Recommendations for Best Management Practices to Control and Reduce Inadvertent Cargo Vapor Emissions in the Tank Barge Community

A Collaboration of
the Chemical Transportation Advisory Committee (CTAC),
the Louisiana Department of Environmental Quality (LDEQ),
the Texas Commission on Environmental Quality (TCEQ),
the U.S. Coast Guard and
the American Waterways Operators (AWO)

U.S. COAST GUARD

CTAC

Louisiana Department of Environmental Quality
LDEQ

TCEQ

The American Waterways Operators

BACKGROUND

The federal Clean Air Act and federal regulations adopted by the Environmental Protection Agency (EPA) require each state to achieve attainment with National Ambient Air Quality Standards (NAAQS). States that do not meet NAAQS must prepare a State Implementation Plan (SIP) under the Clean Air Act to incorporate reductions to meet NAAQS. Certain areas in both Louisiana and Texas have not been able to demonstrate attainment for NAAQS prior to the new 2015 ozone standard, which is more stringent. The Louisiana Department of Environmental Quality (LDEQ) is responsible for revising Louisiana's SIP to enable Louisiana to meet ozone standards, while the Texas Commission on Environmental Quality (TCEQ) is responsible for SIP preparation and oversight in Texas. EPA's approval of the SIP and attainment of NAAQS is essential for economic development and funding of federal projects.

Tank Barge Best Management Practices: History and Goals

Between 2005 and 2007, infrared "HAWK" overflights indicated potential emissions problems attributable to tank barges operating in Louisiana waters. AWO members responded by reaching out to LDEQ and the U.S. Coast Guard to review the results and formulate a plan to address the potential emissions issue. AWO immediately created the Tank Barge Emissions Working Group in order to determine the amount of inadvertent emissions attributable to tank barges operating in Louisiana and to implement necessary changes to mitigate these emissions where possible. In 2006, the working group, made up of more than a dozen liquid carriers, developed an industry Best Management Practices (BMPs) document to reduce and control emissions from barges. AWO reached out to LDEQ, TCEQ, the Coast Guard and the Chemical Transportation Advisory Committee (CTAC) to vet and further improve the BMP. The BMP quickly became the standard practice for the AWO membership.

In 2009, the BMP was included in the "Weight of Evidence" section of TCEQ's State Implementation Plan, validating the Best Management Practices as an effective voluntary tool to reduce emissions in the State of Texas.

Also in 2009, the AWO Inland Liquid Sector Committee joined with LDEQ in signing a Memorandum of Understanding (MOU) to study the effect of barge traffic on air quality in the Baton Rouge area. The MOU outlines an in-depth plan to determine if barges are impacting Volatile Organic Compound (VOC) readings at LDEQ's Carville air monitoring site. The monitoring program ran from May 1 until September 30, 2009.

At AWO's Spring Convention in Arlington, VA, in April 2009, the Inland Liquid Sector Committee directed the Barge Emissions Working Group to review, update and improve the Tank Barge Emissions BMP in an effort to continue to be proactive on air emissions. In response, the working group developed the revised and attached BMP matrix which identifies areas of activity that can accomplish emission reductions. The BMP document has been reviewed by both LDEQ and TCEQ, in addition to the Chemical Transportation Advisory Committee (CTAC) and the Coast Guard. The intent of the revisions is to enhance the BMP's

value as a living document so that AWO members can continue to incorporate these practices into their operations, and to contribute to the control and reduction of inadvertent emissions from tank barges. The intent of the revisions is not to undermine the progress of industry-agency collaboration since 2005 or to impose non-practicable demands on barge operators.

In 2011, AWO members participated in a collaborative study with a committee under the East Harris County Manufacturer's Association to determine whether the BMPs were being used by tank barge operators and if so, whether they were effective in reducing inadvertent VOC emissions. The committee, named the East Harris County Air Partners, consisted of representatives from the major chemical and refining companies in Houston, TCEQ Region 12, Port of Houston, Environmental Defense Fund, Air Alliance Houston, Harris County, and US Coast Guard. The study included both a survey to barge operators and a monitoring effort using the GasFindIR camera in key barge operating areas.

