has shown a consistent and dramatic decline in oil spills from tank barges since the Coast Guard-AWO Safety Partnership was established in 1995, but in recent years, as the number and volume of spills from tank barges has decreased, the number, and in at least two years, the volume, of operational oil spills from towing vessels has exceeded cargo spilled from tank barges. The Quality Action Team (QAT) on Operational Oil Spills from Towing Vessels was established to assess the causes of operational oil spills from towing vessels and make recommendations to reduce the number and volume of such spills.

The group reviewed the 1997 report of the QAT on Tank Barge Transfer Spills, the draft Coast Guard Office of Investigations and Analysis (CG-INV) report on Operational Oil Spills from Towing Vessels and a detailed report from CG-INV containing pertinent information about 52 non-casualty towing vessels spills to be used as case studies. Additionally, AWO member companies provided internal incident reports and examples of best practices implemented at their companies to prevent operational oil spills.

Due to the high percentage of spills attributed to human factors and material condition and failure, particularly during internal transfers, the QAT focused on identifying specific contributing factors to these causes. QAT members closely examined human factors, such as inattention, procedural errors, mistiming and inadequate communication, and agreed that major factors contributing to spills caused by human factors are a lack of training, transfer procedures not being tailored to the specific vessel, or transfer procedures written by shore-based personnel that do not translate well to operations on the water. Members also identified contributing factors related to material condition and failure such as overcomplicated equipment, not conducting preventative maintenance and not ensuring consistent equipment purchasing procedures.

The QAT produced a table reflecting the primary causes and contributing factors to operational oil spills from towing vessels. In conjunction with the primary causes and contributing factors, the QAT came up with a compendium of best practices that could be implemented above and beyond regulatory requirements to prevent operational oil spills. These best practices are not meant to be prescriptive, but should be used as suggestions that can be uniquely applied to different regions and operations as appropriate. The best practices recommend elements to be incorporated in the initial design and subsequent alteration of a vessel as well as policies, procedures and training to prevent distraction and establish a strong management culture that has shown to prevent spills.

The QAT encourages the use of the compendium of best practices to prevent operational oil spills as a toolbox of policies and procedures that can be incorporated into a company’s safety management system. The best practices will be widely shared with industry in national and regional safety meetings as well as AWO and industry publications.

Background

The QAT on Preventing Operational Oil Spills from Towing Vessels was chartered on November 5, 2013 (Appendix I), under the auspices of the Coast Guard-AWO Safety Partnership. The Coast Guard-AWO Safety Partnership, established in 1995, is led by the National Quality Steering Committee (QSC), a group of senior Coast Guard and towing industry leaders who meet twice a year to discuss cooperative action promoting safety and environmental stewardship through sound and effective regulations and standards.

The Coast Guard Authorization Act of 2010 required the Coast Guard to submit a report to Congress on the causes of oil spills for the most recent ten-year period.[1] That report was delivered in April 2012 with analyses of spills from several marine industry segments, including towing vessels and tank barges.[2] The data showed that towing vessels had a high number of minor oil spills when compared to other commercial vessel types. Overall, the number of incidents ranked towing vessels second in total spills among commercial vessels. Further, as shown in the table below, a large majority of towing vessel spills (87%) were non-casualty or "operational" discharges, with an average of one spill every 1.4 days. This is consistent with towing industry safety statistics reports regularly prepared for the QSC by the CG-INV office. These reports have shown a consistent and dramatic decline in oil spills from tank barges since the Partnership was established, but in recent years, as the number and volume of spills from tank barges has decreased, the number, and in at least two years, the volume, of operational oil spills from towing vessels has exceeded cargo spilled from tank barges.

Casualties and Oil Spills from Towing Vessels, By Calendar Year

Year	All Casualties Involving Involving Towing Vessels	Casualties With Spills	Gallons Spilled	Non-Casualty Spills From Towing Vessels	Gallons Spilled
2001*	208	47	7,288	326	6,549
2002	900	16	3,120	249	15,448
2003	913	27	12,780	262	15,063
2004	832	41	22,770	263	18,959
2005	804	36	35,368	250	18,476
2006	1,121	53	42,928	281	4,472
2007	1,340	51	12,509	291	10,664
2008	1,360	50	22,870	250	5,715
2009	1,221	39	9,696	212	3,178
2010	1,552	36	22,666	182	3,476
Totals	**10,251**	**396**	**191,995**	**2,566**	**101,998**

* The 2001 Incident count is from a previous information system (MSIS), with different vessel recording criteria.

In August 2012, the QSC asked the AWO Interregion and Coastal Safety committees to work with CG-INV to review the towing vessel operational oil spill statistics and provide recommendations to the QSC on how best to proceed. In late 2012, CG-INV prepared a draft report titled "Operational Oil Spills from Towing Vessels, 2001-2010." The AWO safety committees reviewed the report in January 2013 and recommended that the Coast Guard and AWO work together to develop recommendations to reduce operational oil spills from towing vessels as part of the continuous improvement process, with the ultimate goal of zero spills.

[1] Public Law 111-281, Section 703.
[2] U.S. Coast Guard, Improvements to Reduce Human Error and Near Miss Incidents. Report to Congress, April 2012.

At its April 2013 meeting, the QSC endorsed this recommendation and agreed to develop a charter for a Coast Guard-AWO QAT on Preventing Operational Oil Spills from Towing Vessels. The QSC noted that one of the earliest QATs chartered by the Partnership focused on preventing tank barge transfer spills, and asked the QAT to consider whether lessons learned from this report could be applied to reduce the number and volume of operational oil spills from towing vessels.

Tasks

The Coast Guard-AWO QAT on Preventing Operational Oil Spills from Towing Vessels conducted the following tasks, as set out in its charter:

1) Review the CG-INV report on Operational Oil Spills from Towing Vessels and, as needed, additional information from CG-INV and AWO member companies to identify the most prevalent causes of operational oil spills from towing vessels;
2) Interview subject matter experts at AWO member companies, including towing vessel crewmembers, to provide further insight into the causes of operational oil spills and measures to prevent their occurrence and reduce their impact;
3) Identify and understand current industry practices to prevent operational oil spills;
4) Review the report of the Coast Guard-AWO QAT on Tank Barge Transfer Spills and consult with Coast Guard and industry personnel with knowledge of tank barge transfer operations to assess whether and how lessons learned from the tank barge sector could be applied to reduce the number and volume of operational oil spills from towing vessels;
5) Develop recommended best practices to address the identified causal factors;
6) Present a progress report to the QSC at its February 2014 meeting;
7) Present a final report to the QSC at its August 2014 meeting; and,
8) Develop an outreach plan to make AWO members and other companies throughout the towing industry aware of the QAT's recommendations and tools available to assist them in implementing these recommendations.

Membership

Co-chaired by CDR Patrick Nelson, Detachment Chief of the U.S. Coast Guard Towing Vessel National Center of Expertise (TVNCOE), and Jason Adams, Chairman of the AWO Interregion Safety Committee and then GM-Safety, Training & Environmental, Ingram Barge Company, the QAT brought together participants from the inland and coastal tugboat, towboat and barge industry, U.S. Coast Guard headquarters and the TVNCOE. (A full list of QAT members is included in its charter in Appendix I.) The QAT conducted its work between December 2013 and December 2014.

Process, Data and Findings

The QAT's first meeting was held in January 2014 to review the report of the 1997 QAT on Tank Barge Transfer Spills, the draft CG-INV report on Operational Oil Spills from Towing Vessels and a detailed report from CG-INV containing pertinent information about 52 non-casualty towing vessel spills to be used as case studies (Appendix II). Findings and analyses of these reports are described below.

QAT on Tank Barge Transfer Spills

The QAT reviewed the report of the 1997 QAT on Tank Barge Transfer Spills to assess how lessons learned from the tank barge sector could be applied to reducing operational oil spills from towing vessels. The top five causes of spills identified by the QAT were:

- Not following procedures;
- Non-functioning equipment;
- Workplace hurry up;
- Misuse of equipment; and
- Lack of knowledge among the crew.

