STEEL TANK INSTITUTE

RECOMMENDED PRACTICE FOR

STORAGE TANK MAINTENANCE

R111 REVISION

2ND EDITION

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PREFACE

The Steel Tank Institute (STI), established in 1916, is a not-for-profit 501(c)(6) organization whose purpose is to secure co-operative action in advancing, by all lawful means, the common purposes of its members; and to promote activities that enable the industry to conduct itself with the greatest economy and efficiency. It is further the purpose of STI to cooperate with other industries, organizations, and government bodies in the development of reliable standards which advance industry manufacturing techniques to solve market-related problems.

This Recommended Practice is intended for use by organizations and/or individuals who are knowledgeable and experienced in tank maintenance. Note that the recommendations included in this standard are minimum recommendations. When applicable federal, state and local laws are more stringent than the requirements of this standard, then those laws and regulations shall apply.

INTRODUCTION

Operations and maintenance procedures for water monitoring and removal in fuel storage tanks have been a recommended practice for over thirty years. However, a number of factors have changed over the past few years that have increased the risk for water entry and accumulation in the storage system, and subsequent potential for microbial growth, if water is not removed.

Today's distribution/delivery infrastructure is different from only a few years ago. Terminal capacity in the United States has been shrinking, yet fuel consumption has continued to grow. As a result, more fuel is moving through distribution at a faster rate, allowing less time for water to settle out before the product moves through each phase in the distribution process. Also, as the industry has moved from proprietary to shared delivery infrastructures, individual companies have less control over the process and product.

Gasoline chemistry has changed significantly as well, from the removal of lead and MTBE, to additives such as ethanol. Most of these changes were made to comply with standards set by EPA Fuels and Fuel Additive Regulations (40 CFR 79) that became effective in 1996.

These new fuels are more susceptible to moisture accumulation, separation, and potential biodegradation accelerated by water. For example, lead was a natural poison to the microbes that can grow in a moist environment, but in today's lead-free fuels, microbial growth can more readily occur. With alcohol-enhanced fuels, "phasing" can more easily occur, separating water, gasoline, and alcohols into three distinct layers.

Most of these conditions did not exist in the 1970s, 1980s, or even much of the 1990s—certainly not to the extent that they exist today. Furthermore, microbial activity is better understood today and has been found to be a much more common phenomenon than previously realized.

Owners and operators of storage systems need to be aware of these problems and immediately implement operations and maintenance practices to monitor for and remove any water from storage tanks.

NOTE ON THE APPENDIX

Included in the Appendix of this booklet are several record-keeping forms to assist tank owners and operators to establish regular monitoring and inspection practices. Numerous resources for standards, regulations and organizations with helpful information are also provided.

1 FUELS ARE CHANGING

1.1 All Fuels

Overall, automotive fuels have had to become cleaner to accommodate newer, cleaner burning engines. While carburetors were common in the past, today fuel injection systems are used. A fuel injection system atomizes the fuel by forcibly pumping it through a small nozzle under high pressure. Fuel injection systems are more sensitive to particle contamination, thus requiring cleaner fuels.

As noted in the Introduction, operations and maintenance procedures for water monitoring and removal have been a recommended practice for over thirty years. Routine monitoring, inspection, and removal of accumulated sludge are needed to maintain fuel quality, regardless of fuel type.

1.2 Ethanol Blended Gasoline

Over ninety five percent of all gasoline sold today in the U.S. is blended with ethanol, mostly at 10% (E10). In October 2010, the US EPA approved the use of E15 (85% gasoline/15% ethanol) in 2007 automobiles and younger. Currently, only about 1% of vehicles are capable of running on E85 (85% ethanol/15% gasoline).

Fuel grade ethanol must meet ASTM 4806, *Standard Specification for Denatured Fuel Ethanol for Blending with Gasoline for Use as Automotive Spark-Ignition Engine Fuel, or ASTM D5798, Standard Specification for Fuel Ethanol for Automotive Spark-Ignition Engines*.

Ethanol is incompatible with some plastic tank materials, lining materials, and older adhesives, sealants, and gaskets. Ethanol blended fuels also have reduced tolerance for water, increasing the potential for water bottoms to form.

Ethanol-blended fuels can hold more water than traditional fuels. Once the fuel is saturated, excess water will separate and cause two distinct layers of product ("phasing"). The top layer is mostly gasoline that is lower in octane, and perhaps out of specification. The bottom layer is a mix of ethanol and water that will not work as fuel in an internal combustion engine. Further, it is in that water bottom that microbes can grow and proliferate, and where the storage system is exposed to greater than 10% of ethanol, potentially damaging incompatible equipment.

Ethanol also tends to loosen any sludge, slime, and scale that may already be present in a tank. If the tank is not cleaned before the ethanol-blended fuel is introduced, dissolved materials may cause excessive filter clogging or result in damage to engines that receive the contaminated fuel.