Both LDEQ and TCEQ have embraced industry's commitment to take continued action in addressing the issue of barge emissions. To supplement industry efforts, CTAC helped identify core third party stakeholders that need to be educated about the AWO BMP matrix: 1) shore tankering companies; 2) shipyard/cleaning vendors; 3) terminals/facilities; and 4) cargo inspectors/surveyors. In addition, AWO members are strongly encouraged to promote the BMPs to outside vendors to ensure industry's commitment to this initiative is fully communicated and executed.

Attached is the updated and improved BMP. AWO members will continue to promote use of this document for all facets of the tank barge industry. The tank barge industry will also proactively look for opportunities to educate, and communicate with, oil and chemical refineries and manufacturers about EPA and state agencies working to reduce emissions from all possible sources on tank barges, particularly those BMPs which rely on the participation of third parties to implement. The industry is ready to assist these stakeholders in developing fail-safe processes that ensure environmentally-safe operations and equipment as they interface with the barge industry.

As one of the most environmentally friendly forms of transportation, the barge and towing industry looks to continue its long history of leadership in environmental protection. Recent successes have proven that the most significant challenges are best resolved through government and industry collaboration. In following this long tradition of leadership and partnership, the industry looks forward to continuing its work with LDEQ and TCEQ as they develop emissions-reduction programs and implementing the BMP to reduce inadvertent emissions from tank barges.

Intended Use / Applicability to Barge Operations

In January 2015, AWO members met to discuss whether the BMPs should be reviewed and revised to reflect the experience and lessons learned over the previous 5 years of applying the best management practices to everyday barge operations. The group determined that a more clearly defined applicability needed to added so that barge operators, dock personnel, and/or inspection company personnel were not inadvertently applying a BMP where it was not safe,

practical, or effective. Since the BMPs are primarily directed towards improving a barge's ability to maintain working pressure and to minimize emissions from the pressure relief valve, the BMPs are intended only for equipment capable of holding pressure. Barges with cargos tanks equipped with open vents are not expected to comply with the BMPs, since these barges are able to vent freely as part of their original design.

Where applicable, the BMPs in the following pages will clarify if there is a specific application or operation intended and whether some barges or operations are exempted from using the BMP due to safety or other reasons.

AREA / ITEM	POTENTIAL ISSUE OF CONCERN	PROPOSED BEST PRACTICE	RESPONSIBLE PARTY
Vapor Vent Stack	Discharging – Imploding cargo _____ due to excessive vacuum build-up during discharges while vapor _____?	Ensure PV valve is operational . Begin discharge slowly, then immediately open vent stack valve to allow replacement air to enter cargo tanks Recommend two people for this process when dealing with high hazard or high vapor pressure cargoes. If the transfer is stopped for an extended period, the vapor vent stack valve should be closed until it is time to restart the transfer.	Barge PIC*
	Discharging	Keep all hatches closed, use sight glass to monitor cargo, introduce replacement air (displacement atmosphere) through the vapor vent stack/.	Barge PIC
	Loading with Vent Stack Opened (No vapor recovery)	Keep all hatches closed, use sight glass or other level indicating devices to monitor the cargo level, disperse cargo vapor through open and raised vent stack.	Barge PIC
	Securing after transfer	Ensure the vapor vent stack valve is securely closed and not leaking through the seal and/or packing.	Barge PIC
All Cargo Hatches	Improper Tightening of Dog Bolts	Ensure dog bolts and/or nuts are properly tightened with correct torque. Replace dogs and/or nuts when necessary. To prevent inadvertent emissions, use best management practices that ensure hatches are tool tight.	Barge PIC/Owner/Operator*
	Dog Left Loose	Before, during and after cargo transfers, take steps to avoid opening hatches or to otherwise minimize emissions (e.g. close load with vent stack open using sight glasses, sample through closed sampling devices, etc.). Consider procedure that restricts opening unless the barge is in a shipyard or repair facility.	Barge PIC/Owner/Operator
	Improper Gasket Material Used / Aged / Damaged	Check and replace as necessary at each opening during each yard stay, or as needed at other openings. Ensure hatch is properly seated on closing. Ensure gasket material is fit for the purpose and cargo. Adapt preventative maintenance program based on experience and data.	Owner/Operator
	Hatch Condition - Knife Edge Deteriorated	Inspect at each opening and at established intervals. Clean surfaces. Consider retrofitting hatching with stainless rings.	Owner/Operator
	Expansion Dome Hatch Opened / Closed Improperly by Cargo	PIC communicates procedures for proper closure and gauging to cargo surveyors and customers. When possible, a PIC or other designee	Cargo Surveyor/Customer/Barge PIC