The group agreed these are also primary causes of operational oil spills from towing vessels and these top five causes can more accurately be categorized as either human factors or material condition and failures.

Draft CG-INV Report on Operational Oil Spills from Towing Vessels

Human factors or material condition and failure were also identified as the top two causes of operational oil spills identified in the 2012 draft CG-INV report on Operational Oil Spills from Towing Vessels. Previously completed analysis of 2001-2010 data revealed that most incident causes (78%) were characterized as either human factors or material condition and failure. There was a small amount of overlap among incidents where multiple factors were identified.

	No. Of Incidents	% Of Total
Human Factors	993	43.2
Material Condition/Failure	801	34.9
External Cause	30	1.3
Multiple Factors	112	4.9
Organizational Factors	17	0.7
Unknown	344	15.0
Total	2,297	100.0

Among towing vessels that were receiving or transferring oil, human factors accounted for 75% of the spill incidents and 88% of the volume between 2001 and 2010. The average spill size for incidents involving human factors was more than double that of other spills.

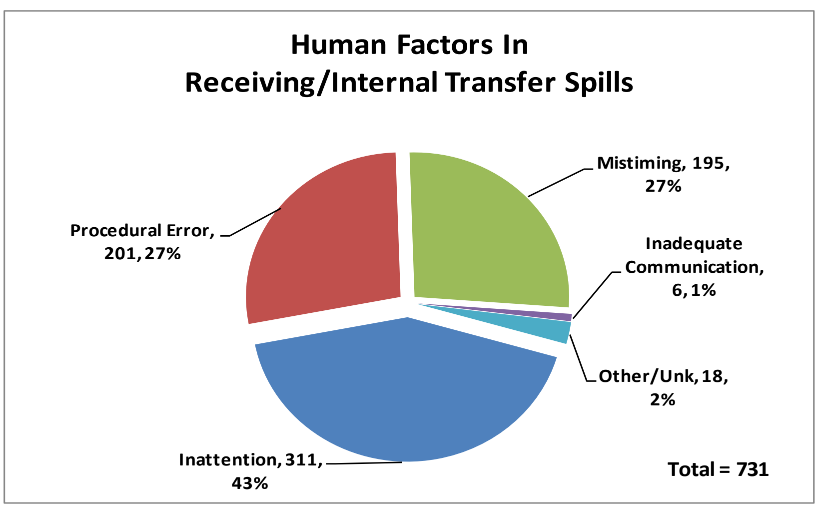
Receiving and Transfer Spills By Causal Factor Type					
Factor Type	Incidents	% Of Incidents	Gallons Spilled	% Of Volume	Gallons Per Incident
Human Factors*	731	75.1	23,864.1	88.2	32.6
Material Condition/Failure	129	13.2	1,679.2	6.2	13.0
External Cause	11	1.1	78.8	0.3	7.2
Unknown	103	10.6	1,448.0	5.3	14.1
Totals	974	100.0	27,070.1	100.0	27.8

* Multiple factors were identified in 47 of these incidents.

When shown separately, volumes spilled during internal transfers accounted for more than half of the total volume of spills associated with the receiving and transfer of oil, but only 35% of the incidents. Furthermore, of the 2,297 incidents of all types in this time period, internal transfer spills were responsible for more than one third of the total spill volume. When compared to spills occurring during the receiving of fuel or oil, the average size of internal transfer spills was about 2.6 times larger. These results may be unexpected, given that internal transfers generally involve smaller volumes of fuel or oil. Thus, the QAT agreed that placing additional emphasis on internal transfers in its discussion of best practices was appropriate.

Receiving and Transfer Spills					
Operation	Incidents	% Of Spills	Gallons Spilled	% Of Volume	Gallons Per Incident
Internal Transfer	337	34.6	15,725.6	58.1	46.7
Receiving Fuel/Oil	637	65.4	11,344.5	41.9	17.8
Totals/Average	974	100.0	27,070.1	100.0	27.8

The biggest human factor associated with the receiving and internal transfer of oil was inattention, which was identified as a cause in 43% of the incidents. Procedural errors (27%) included the performance of tasks in the wrong order or skipping steps in a procedure, such as disconnecting a hose before ensuring that all valves were closed. Mistiming errors (27%) included underestimating how quickly a tank would fill or not allowing enough time for oil flow to stop.



Human factors were then organized according to the specific spill path or source, as shown in the table below. Most spills (87%) involved some form of tank overflow (highlighted). The term "tank 'burp'" is used to indicate a tank overflow of short duration, usually driven by trapped air or a high fill rate.

Human Factors in Receiving Oil and Internal Transfer Spills						
Spill Path/Source	**Inattention**	**Procedural Error**	**Mistiming**	**Communication**	**Other/Unk**	**Totals**
Tank overflow	235	66	117	4	10	**432**
Tank overflow: Incorrect valve alignment	40	73	3	1	4	**121**
Tank 'burp'	1	5	75		1	**82**
Hose came out of tank.	8	11			1	**20**
Valve not fully closed	14	5				**19**
Transfer hose not capped	2	15			1	**18**
Sight glass valve closed	3	9				**12**
Put hose in wrong tank	1	5				**6**
Connected to wrong pipe	2	3				**5**
Tank cover left open	1	2				**3**
Overpressurized transfer hose		2				**2**
Other	4	5		1	1	**11**
Totals	**311**	**201**	**195**	**6**	**18**	**731**

Given the combination of causal human factors and the high percentage of spills, the QAT determined that it was appropriate to focus on policies, procedures and training related to the receiving and transferring of oil.

The QAT then discussed the next highest cause of spills—material condition and failure. About 13% of the receiving and transfer spills were caused by material condition and failure. Nearly two-thirds of these spills involved components of the fuel oil system. The most frequent component failures were valves (24), piping (14) and hoses (10). The hull failures were detected as tanks were filled and fuel appeared in the water next to a vessel. The causes of the remaining incidents were evenly distributed among a variety of failed components in the bilge, ballast and waste water systems. Eight of those discharges occurred from wasted pipes that ran through fuel tanks.

Material Failures While Receiving or Transferring Oil					
System	**Spills**	**% Of Spills**	**Gallons Spilled**	**% Of Volume**	**Gallons Per Incident**
Fuel Oil System	82	63.6	937.6	55.8	11.4
Hull	27	20.9	581.0	34.6	21.5
Other	20	15.5	160.6	9.6	8.0
Total	**129**	**100.0**	**1,679.20**	**100.0**	**13.0**

Given the high number of spills due to material condition and failure in the fuel oil system, the QAT focused on changes that could be made to the valve, piping and hose systems. These changes could be made during the initial vessel design or as subsequent alterations to an existing vessel.

Additional CG-INV Reports on Operational Oil Spills from Towing Vessels

In addition to the 2012 report, CG-INV provided a detailed summary of 52 spills compiled from incident briefs and CG-2692 forms, for those incidents in which one was filed. The majority of these spills occurred in 2010. Further discussion of that information by the QAT revealed that the most prevalent causes cited were:

Equipment Failures

- Line failures;

- Cracks in seals,
- Poor design;
- High flow rate; and
- Activating automatic bilge pumps.

The QAT agreed that many of these factors are based in system design.

Human Factors

- Inattention of responsible party;
- Improper monitoring;
- Intentional discharge; and
- Not following procedures.

Company Best Practices to Prevent Operational Oil Spills from Towing Vessels

Additionally, AWO member companies provided internal incident reports and examples of best practices implemented at their respective companies to prevent operational oil spills. The QAT agreed that many of the causal factors identified in the CG-INV reports were consistent with incident causes reported by AWO member companies. A compilation of these incident reports and best practices is included in Appendix III.