When storing ethanol blends, it's important to:

- Check for tank compatibility with all compositions of ethanol (steel is compatible with all ethanol blends).
- Clean the tanks before introducing ethanol-blended fuels.
- Monitor for water and contaminants frequently.
- Remove water and contaminants from the tank when identified.

1.3 Ultra Low Sulfur Diesel (ULSD)

ULSD fuel was developed with the goal of reducing air emissions. ULSD fuel enables the use of cleaner technology diesel engines and vehicles, thus promoting cleaner air. ULSD became mandatory at retail facilities as of December 1, 2010.

All diesel fuels must meet ASTM D975, *Specification for Diesel Fuel Oils*. Up to 5% biodiesel may be added to diesel fuel and still labeled as only diesel fuel.

1.4 Biodiesel

Biodiesel blend stock (B100) must meet ASTM D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*. Diesel fuel containing up to 20% biodiesel (B20) must meet ASTM D7467-08, *Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to 20)*; home heating oil applications must comply with ASTM D396-08b, *Specification for Fuel Oils*, which includes requirements for up to 5 percent biodiesel.

Biodiesel also serves as a lubricant, a common additive in diesel fuels.

Brass, bronze, copper, lead, tin, and zinc oxidize in both diesel and biodiesel fuels, creating sediments that can result in plugged fuel filters.

Pure biodiesel (B100) or blends higher than B20 cause additional problems with rubber seals, gaskets, and hoses.

Biodiesel can create further problems if it is introduced into a storage tank that previously held diesel. Number 2 diesel tends to form sediments that stick to and accumulate in storage systems, forming layers of sludge or slime; the older the system and the poorer the maintenance, the thicker the accumulation. Biodiesel, being a good cleaning agent, will dissolve these sediments and carry the dissolved solids into the fuel systems of vehicles. Fuel filters will catch most of it, but in severe cases the dissolved sediments can rupture filters and cause fuel injector failure. B20 generally doesn't create problems as much as higher blends or B100 biodiesel, but tanks should be cleaned before switching to any biodiesel.

Industry experts recommend that biodiesel meet ASTM D6751 and be used within six months of manufacture to ensure that the quality of the fuel meets specifications. Fuel degradation pathways for biodiesel are more likely with higher concentration blends. Fuel may be more likely to destabilize and do so more quickly as the blend level is increased.

When storing biodiesel, it’s important to:

- Check for tank compatibility (steel is compatible with all biodiesel blends).
- Clean the tanks before introducing biodiesel fuels.
- Monitor for water and contaminants frequently.
- Remove water and contaminants from the tank when identified.

2 PREPARING TANKS FOR CHANGES IN FUEL TYPE

2.1 Preparation for first time biofuels

Special attention needs to be given to tanks prior to introducing biofuel products for the first time. Ethanol and biodiesel blends act as a cleaning agents and when introduced to the tank, may loosen or dissolve contaminants from the tank wall. These contaminants typically collect in the tank bottom and may result in excessive dispenser filter clogging and damage to engines if the contaminate reaches the fuel system. There are numerous vendors that offer “biofuel preparation” services.

2.2 Changing between gasoline and diesel fuels

If a tank is to be converted from storing one fuel to another, the tank and its related dispensing equipment must be thoroughly cleaned, inspected, and verified to be compatible with the new fuel to be stored. Care should also be taken to make sure gasoline is not commingled with any diesel product.

2.3 Regulations

Contact your implementing agency for specific compatibility requirements. Many agencies may require owners who store biofuels follow specific requirements, which could include submitting state specific documentation.

You must notify your implementing agency at least 30 days before switching to any of the following products:

- Regulated substances containing greater than 10 percent ethanol
- Regulated substances containing greater than 20 percent biodiesel
- Any other regulated substance identified by your implementing agency

3 TYPES AND IMPACT OF FUEL CONTAMINATION

3.1 Water

High throughput in the fuel distribution/delivery infrastructure allows less time for water to settle out of the product before it's delivered into the distribution system from the refinery or as it's moved along the shipping process. Therefore, water may enter the storage system through the delivered product. Fuel may be delivered warm and, as it cools, water naturally condenses out and collects at the bottom of the tank.

Certain fuels are also more prone to moisture attraction and subsequent separation when subject to temperature swings, because a fuel's composition and temperature affect the amount of water it can hold. Generally, the higher in aromatic content and the warmer the fuel, the more water it can hold in solution. When the fuel is cooled, it causes the water to be released and settle at the bottom of a storage tank.

Common installation procedures—including open vents, low fill areas, and sloped tank installations—contribute to water accumulation.

Water can also enter a storage system via damaged fill boxes or fill cap gaskets, loose fittings or plugs, poor practices relating to spill buckets, rainwater accumulated within tank sumps, any tank orifices that are not water/vapor tight, condensation in the

storage system caused by temperature swings or air entering via vents or other openings if the tank is not tight.