	Surveyors/Customers	should accompany cargo surveyors/customers while on barge. Cargo surveyors/customers should not conduct operations unless appropriately trained on proper opening/closing procedures.	
Sight Glasses	Cracked Sight Glass	Ensure the sight glasses are inspected each transfer and cracked sight glasses are reported and replaced.	Barge PIC/Owner/Operator
	Gasket Material Worn or Improperly Installed	Inspect during each transfer and during shipyard periods. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
	Wiper Mechanism Gasket Material Deteriorated	Visually inspect during every transfer and during shipyard periods. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
	Incompatible Gasketing Material for Product	Ensure proper gasket selection, inspect during shipyard periods, inspect for leakage and other problems during each transfer and report for repair as needed.	Barge PIC/Owner/Operator
Header Flanges (Blinds)			
	Improper Tightening of Bolts	Reinforce appropriate method to ensure leak-free connection.	Owner/Operator/Barge PIC/Dock PIC

	Flange Face Surface	Inspect flange faces before connecting and report defects that interfere with a leak-free connection.	Barge PIC/Owner/Operator
	Proper Gasket Material for Product	Ensure proper gasket selection and ensure that a new gasket is used when flange connections are made.	Barge PIC/Owner/Operator
	Header Valve Seats Leaking	Ensure valves are properly seated before and after the transfer. Report needed repairs. Test during shipyard periods, at least annually. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
Cargo Pump	Deepwell Can Bleed Valve Open or Leaking	Ensure valve is properly sealed; consider installing closed bleeder system.	Owner/Operator
	Cargo Pump Seal Leaking - Cavity Holding Product	Recommend tandem seals on deep well pumps for high hazard cargoes Do not operate cargo pump mechanical seals unless pump is primed. Consider use of mechanical seal as practical.	Owner/Operator

Restricted Gauge Tubes	Gauge Tube Cap Improperly Installed / Loose / Missing	PIC communicates obligations for proper closure and gauging to cargo surveyors and customers; when possible, a PIC or other designee should accompany the inspector while on the barge. Recommend that PIC remain on the barge with the cargo surveyor/customer until gauging and sampling operation is complete. Recommend that contract shore tankermen remain on the barge until the cargo surveyor/customer completes gauging and sampling or until being released by the customer after the transfer is complete.	Cargo Surveyor/Customer/Barge PIC/Dock PIC
	Gauge Tube Threads Damaged	Inspect at each transfer when the gauge tube is opened and during shipyard periods. Repair as necessary. Adapt preventative maintenance program based on experience and data.	Barge PIC/Inspector
Slop Tank	Pressure Relief Valve Leaking or Setting Incorrect	Bench test, verify setting, confirm labeling is correct and inspect during shipyard periods. Adapt preventative maintenance program based on experience and data. Verify leak-free during each transfer.	Owner/Operator
	Improperly Secured Openings	Operate as a closed system. Develop and implement a training process on proper procedures.	Owner/Operator
	Improper Gasketing Material Used / Aged / Damaged	Consider replacement of gasket material at established intervals; recommend at least every two years. Adapt preventative maintenance program based on experience and data. Gasket should be inspected by PIC if hatch is opened.	Barge PIC/Owner/Operator
	Hatch Condition - Knife Edge Deteriorated	Inspection at each opening. Clean surfaces. Consider retrofitting hatch with stainless rings.	Barge PIC/Owner/Operator
	Sight Glass Cracked	Develop and implement training and procedures to ensure the sight glasses are inspected once each transfer and cracked sight glasses are reported and replaced. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
	Sight Glass Gasketing Material Used / Aged / Damaged	Develop and implement training and procedures to ensure proper gasket selection. Inspect during shipyard periods, and inspect for leakage and other problems each transfer. Report for repair as needed. Adapt preventative maintenance program based on experience and data.	Owner/Operator
Cargo Stripping Pump	Packing Gland Leakage	Develop and implement training and procedures. Conduct inspection prior to, during and after each transfer.	Barge PIC/Owner/Operator