Due to the high percentage of spills attributed to human factors and material condition and failure, particularly during internal transfers, the QAT focused on identifying specific contributing factors to these causes. QAT members closely examined human factors, such as inattention, procedural errors, mistiming and inadequate communication, and agreed that major factors contributing to spills caused by human factors are a lack of training and transfer procedures written by shore-based personnel that do not translate well to operations on the water. Members also identified contributing factors related to material condition and failure such as overcomplicated equipment, not conducting preventative maintenance and not ensuring consistent equipment purchasing procedures. The QAT discussed best practices to address these causal and contributing factors to prevent spills.

Additional Meetings and Discussions

To increase awareness of the QAT's work and gather additional information, a facilitated discussion was held at the January 2014 meeting of AWO's Coastal and Interregion safety committees. The discussion further explored the most prevalent causes of operational oil spills from towing vessels and tactics companies use to address those factors.

On conference calls in March and June 2014, the QAT worked on a table of causal factors and best practices created based on input from the January meetings. The group agreed that, due to the variability of vessel configurations and operations, the QAT should develop a compendium of best practices rather than recommend changes to existing Coast Guard regulations. The group also discussed an outreach plan.to share the recommendations of the QAT with AWO members and other industry stakeholders to prevent operational oil spills from towing vessels.

In August 2014, the QAT held another in-person meeting in conjunction with the meeting of AWO's Coastal and Interregion safety committees. The group focused on refining and clarifying its suggested best practices.

Primary Causes and Contributing Factors of Operational Oil Spills from Towing Vessels

The table below reflects the primary causes of operational oil spills from towing vessels as well as contributing factors to spills. This information was gathered from the 2012 draft CG-INV report on Operational Oil Spills from Towing Vessels, additional CG-INV reports and QAT members' operational experience. These causes and factors are not intended to be comprehensive, but list basic problems that contribute to spills as demonstrated by the data, as well as specific factors that should be considered to address these problems.

Equipment

Primary Cause	**Factors**
Equipment Design	Consider risk mitigation in initial system design and any subsequent alterations. Factors for initial system design include: • Tank design; • Valves; • Containment boxes; • Deck design; • Vent system; • Warning and notification system; • Types of lines; and • Fuel flats Factors for subsequent alterations include: • Prevention equipment; and • Sight glasses and openings
Prevention and Maintenance	Institute preventative maintenance measures. Factors include: • Frequency; and • Standards.

Organizational/Human Factor

Primary Cause	**Factors**
Distraction	Implement measures to reduce distractions from key personnel during fuel-related evolutions. Preventing distraction should focus on ensuring that crew is only performing one task at a time.
Procedures	Design procedures so that they are conducive to effective comprehension and successful, consistent implementation. Factors include: • Corporate culture; • Management practices; and

	• Procedure implementation.
Training	Implement targeted training with a focus on continuous improvement through recurring training. Factors include: • Content of training; • Initial training; and • Recurring training.

In conjunction with these causes and contributing factors, the QAT discussed best practices that could be implemented above and beyond regulatory requirements to prevent operational oil spills. The best practices, which are based on the causal factors listed above, are included below.

Compendium of Best Practices

The best practices and recommendations below coincide with the primary causes and contributing factors of operational oil spills from towing vessels identified by the QAT and included in the table above. These best practices and recommendations are not meant to be prescriptive, but have been found to be beneficial by different companies in different situations.

EQUIPMENT

Given the high number of spills due to material condition and failure in the fuel oil system, the QAT focused on changes that could be made to the valve, piping and hose systems that have been shown to prevent spills. These changes could be made during the initial vessel design or as subsequent alterations to an existing vessel.

A. Equipment Design

The following are recommendations for equipment type and design to be incorporated in the initial design of a vessel. If possible, it is more practicable for this equipment to be incorporated into the initial design of a vessel. But this should not preclude any of these recommendations from also being made in subsequent alterations.

a. Tank Design

- A tank should have a consistent rate of fill that is controlled, but does not take too long to fill.[3]

b. Valves

- Fewer valves are ideal because this:
  - Makes the system simple;
  - Makes access easier if the crew needs to shut down the system;
  - Makes the valves easier to observe (rising stem valves are typically easier to observe in open or closed position); and
  - Minimizes the chance of error.

[3] Consult 46 CFR 31-64 for vessel type and class requirements.

c. Containment Boxes

- Ensure containment boxes are of sufficient capacity;
- Design containment boxes to drain back into the tan;.
- Locate containment boxes under the winches, hydraulic lines and connections to prevent leakage and failure.[4]

d. Deck Design

- Bulwarks should be closed around all fuel connections; and
- The deck should be designed so that it is easy for a fuel flat to come alongside the vessel and connect for fueling.

e. Vent System

- Vents should be interconnected between multiple tanks so spills goes into overflow tanks equipped with high and low level alarms.

f. Warning and Notification System

- All tanks should be equipped with alarms that have lights and sounds to alert the crew when an overflow or spill occurs.

g. Type of Lines

- Use standardized hoses throughout the fleet that are appropriate for the type of operation and equipment; and
- Use a hard piping connection whenever possible.

The following are best practices and recommendations for subsequent alterations that can be made to a vessel. Retrofitting the vessel by adding this equipment has shown to prevent spills.

a. Transfer Hoses

- All fuel and oil transfer hose fittings should have:
    - Safety straps, tape, or secure on quick fittings;
    - Buckets under the hose joints; and
    - Spill pads around joints.

b. Sight Glasses and Openings

- Double sight glasses should be used so the second glass will contain the spill if the first glass breaks; and

[4] For more information, consult 46 CFR 162.050.

- Safety check valves that automatically shut off if the flow rate is too high are recommended.

c. Fuel Flats

- Ensure the fuel flat is properly moored alongside the vessel and aligned when taking on fuel;
- Ensure the condition and length of the hose to be used during fueling is adequate; and
- Ensure the proper fuel flat is alongside the vessel while taking on fuel.

B. Prevention and Maintenance

a. Hydraulic Hoses

- Hydraulic hoses should be tested annually at 1.5 times the intended pressure;
- Hydraulic hoses should have a standard replacement schedule (typically every 2-3 years.); and
- For vessels working in saltwater environments, densyl tape around steel fittings.

b. Standards

- Crew should routinely conduct visual inspections for small holes and deck conditions;
- Companies should have a purchasing policy for hoses so all hoses are appropriate for the vessel;
- Hoses should be maintained based on the manufacturers' recommendations or greater; and
- Hoses should be for one pressure rating higher than intended pressure; and

ORGANIZATIONAL/HUMAN FACTORS

Given the combination of causal human factors and the high percentage of spills, the QAT determined that it was appropriate to focus on policies, procedures and training related to the receiving and transferring of oil.

A. Distraction

- Minimize distractions by emphasizing that only one task should be done at a time. Ways to ensure that crew is only doing one task at a time include:
  - Crew completing a fuel transfer should wear a brightly colored vest so other crew know they are not to be disturbed; or

    - Other readily apparent means of displaying crew should not be distracted during a transfer.

B. <u>Procedures</u>

a. Corporate Culture

- Institute a goal of zero spills that is reinforced by senior management;
- Require that senior management is notified of all spills to water to raise spill awareness;
- Hold crew accountable for spills resulting from failure to follow company policies and procedures or for failing to report spills;
- Give crew stop-work authority and reward crew for exercising it;
- Institute policies and procedures for management of change;
- Investigate all spills and identify causes to determine future preventative actions; and
- Provide a mechanism for feedback from the crew to tweak policies.

b. Management Practices

- All companies should include detailed vessel-specific procedures for fuel transfers and piping diagrams in their Safety Management System. Vessel-specific procedures should be written in plain language to be easily implementable and include:
    - Assigning two personnel for taking on fuel;
    - Established rates for internal transfers;
    - Securing bilge pumps;
    - Lowering “top-off” points;
    - Making filling of potable water a deck responsibility;
    - Procedures for conducting a pre-transfer conference or briefing; and
    - Efforts to enhance situational awareness.
- Checklists should be regularly audited to ensure crew is following procedures;
- A consistent methodology, such as the ISO standard, should be used for color coding of piping systems to avoid confusion if crew moves between vessels in a fleet;
- Ensure there is a centralized tracking system for corrective actions. Close out all actions while being cognizant of long-term fixes and follow-up on prevention strategies; and
- Take measures to ensure the crew are trained and familiar with the vessel they are on, including any unique aspects such as maintenance of a “quirk” list.

c. Procedure Implementation

- The master should be aware of all ongoing internal and external transfers;
- Transfers should be done in favorable conditions. If conditions are unfavorable, do not conduct the transfer, or consider a risk mitigation strategy so the transfer can be conducted safely;
- Ensure cam-locks are properly secured;
- Lock-out kits should be used for valves to ensure valves are actually locked out;
- Floating fueling sticks should be used to indicate inactive tanks;
- Vent bags should be used; and
- A valve cycling procedure (close/open/close) should be used to ensure nothing is left in valves.

C. Training

a. Content of Training

- Pictures of tanks, valves and piping systems should be included in trainee walkthrough; and
- Engineers should have video training to demonstrate proper procedures.

b. Initial Training

- Training should be done with more than one person so erroneous information is not passed down through crew;
- Training should be simple to ensure comprehension and competency;
- Standard Operating Procedures should be in plain language so crew understands process and policies;
- Crew should have pocket-sized SOPs for easy access and reference;
- PICs should be matched to a specific vessel; and
- A system of verification should be established to evaluate competency and understanding. Examples to evaluate competency are written tests and demonstrating procedures to senior personnel.

c. Recurring Training

- Crew should have to do recurring training every two to five years;
- When a crewmember goes to a different vessel, training gaps should be filled in for the vessel the crewmember is moving to; and

- Standards for maintaining PIC efficiency should be stablished, such as completing a certain number of transfers in six months.

Using and Publicizing the Compendium of Best Practices

The Coast Guard and AWO should encourage the use of this compendium of best practices to prevent operational oil spills as a toolbox of policies and procedures that can be incorporated into a company's safety management system. The QAT believes that by cataloging these prevention strategies and making them available to all towing companies, an increased awareness of risk and understanding of strategies to prevent these types of spills will result in a reduction in operational oil spills.

The findings of the QAT and future work to prevent operational oil spills from towing vessels should be widely shared with the industry through the Coast Guard-AWO Safety Partnership National QSC, Regional Quality Steering Committees (RQSCs), AWO safety committee meetings, *AWO Letter*, AWO website and TVNCOE. The AWO public affairs team should lead an effort to publicize the QAT's report in various industry publications to increase awareness of this report.

APPENDIX I

QUALITY ACTION TEAM FOR PREVENTING OPERATIONAL OIL SPILLS FROM TOWING VESSELS CHARTER

Coast Guard-AWO Safety Partnership
Quality Action Team

On

Preventing Operational Oil Spills from Towing Vessels

November 5, 2013

Background

The Coast Guard-AWO Safety Partnership National Quality Steering Committee (QSC) regularly receives towing safety statistics reports from the Coast Guard Office of Investigations and Analysis (CG-INV). These reports have shown a consistent and dramatic decline in operational oil spills from tank barges since the Partnership was established. In recent years, as the number and volume of spills from tank barges has decreased, the number and volume of operational oil spills from towing vessels has exceeded cargo spilled from tank barges.

In August 2012, the QSC asked the AWO Interregion and Coastal Safety committees to work with CG-INV to review the towing vessel operational oil spill statistics and provide recommendations to the QSC on how best to proceed. In late 2012, CG-INV prepared a report on Operational Oil Spills from Towing Vessels, 2001-2010, and the AWO safety committees reviewed the report in January 2013. The committees recommended that the Coast Guard and AWO work together to develop recommendations to reduce operational oil spills from towing vessels as part of the continuous improvement process, with the ultimate goal of zero spills. At its April 2013 meeting, the QSC endorsed this recommendation and agreed to develop a charter for a Coast Guard-AWO Quality Action Team (QAT) on Preventing Operational Oil Spills from Towing Vessels. The QSC noted that one of the earliest QATs chartered by the Partnership focused on preventing tank barge transfer spills, and asked the QAT to consider whether lessons learned from this report could be applied to reduce the number and volume of operational oil spills from towing vessels.

Objective

The Coast Guard-AWO QAT on Preventing Operational Oil Spills from Towing Vessels is established to make recommendations to prevent operational oil spills from towing vessels. The QAT will draw on the CG-INV report on Operational Oil Spills from Towing Vessels, the report of the Coast Guard-AWO QAT on Tank Barge Transfer Spills, and industry and Coast Guard expertise to assess the causes of operational oil spills from towing vessels and make recommendations to reduce the number and volume of such spills.

QAT Tasks

The Coast Guard-AWO QAT on Preventing Operational Oil Spills from Towing Vessels will conduct the following tasks:

1) Review the CG-INV report on Operational Oil Spills from Towing Vessels and, as needed, additional information from CG-INV and AWO member companies to identify the most prevalent causes of operational oil spills from towing vessels;

2) Interview subject matter experts at AWO member companies, including towing vessel crewmembers, to provide further insight into the causes of operational oil spills and measures to prevent their occurrence and reduce their impact;

3) Identify and understand current industry practices to prevent operational oil spills;

4) Review the Report of the Coast Guard-AWO QAT on Tank Barge Transfer Spills and consult with Coast Guard and industry personnel with knowledge of tank barge transfer operations to assess whether and how lessons learned from the tank barge sector could be applied to reduce the number and volume of operational oil spills from towing vessels;

5) Develop recommended best practices to address the identified causal factors;

6) Present a progress report to the QSC at its February 2014 meeting;

7) Present a final report to the QSC at its August 2014 meeting; and,

8) Develop an outreach plan to make AWO members and other companies throughout the towing industry aware of the QAT's recommendations and tools available to assist them in implementing these recommendations.

Use of Operational Oil Spills Data

To support this charter, the Coast Guard will provide data on the incidents to be studied by this QAT. In accordance with current DHS and Agency policy, the incident reports will be reviewed and personally identifiable information (PII) will be redacted prior to use by the QAT. In accordance with 5 U.S.C. 552(b)(6) and (b)(7)(C), no PII or company confidential information, such as names of private citizens; identifying role descriptions for persons whose names are withheld; Social Security numbers; home addresses; home telephone numbers; dates of birth/ages; merchant mariners document numbers; license numbers; drug/alcohol test results; or handwritten documents shall be revealed outside of the QAT deliberations.

Exemption from the Federal Advisory Committee Act

The Working Group is intended to be exempt from coverage by the Federal Advisory Committee Act (FACA) and is established and will be operated as a non-FACA committee. Specifically:

- The Coast Guard will not in any way manage or control AWO's selection of persons or groups to represent AWO in the Working Group;
- In carrying out the Working Group's tasks, Working Group members will set their own agenda which will not be determined or controlled by the Coast Guard;

- The Coast Guard will not fund the participation of AWO or AWO's representatives in the Working Group;
- The parties do not expect and the Coast Guard does not solicit consensus advice or recommendations from the Working Group.

Membership

QAT members will include:

Team Leaders: Jason Adams, Ingram Barge Company
CDR Patrick Nelson, TVNCOE

Team Members:

Pat Lee, CG-CVC
Paul Eulitt, CG-INV
TBD, Deloach Marine Services
Tim Sizemore, AEP
Darren Gautreaux, Marine Support and Management
Kimberly Hidalgo, Florida Marine Transporters
Andy Norval, Blessey Marine
Tim Robinson, SCF Marine
Jim Smith, Magnolia Marine
Susan Hayman, Foss Maritime
Alan Bish, Reinauer Transportation
Mike Brady, Bouchard Transportation Company
Mike Curry, Maxum Petroleum
Dick Lauer, Sause Brothers

Timeline

The QAT will provide a progress report to the Coast Guard-AWO National Quality Steering Committee at the February 2014 National QSC meeting and a final report at the August 2014 National QSC meeting.