	System Valves Leaking	Develop and implement training and procedures, ensure valves are properly seated before and after each transfer and inspect prior to and during each transfer. Inspect and replace if necessary while in the shipyard.	Barge PIC/Owner/Operator
	Blind Flange loose / Threads on plugs bad / Deck stripping valves leak	Develop and implement training and procedures, and conduct inspection prior to and during each transfer. Utilize cross tightening method.	Barge PIC/Owner/Operator
	Priming pot leaks/Strainer pot gasket bad	Develop and implement training and procedures: conduct inspection prior to and during each transfer. Inspect and replace gasket if necessary during shipyard periods or as needed at other openings	Barge PIC/Owner/Operator
Cargo Tanks	Leaks to Inner Bottoms and Void Spaces.Vapor Leaks due to Hull Failure	PIC to check voids for leaks at each transfer. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
	Pin hole leaks in raised trunk or deck areas	Inspect tank tops at each transfer. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
Cargo Tank Valves	Reach Rod Packing Gland Leaking (Manual / Mechanical)	Inspect prior to and during each transfer. Tighten or replace packing if needed (May Involve Shutting Down Transfer)	Barge PIC
Cargo Tank Spill Valves	Improper Gasketing Material Used / Aged / Damaged	Consider replacement of gasket material at established intervals; recommend at least every two years, or as needed at other times. Adapt preventative maintenance program based on experience and data.	Barge PIC/Owner/Operator
	Bad O rings	As part of the pre-transfer inspections, PIC verifies the spill valve has not leaked cargo or is not leaking vapors	Barge PIC
Pressure Relief Valves	Improper Gasketing Material Used / Aged / Damaged	Consider replacement of gasket material at established intervals. Adapt preventative maintenance program based on experience and data.	Owner/Operator

	Pressure Relief Valve Setting Incorrect	Bench test, verify setting, confirm labeling is correct and inspect during shipyard periods. Adapt preventative maintenance program based on experience and data. [Note: To match earlier section, should it say this: Bench test, verify setting, confirm labeling is correct and inspect during shipyard periods. Adapt preventative maintenance program based on experience and data. Verify leak-free during each transfer.]	Owner/Operator
	Bad seats inside valve	Bench Test and Inspect during shipyard periods. Adapt preventative maintenance program based on experience and data.	Owner/Operator
	Pressure Relief Valve Incorrect Rating	Verify manufacture labeling is correct and labeling is in place	Owner/Operator
Cargo Header Drip Pans	Residual Product Left in Drip Pan	Make proper notification if material or cargo ends up in drip pan. Docks should develop a process to minimize cargo in the drip pan. Facility and Vessel PICs should discuss methods to remove cargo from drip pans if/when necessary.	Facility/Dock PIC
	Rust Buildup Trapping Cargo / Vapors	Drip pans inspected and cleaned during shipyard periods. Inspect each transfer and arrange for more frequent cleaning as needed.	Owner/Operator
Over Pressurization	Potential facility barge over-pressurization	Adhere to the transfer procedures so that negative pressure is maintained when possible.	Facility/Barge PIC/Dock PIC
	Vapor Growth too High for Facility System to Remove Effectively	Stop transfer until plan to handle vapors is established	Facility/Barge PIC/Dock PIC
	Loading Rate Exceeds Barge / Facility Capabilities (Vapor Leaks)	Develop and implement training. Barge and Facility PIC should discuss and agree to maximum loading rates and transfer procedures as part of pre-transfer conference. PIC should monitor pressure and control rate as appropriate. Ensure PIC is capable of determining and controlling loading rates (able to slow load rate or stop transfer if required).	Barge PIC/Dock PIC/ Owner/Operator
	PVRV / Spill Valves Open Due to Excessive Pressure	Develop and implement training. PIC should monitor pressure and control rate as appropriate. Ensure PIC is capable of determining and controlling loading rates (slow load rate or stop transfer if required). Stop transfer until the pressure gets back into normal limits. Commence	Barge PIC/Dock PIC