Thomas A. Allegretti
President & CEO
The American Waterways Operators
National QSC Co-Chair

RDML Joseph A. Servidio
Assistant Commandant for
Prevention Policy
U.S. Coast Guard
National QSC Co-Chair

APPENDIX II

ADDITIONAL CG-INV REPORTS

CG-INV provided the QAT with detailed reports containing pertinent information about 52 non-casualty towing vessel spills to be used as case studies. The following summaries of each of these incidents are drawn from incident briefs and CG-2692 forms, as applicable.

3716418 A T/V discharged .5 gallon of hydraulic oil into the river due to a hydraulic steering line failure.

A T/V discharged approximately .5 a gallon of diesel fuel into the Intracoastal Waterway due to a pump shut-off
3707766 switch malfunction.

An UTV discharged approximately 1 gallon of hydraulic oil into the river. The discharge was caused by a
failure of the steering system coolers and/or cracks in the piping of the related cooling system when tested at a shipyard.
3707205 The discharge was stopped by closing the oil cooler's overboard discharge valve and tagging out the steering system for further investigation.

A deckhand onboard a UTV admitted he intentionally discharged used oil and fuel filters into the River.
3703337 The deckhand claims the wheelman ordered him to dispose of them in this manner.

While a T/V being was being raised in dry dock a pin-hole leak was found in the starboard #2 fuel tank.
3702809 Diesel fuel leaked out onto the dry dock and approximately 2 gallons reached the river.

A T/V spilled 12 gallons of bilge slops into a river. The sump pump malfunctioned and pumped the slops into the clean bilge
3700255 and then the slops were automatically pumped overboard.

A T/V discharged approximately 1 cup of diesel fuel into the waterway,
3700197 The spill was caused by a fuel filter coming loose and fuel then spilled onto the deck of the vessel and into the waterway.

An UTV discharged approximately 4 gallons of diesel into the river. Two small cracks were found in the engine room port fuel tank
leaking into the bilge. It was decided to transfer the remaining diesel from the port fuel tank into one of the starboard
fuel tanks using a 2 inch black rubber hose with a pneumatic pump. While the transfer was taking place a wake from a passing commercial
vessel rocked the vessel causing a discharge of diesel from the starboard fuel tank vent pipe onto the deck and into the river.
3694502 The transfer continued without further incident and the cracked fuel tank was permanently repaired.

During an internal transfer conducted by the vessel's engineer a moored T/V spilled 149 gallons of diesel fuel into the river.
The cause of diesel fuel discharged was the inattention of the responsible party to the transfer and overfilling of a fuel tank.
3685617 The diesel oil spilled from the fuel tank deck vent onto the deck, over the side and into the river. Soundings confirmed quantity spilled.

A T/V discharged approximately half a gallon of oily water into the river while pumping out the stern void. Cause was due to due to unknown
3685351 oil residue leftover in the bilge pump hose.

A T/V discharged approximately 20 gallons of diesel fuel onto the vessel's deck and an estimated 5 gallons entered the water transferring
fuel from the stern fuel oil tanks to the forward fuel oil tanks. The cause was failure of the Chief Engineer to properly monitor the vessel's
3685331 fuel oil transfer. He got engaged in another activity and forgot about the transfer causing the overfilling of the vessel's forward main fuel tanks.

A T/V discharged of approximately 4 gallons of diesel fuel into the water due to a small leak in the main fuel line from the #4 stbd aft fuel tank.

3684866	The source was secured by shutting off the bilge pump. The company replaced the leaking fuel line to prevent a reoccurrence.
3684411	A T/V discharged hydraulic oil into the river. When the vessel was started, pressure on the steering hydraulic lines caused a hydraulic line to fail and oil spilled over the stern. When an employee noticed sheen (20ft x 5ft) at the stern of the vessel, it was shut down and crew proceeded to contain and clean up.
3684232	A portable generator on board a T/V was leaking diesel fuel from a fuel line failure. The owner was contacted and source was secured and repaired.
3682300	During an emergency situation, a T/V purposely engaged the bilge pump and discharged approximately 5 gallons of oily bilge water into the river.
3679363	A T/V discharged 4 gallons of diesel fuel into the river. The cause was due to an equipment failure from a ruptured fuel tank.
3678091	A T/V discharged half a gallon of lube oil from the outer most shaft seal into the river. The discharged was caused by worn packing on the shaft seal.
3677454	A T/V discharged half a gallon of engine oil from bilges into harbor due to an automatic bilge pump activated. All bilge pumps were secured.
3675361	A T/V discharged 30 gallons of diesel while fueling. Overfill of the starboard fuel tank and oil flowed out of the vents and spilled into the water.
3667646	A T/V discharged 25 gallons of diesel fuel into the river. Investigation found an open valve that allowed fuel to re-circulate back to the fuel tanks. Diesel fuel spilled from a fuel tank vent on the port side of the tug and into the river.
3667255	A T/V discharged an unspecified amount of diesel fuel into the water. The vessel capsized and sank while repositioning dredging equipment.
3666837	An UTV awaiting shipyard maintenance discharged 65 gallons of diesel oil into the river. The cause of the spill was a failed fuel filter gasket on the port generator that allowed diesel fuel to spill into a containment area under the generator. The containment overflowed into the lower engine room shaft alley. The shaft alley pump automatically activated pumping the oil overboard.
3664754	An UTV was undergoing repair work when approximately 10 gallons of # 1 fuel oil was pumped overboard. Investigation confirmed the slop oil tank was overfilled and draining back into the lower part of the engine room then into the shaft alley bilge. When the oil filled the shaft alley the bilge shaft alley pump activated and pumped the oil into the river.
3664499	While T/V was fueling, the loading rate was too great and entered the tank faster than air could escape, causing 1 gallon of diesel fuel to spill from the fuel tank vent and overboard into the river,
3661654	A T/V spilled an unspecified amount of hydraulic oil into the river. The spill was a result of a hydraulic steering oil filter coming loose in the aft steering engine compartment and automatically pumped overboard.
3660885	A T/V discharged approximately 1 gallon of hydraulic fluid into the water. The source of discharge was from a leak in the port kort nozzle hydraulic line.

A T/V while changing tanks discharging waste oil ashore opened the wrong valve and pumped bilges into a small waste oil tank overfilling it and
3658918 spilling oil onto the deck and into the water.

3658306 A T/V discharged 5 gallons of gear oil into the Brazoria River due to a damaged underwater seal caused by a fouled port Z drive unit,

An UTV spilled 1 gallon of diesel fuel while transferring from the #4 tank to the day tank when a valve to the #5 fuel tank, not involved in transfer,
3698755 vibrated loose causing fuel to transfer into the already filled #5 tank and then vented out onto the outer deck and into the water.

The operator of a T/V transitioned from ahead to astern too quickly damaging the motors spilling .25 gallons of lube oil into the water.
3698156 The discharge was caused by equipment failure and operator error on the vessel.

3700508 A T/V discharged diesel fuel into the water from a hole in the hull in view of the #2 port fuel tank.

Idle T/V had rusted a hole through the main deck and into one of the fuel tanks. The tanks had been drained but over the years a high volume
3703678 of rain water entered into the tank, overfilling and 1 gallon of residual diesel fuel spilled out.

A T/V spilled 5 gallons of hydraulic oil into the water. Investigation revealed while the crew were using the bow capstan a hydraulic hose on the
3704726 crane burst (same hydraulic system).

3704756 An UTV while transiting the waterway took on water for an unknown reason and spilled approximately 25 gallons of diesel into the water.

A T/V discharged 5 gallons of diesel fuel oil into the water. While filling the day tanks a faulty overflow float allowed fuel to circulate to the number
3708595 four (4) port fuel tank, overflowing and spilling onto the deck of the vessel and into the water.

A T/V discharged 501 gallons of diesel fuel while underway over 22 miles of waterway. The oil emanated from the stern fueling station containment.
3713386 Investigation revealed that after shore-side fueling a fuel line return valve was not closed which allowed the stern fuel tank to be overfilled.

A T/V discharged 1.5 gallons of hydraulic oil into the water. Investigation found that while vessel was conducting mooring operations, one
3716362 of the mooring lines snagged one the vessel’s hydraulic line. The line broke and hydraulic oil flowed onto the deck and spilled into the river.

A T/V discharged one gallon of diesel oil from the no.2 fuel tank, into the grey water line, and then overboard into the water into the water.
A weld on a grey water line that runs through the # 2 fuel tank was wasting, causing fuel in the tank to penetrate the weld and
3716589 enter the main grey water line. Transferred diesel out of the # 2 fuel tank and removed the faulty grey water line that runs through the fuel tank.

3721265 An UTV was fueling and during the fueling operation a fuel tank was overfilled and a quantity of oil spilled into the river.

An UTV discharged less than one gallon of lubricating oil. The cause was due to lubricating oil tanks being overfilled. Investigation revealed that
a deckhand was priming the main diesel engine for start-up by pumping lubricating oil from a pre-lube tank. The crew member noticed the level
of the tank running low through the sight glass on the pre-lube tank. The crew member then opened a valve to fill the pre-lube tank with more

lubricating oil from a larger tank. The crew member was unaware that oil would drain back into the pre-lube tank after the engine started.
3721409 As a result the pre-lube tank became overfilled and discharged lube oil through the overflow pipe onto the deck and into the river.

A T/V was engaged in fueling operations when the operation was ceased due to back pressure while filling the #1 starboard fuel tank.
3722341 The backup pressure caused 4 gallons of diesel to spill into the water.

A T/V discharged one pint of hydraulic oil from a steering hose failure. The hose originally had chafing gear around it, but the chafing gear had moved and was not protecting the hose. The leak was caused by the rubbing of the hose on the deck. The majority of the spill was
3725468 contained on deck but some leaked into the scupper and into the water.

A tankerman on a T/V discharged 50 gallons of oily water into the river when he mistakenly unplugged what he thought was the bilge pump after cleaning out the bilge. He actually unplugged the shaft alley pump. When he left the boat for the day the bilge pump continued to intermittently pump the bilge into the secondary containment until it filled and overflowed onto the deck and into the water.
3725599 Returning early the next morning he discovered his mistake and shut down the bilge pump.

A T/V's small skiff was used to transport a boarding party to the vessel. While it was tied up alongside the tug it was swamped and sank when tugboat backed down and wake swamped the small boat. One gallon of gasoline spilled into the river from the gas can supplying fuel
3730941 to the outboard..

A T/V’s hydraulic line in the engine room broke while conducting crane operations and discharged 13 gallons of hydraulic oil into the engine room bilge. Some of the oil made its way into a cofferdam and 1 pint was automatically pumped into the waters before the crew
3732421 could secure the pump.

A T/V discharged approximately 250 gallons of diesel fuel into the bay when the vessel sank during heavy weather wave action. Cause
3740276 due to engine room flooding (main deck doors not secured).

A T/V discharged bilge oil into the waterway. A bilge suction valve was left open while using the system to flush a ballast tank in preparation
3746101 for an upcoming survey.

3748317 A T/V discharged 1 gallon of diesel while fueling. The cause was due to PIC overfilling the tank.

A T/V discharged 2 gallons of slop oil into the water while at a shipyard. Shipyard personnel were cleaning vessel’s tanks and the discharge
3749359 of the slop tank ashore wasn’t able to keep up. The oil overflowed into the shaft alley and was automatically pumped overboard.

A T/V discharged 3 gallons of bilge slop oil into the water. While in shipyard for an unspecified reason an excessive amount of water filled
3749367 the engineroom and the mixture made its way to the shaft alley and stuffing box well where the bilge oil was automatically pumped overboard.

The engineer aboard a T/V started moving slops to the slop oil tanks. A crewmember noticed oil coming out of the tank vent located on deck.
3755928 The engineer stated he believed the slop oil tanks were empty before he started the transfer.

3756859 A T/V discharged .1 of a gallon of diesel oil into the water. The discharge occurred due to wasting where a pin-hole leak in a deck drain pipe (scupper) that runs through the starboard fuel tank. The crew drained the fuel tank to below the pin-hole to stop more diesel from flowing out of the tank into the scupper and into the water.

APPENDIX III

COMPANY BEST PRACTICES AND LESSONS LEARNED

QAT members from the towing industry provided internal incident reports, best practices and lessons learned implemented to prevent operational oil spills in their respective companies for QAT consideration. The reports of six companies are included in this appendix:

Company A

Captain,

Please pass this information along to the Engineer and order parts as needed.

We have recently experience a spill to water on one of our vessels while taking on fuel from a fuel flat. The transfer was completed and the PIC in charge of the fuel flat was in the process of blowing out the line before disconnecting the hose. When air pressure was applied to the line it blew the dust cap off the quick connect fitting located at the fueling station on the other side of the boat (port side). As a result fuel oil spilled on the deck and into the water.
As we are aware, our goal is Zero Spills and environmental releases of any kind. It does not matter if the spill originates from a boat or a tank barge. Our challenge here is to develop and implement a corrective action that will prevent an incident like this from happening in the future.

Contributing factures:

1) Excessive air pressure was used by the PIC on the fuel flat when clearing the line. This resulted in an hydraulic shock to the quick connect dust cap located at the fuel manifold on the opposite side of the vessel.

2) It was reported that the dust cap did not fit tightly on the male adaptor and the cam lock levers were not secured.

3) The port side fueling station (the location of the spill) was rarely used. The starboard is the primary station used when fueling the vessel.

Corrective Actions:

1) When completing the Declaration of Inspections prior to beginning the transfer; discuss how the cross over hose will be cleared when the transfer is completed. If air pressure is to be used, agree on a safe psi and purge system slowly. Briefly discuss the dangers of over pressuring the line. You can use this case as an example of what can occur when over pressuring a line.

2) Do the following if you use dust caps and or female quick connect fittings on any piping used to transfer oils of any

type. Check all gaskets used in these fittings for excessive wear (loose when coupled) or defects. Change gaskets if you have any reason to suspect they may not perform as intended. Do you have gaskets being used in oil service that you can't remember the last time they were changed? If so, replace them. Gaskets are cheap, fuel spills are expensive.

3) Cam lock quick connect fittings are time savers and make our job easier. But we have to secure the cam arms to ensure they do not release accidentally and spill oil in the water as a result. Going forward we will secure all cam locking arms using **Velcro Cam Arm Straps** and **Nylon Cable Ties**. The Velcro cam arm safety straps(seen below) will be used whenever the cam arms are in the locked position. They nylon cable ties will be used in addition to the safety straps on fittings not in use during a transfer.

Using this incident as an example; the quick connect fittings used to connect the transfer hose from the flat to the fuel manifold on the boat would have safety straps only on all cam arms. The cam arms on the dust cap on the opposite side of the boat (the one that came off) would be secured with nylon cable ties through the rings on the locking arms and also covered by an Velcro safety strap. When the transfer is completed and the hose removed, the dust cap would be installed on the adapter using both the nylon cable tie and the safety strap.

- The Velcro Cam Arm Straps are available at Grainger part number - 38W985
- If you do not have the nylon cable ties onboard just determine the length you need and order them.

Please order your safety straps and cable ties as soon as possible to comply with this prevention measure. Let’s have Zero Spills in 2014.