		loading at a slower rate.	
	Vacuum / Pressure Gauge Leaks	Monitor pressure on vapor system during transfer. Replace gauges if needed.	Barge PIC
Cargo Vapor Pressure	High Vapor Pressure Cargo	Consider carriage of cargoes in barges rated sufficiently to prevent breathing from PV valves based on transit area of the vessel.	Shipper/Facility/Owner/Operator
	Valve Packing Leaks due to Excessive Pressure	Tighten and replace packing when necessary with appropriate material for the cargo being carried. Consider utilizing a mechanical seal.	Barge PIC/Owner/Operator
Facility Line Evacuation	Pigging/Blowing Cargo Pipelines (Vent Stack, Ullage, Dome Release)	Develop and implement training. PIC should adhere to procedures to restrict and control pigging and blowing of cargo pipelines and hoses to minimize releases and avoid cargo spillage. Ensure PIC understands that when loading under vapor control, pigging to barges is prohibited.	Faciltiy PIC/Vessel PIC
Nitrogen Introductio n	Premature PV Release - No Compression of Nitrogen for Cargo Vapor Growth	Remove excess nitrogen pressure if added at Shipyard or transferring facility. When barge has cargo vapors present, release through a shore-based vapor control system when possible.	Facility/Barge PIC/Dock PIC

Internal/External Steam Coils	Leaks through steam condensate lines to deck	Air test steam coils during shipyard periods. Blow out steam lines after every use to remove any condensate. Adapt preventative maintenance program based on experience and data.	Owner/Operator
	Steam coils leak into inner bottom/wing voids	Air test steam coils during shipyard periods and repair as needed. Adapt preventative maintenance program based on experience and data.	Owner/Operator
Inspection / Gauging	Inconsistent Methods Resulting in Unnecessary Emissions	If the cargo requires closed or restricted gauging, used closed sampling when possible. Ensure cargo surveyors use closed gauging and sampling when available.	Cargo surveyor/Dock PIC/Barge PIC/ Facility/Customer
	Lack of Oversight	When possible, PIC to escort cargo surveyor to ensure adherence to suggested BMP, provide immediate communication to barge operator management in the event that any deviations occur, and ensure vapor tightness of barge post sampling. Add training of cargo surveyors.	Cargo Surveyor/Dock PIC/ Barge PIC/Facility/Customer
	Lack of Communication	Barge owners/operators, with the support of chemical and oil refiners will inform cargo surveyors of the impact of improper gauging and sampling.	Cargo Surveyor/Dock PIC/ Barge PIC/Facility/Customer
	Training of Cargo Surveyors	Cargo surveyors/customers should not conduct operations unless appropriately trained on proper opening/closing procedures. PIC communicates procedures for proper closure and gauging to cargo surveyors and customers. When possible, a PIC or other designee should accompany cargo surveyors/customers while on barge.	Cargo Surveyor/Dock PIC/ Barge PIC/Facility/Customer

*Person in Charge.

*A forward slash ("/") combining "Owner/Operator" indicates either/or; in all other cases, forward slashes indicate "and" (either a combined effort or a shared responsibility). As a general rule the Tank Barge Emissions Working Group encourages all stakeholders to play a proactive role in addressing each responsibility where practicable.