A) <u>External</u> (taking on fuel from fuel flats)

<u>Contributing factors:</u>

1) Loss of situational awareness (loosening face wires while when close to topping off a fuel tank)

2) Open hatch transfer (transferring fuel from one vessel to another while in shipyard. Fuel tank hatch lid on receiving is removed and discharge hose is placed inside fuel bunker. Discharge hose jumps out of fuel tank when purging line)

3) Valve alignment (Engineer new to vessel, tops off a fuel tank and closed the fill valve. Short time later tank overflows because he closed the wrong valve)

B) <u>Internal</u> (transferring oil products internally on the vessel)

<u>Contributing factors:</u>

1) Loss of situation awareness/Distraction (Engineer transferring fuel oil from one tank to another. Pump is small and transfer rate is slow. Engineer is called on to assist with an issue at a remote location on the vessel. Receiving tank overflows while Engineer is absent).

2) Poor Design (Deck crew one washing down the exterior of the boat using the fire hose. A bleed valve is open to relieve some of the pressure off the fire hose to make it easier to handle. Water from the bleed line valve is discharging on top of a lid that is covering a spill containment surrounding the Main Engine lube oil fill connection. The lid does not completely cover the top of the spill containment and as a result water enters the container and drains into slop tanks. Slop tank over flows and spills into river.

<u>Internal External Corrective actions:</u>

- Engineers are not allow to perform any other task while conducting a transfer of any kind. Engineers are required to wear an orange vest when conducting any transfers. This informs others they cannot be disturbed and remind the Engineer they are involved in a transfer.

- Discharge hoses can only be attached to hard fittings, and never allowed to dangle in open hatches.

- During external transfers a deck hand is assigned to the Engineer to assist. The Deckhand takes on water and loosens face rigging as needed. The DH assists in monitoring fuel levels in tanks when loading. The Engineer can only transfer one oil product (fuel, lube, gear oil etc.) at a time. This helps ensure that the engineer only has to top off one tank at a time.

- When topping off fuel tanks the distance from the top of the tank to sure surface of the fuel (innage) was increased from 6" to 18".

- Some internal transfers can take hours to complete which makes it difficult to stay focused. When possible timer switches were placed on fuel pump control boxes as an added precaution. Also placed lights in upper E/R that lite up whenever the fuel transfer pump was on.

- We are considering high level alarms for fuel bunks on new construction boats.

- Color coded tape was used to mark all E/R piping and valves.

Company B

The following are the best practices we use to minimize the risk of overboard discharges while conducting vessel transfers.

- Fuel piping diagram and transfer procedures readily available.
- JSA reviewed by all crew involved.
- DOI reviewed and signed.
- Emergency contingency plan discussed and understood by all parties
- Initial, maximum and top off flow rates established and agreed on by all before transfer begins.
- Properly trained PIC's. Familiar with tank, valve and piping lay out.
- Sufficient number of personnel involved.
- If engine room sight glasses are used to monitor levels, never fill beyond the top of the sight glass, always maintain a visual reference.
- Always use hard piping connection. Never place a wand in fill tube.
- Cam locks to be secured with either pins or tape.
- Close off or block all dewatering ports.
- Have spill clean up material readily available.

Company C

We are mitigating human error using the following methods:

1. All bunker tanks are fitted with high level alarms, day tanks are fitted with high level and low level alarms and an overflow tank preventing any fuel coming from the fuel vents
2. Regarding the design issue our new vessels bunker tanks are also fitted with high level alarms and an overflow piping system which empties into a central overflow tank which has both high and low level alarms. Only the overflow tank is vented to atmosphere, there are no vents on the individual tanks. The design issue should be considered for new builds only and not as a retrofit due to the costs involved.
3. The overflow tank design also prohibits all heavy weather spills and limiting tanks to 90% of capacity on the older vessel has also proven effective.

The use of policy and procedures to limit discharges is fine but without investing proactively in equipment it can only go so far. The issue of hydraulic hoses is a bigger issue due to the tremendous pressure the hoses operate under and the fact that with high pressure it is possible to put 100-200 gallons of hydraulic oil overboard in just a few minutes. Only aggressive PM procedures and inspections can reduce these failures, along with the use of the proper hoses.
In their statistics there was no breakdown as to whether tanks had high level alarms that may have failed or been ignored. Are inland vessels fitted with any type of bunker tank alarming?

Company D

The fueling systems have been greatly simplified with a reduction in the number of valves, in some cases combining tanks to reduce the number of observations a person needs to make while fueling.

Fueling operations require two persons, with one, a PIC, controlling valves and observing tank levels, with the assistant, a PIC Trainee, standing by on the outside, or the side of the vessel nearest the fueling facility to advise the facility PIC when to start and stop.

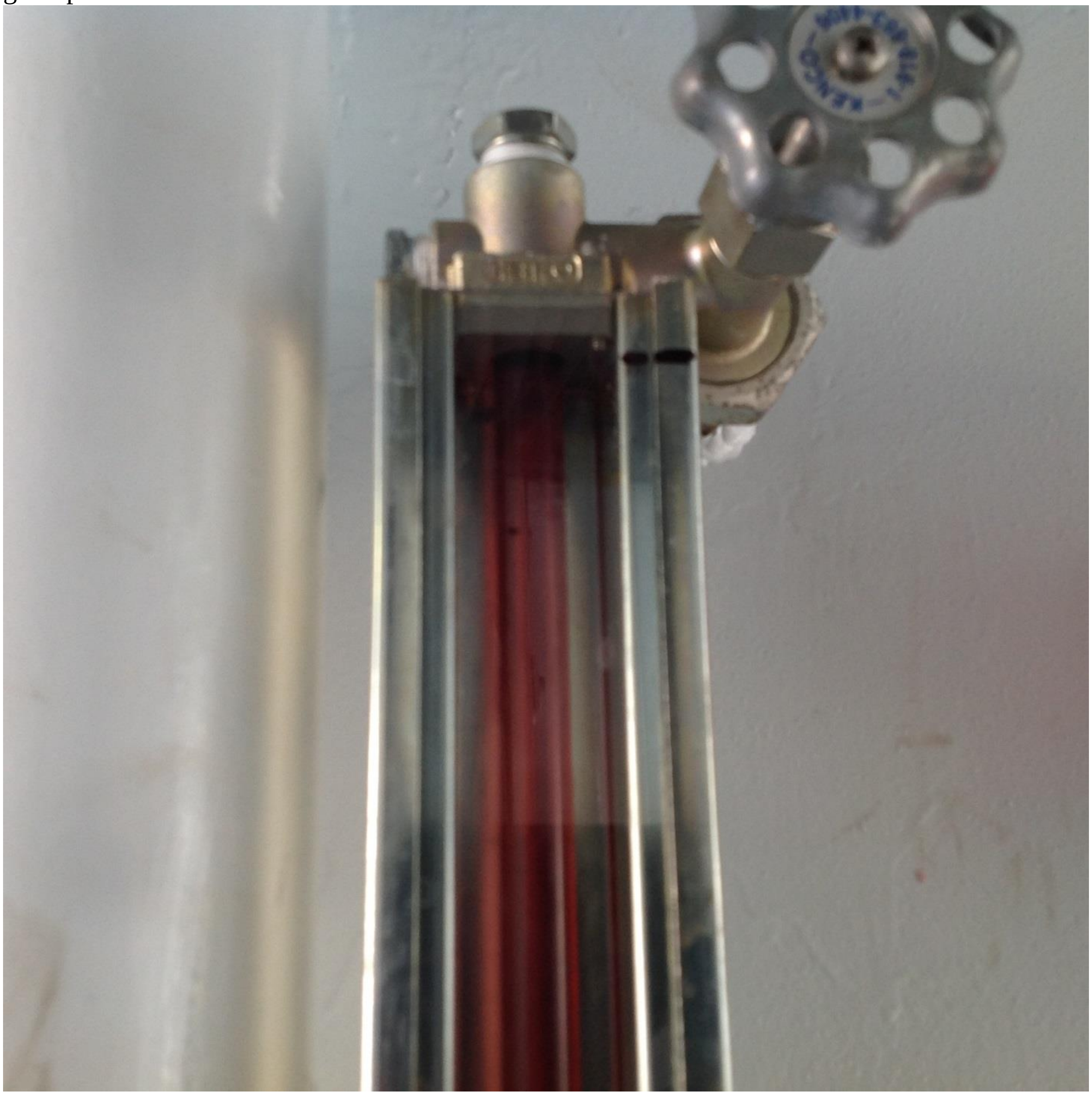
We also find that procedures for each vessel may need to be visited from time to time as a crew will find a glitch and work around it without changing their procedures to correct the issue until there is a spill.

A deck crew member is not eligible to become a PIC until he has risen to a senior deckhand level. To become a PIC they are required to come in to the office, take a test and interview. Some of the questions on the test are as simple as which way do you open or close a valve.

We have eliminated most of the fill stations which do not have a fixed type hook up and use a gas station type nozzle.

The following are some of the physical changes that we have made or are making to our vessels:

1. Improved Sight Glasses- Sight Glasses are the type which will contain leakage if the glass/plastic tube breaks or leaks



2. Fueling Stations are Contained so that any spillage is sent to a slop tank

3. Improved Labeling of Valves and Piping in the Vessel

4. High Level Alarms

5. Daytanks are controlled by high and low auto switch systems rather than depending on a person to stand by to shut off when transferring fuel. Also, each daytank has an overflow return to the same tank from which it is pulling fuel

6. Standardized Color Coding of Piping Systems

7. Good Visibility Between Valves and Sight Glasses

Filter Systems are in Containment Pans

Company E

General

1. A minimum of three qualified individuals will be involved in each fuel transfer operation unless specifically authorized by the Area Manager, Port Engineer, or Port Captain.

2. The wheelhouse watch is to be informed of any internal fuel transfer and the estimated time of completion prior to the start of the transfer. Notify the wheelhouse when the transfer is complete.

3. Individuals assigned to an oil transfer shall have no other tasks assigned.

4. Oil transfer operations will be shut down when unauthorized personnel arrive on scene.

5. Soundings, using a gauging tape, will be the primary method of verifying fuel depth. The use of sight glasses is to be considered an alternate method only when the PIC believes this technique to be more prudent; in this case the PIC must verify that sight glass valves are fully open when in use.

6. The individual in charge of gauging tanks will check the level every 15 minutes at a minimum until the level of liquid in the tank is 24" from the top. The tank will be gauged every five minutes after reaching the 24" level. Once a tank reaches 24" from the top, the individual responsible for the tank will not leave his station for any reason until the tank is topped off.

7. Maximum tank fill shall be 12 inches from the tank top or 95% capacity, whichever is less. Exceptions will be made on a case-by-case basis only, and must be approved by the Area Manager, Port Engineer, or Port Captain, and shall be logged in the wheelhouse log.

8. The individual assigned to monitor the engine room manifold shall maintain voice contact at least every 15 minutes with the tank gauger.

9. When an individual is assigned to monitor the transfer hose, this individual shall document the readings off the dock meter at least every 15 minutes; this reading will be noted on the Tug Fueling Log.

10. Common vent systems are a safety feature only, and are not to be used in lieu of soundings.

11. When loading fuel from a facility and/or truck is complete, the hose will be purged and/or drained, walked out, and relieved of any air pressure (bled out) at the highest possible point. Loading facility PIC/driver will notify tug PIC that the hose is empty, walked out (if applicable), any air pressure has been vented, and

that it is OK for the tug to disconnect. Only after this procedure and communication has taken place shall the tug PIC close both the tug's fuel header valve and the hose shut-off valve. When disconnecting fueling hose, extreme care should be taken in case any pressure or product remains in the hose or the Tug's fuel header. Cam-lock dogs should be slowly opened one at a time. If any pressure or product remains in the hose, this procedure should allow control and containment of the product.

Internal transfers (including transfers to the day tank):

1. Prior to transferring fuel, the PIC shall ensure the following:
   a. Notify the wheelhouse watch of the intended transfer and the estimated time of completion.
   b. Maintain diligent watch while transferring fuel. **Under no circumstances is the engine room to be left unattended while transferring fuel.**

2. Following the transfer the bridge watch shall be notified, all appropriate valves shall be verified as closed, and the transfer time of completion shall be recorded in the wheelhouse log.

Oil Transfer Hose

The terms "fueling hose" or "fuel hose" in this section shall be assumed to refer to any oil transfer hose used on a tug or barge other than barge cargo transfer hose.

A. Purchasing responsibilities

1. The Procurement Manager is the only person authorized to purchase barge and tug fueling hoses. When either the Port Steward's office and/or a Port Engineer are requested to provide a fueling hose, the request is to be passed on to the Purchasing Agent.

2. Company fueling hoses shall be of a heavy duty design and constructed in accordance with the Rubber Manufacturer's Association (RMA) current specification for fueling hoses. Company fueling hoses shall be rated at a maximum allowable working pressure (MAWP) of 150 psi.

3. Fueling hoses shall have ferruled cam lock fittings as end attachments. These end fittings shall be compression sleeve-type swaged couplings. Banded end attachments are prohibited.

B. Purchasing

1. The purchase order shall specify a MAWP of 150 psi and will request that the factory provide a certified test and inspection report which includes the following information:
   a. Order number and date
   b. Hose type and serial number
   c. Hose size and length

d. Length (Lo) at 10 psi
e. Length (Lt) at 1.5 x MAWP
f. Immediate release length (Lr) at 10 psi after the 1.5 x MAWP test
g. Permanent release length (Lp) after 15 minutes at 0 psi
h. Rated burst pressure
i. Manufacturer name
j. Date of manufacture
k. Date of hydrostatic test

C. Handling and storage

1. Fueling hose must be handled carefully and inspected prior to each use for nicks, gouges, tears, or cuts.

2. Fueling hose should be stored either loosely coiled or laid out straight on adequate supports.

3. Whenever possible, hose should be stored under cover or inside protected from the weather. If stored outside, hose should be protected from unintended contact with forklifts, machinery, or other stored gear and should be shielded from exposure to direct sunlight.

D. Testing and inspection

1. All new fueling hoses shall be tested when received before being placed into service.

3. All fueling hoses shall be hydrostatically tested annually to 1.5 times the MAWP and visually inspected for leaks and checked for significant elongation.

4. The annual elongation test results shall be compared to the original test data for the hose.

5. The limits for allowable elongation shall be the same as specified for barge cargo transfer hose.

6. The date of the hose test shall be marked with paint on each end of the hose.

E. Fueling hose service life

1. Fueling hoses shall be removed from service when they have reached 5 years from date of manufacture, or have failed a pressure test, or are found to have significant external damage.

Company F

1) We do refuelers Person In Charge (PIC) annual renewals. Training dept.
2) Green Dot Program (Gulf)
Training: if a deck hand wants to run lead in the gulf he has to go through a process. Green Dot. First they will need to go through the port mates. Have good deck skills and potential engine room skill. Then they go through a formal training process with the shore engineers. Which takes 4 to 5 day and they have to fuel the vessels. The training is done by the shore engineers and they have to approve. It is a pay increase when this is complete.
3) Continually raising awareness across the fleet by communication, emails, notes, safety messages, stickers, crew change meetings and getting involved.
4) Quarterly vessel/engine room inspections.
5) Add a second radio to the engine room to increase better communications during fueling.
6) During Pilothouse leadership meetings it was stressed that captain and pilots need to take ownership of the fueling of their boat. See that good fueling briefing is completed. They also review previous spill during this meeting.
7) Improved prefueling briefings held in Pilothouse. Pilothouse driven
8) Added level sticks and high level alarms in fuel tanks and slop oil tanks. (still in the process of installing)
9) Uniform Event Analysis UEA's this is a very detailed investigation process that involves many different departments. These UEA's result identifies many lessons learned. Done on all spill events and reviewed during leaderships meetings.
10) All valves and piping in engine room labeled and color coded.
11) Buddy System is used during all refueling operations.
12) Required Spill Response Drills
13) The use of Environmental friendly Trident Hydraulic fluid being used on Dock equipment and on some boats.