3.2 Sludge

Sludge build-up results from breakdown of the fuel itself, which naturally occurs over time, and may include externally introduced contaminates that enter the tank during construction or maintenance activities, or an accumulation of contaminants contained in delivered fuel.

Contaminants such as salts in the water may cause the fuel to degrade its chemical structure to components that may be detrimental to system components, or may cause fuel additives, necessary for maintaining the quality of the fuel distribution system, to leave the fuel and enter the water.

Reddish, scaly, gritty deposits may indicate corrosion and/or silt introduction into the tank. Black or brown deposits may indicate that water contamination has degraded the fuel.

3.3 Microbial contamination

The presence of water in a storage tank, particularly with newer fuels, can allow damaging bacteria to contaminate the fuel and damage tank components. As microorganisms thrive and grow, they form a slime which breaks off and clogs small openings throughout the entire system. This is especially noticeable in filters: filter life shorter than six months or flow slowing to 3-5 gpm are warning signals.

It may be helpful to compare this bacterial phenomenon with mold, which also thrives in a moist environment, begins growing microscopically unseen to the human eye, but eventually becomes a visible, tangible substance.

Other indicators of microbial contamination include plugged fuel lines, erratic tank gauge readings, and frequent replacement of other components such as valves, rubber seals, and hoses. Sometimes, a foul, “rotten egg” smell is noticeable.

As the bacteria digest fuel, they alter it chemically to produce sludge and other materials that attack metal, rubber, fiberglass reinforced plastic, tank linings and coatings. If these byproducts reach engine fuel systems, they can plug fuel filters and cause build-up around the injection nozzles, resulting in inefficient combustion and unusual exhaust smoke.

4 HOW TO MONITOR TANKS FOR WATER AND CONTAMINANTS

4.1 Monitoring and Detection Methods

Traditional methods of monitoring tanks for water and contamination may not be adequate for modern day fuels. For traditional fuels, when water enters a tank, it settles to the bottom and is relatively easy to identify through automatic tank gauge readings or dipping the tank with water finding paste. However, in fuels containing alcohol blends and in some biodiesel blends, the water may combine with the fuel and make water detection difficult.

Tanks should be sloped ¼ inch per foot towards the supply end of the tank. When it is

not possible to slope tanks, they should be checked for water at both ends. You should check your fuel storage tank(s) for water as frequently as possible. In fact, some proactive tank owners check daily for water bottoms. Remove all water found. . Check water bottoms for microbiological contamination and treat with biocide as needed.

4.1.1 Water Paste

Alcohol-compatible water paste on a gauge stick is a quick, easy, and inexpensive way to check for the presence of a water bottom in your storage tank. A variety of different water pastes have been developed to check for water in different fuels. Make sure that you are using the correct paste for the fuel. Special pastes to be used in ethanol fuels and biodiesel can be purchased from your fuel or fuel service provider. Read the directions provided with the paste to insure that you are using the paste per manufacturer specifications. Not properly following the use instructions may lead to false or missed detections. If the paste indicates spotty or inconsistent water detection, this may be a sign of suspended water or accumulated sludge residing in the tank.

It is recommended to check the tank for water at all available access points.

Some of the more common water finding paste products are Kolor Kut, Sar-Gel, and Gasolia.

4.1.2 Automatic Tank Gauging

Automatic tank gauging (ATG) auto systems with water monitoring capability are another option. However, the water sensors must be maintained to remain functional.

Recommended maintenance and inspection schedules: Tanks using ATGs with water level sensors should be monitored daily. If a tank shows water one day and not the next, it may be an indication that water has been absorbed into an alcohol blend fuel or bio-diesel. If inconsistent water levels are observed by the ATG records, additional water paste or bottom sample investigation should occur.

4.1.3 Fuel Filters

Use water-sensitive fuel filters and watch for reduced fueling speed, as this may be a sign of fuel contamination. Most manufacturers of dispenser filters offer a fuel filter that will contain water and most contaminates. Water absorbing filters catch water, causing the filter to expand and reduce fuel dispensing rates. If slow fuel flows are being encountered, an investigation for in- tank water or contaminates should occur.

4.2 Periodic Product Sampling

In addition to the simple procedures outlined above, you should also pull periodic product samples from the inside tank bottom and inspect them. Check with your petroleum equipment dealer or fuel supplier for guidance on sampling devices and procedures. Some basic guidelines include:

- Pull samples from the low end of the tank. Tanks are often installed with a slight tilt to force water to collect in the sump.

- Be aware of the pitfalls of using the fill tube as the sampling port. If it is not located at the low end of the tank, sludge or water may not be detected. Also, if the fill tube is not installed straight, water and sludge may not be detected or it may appear that there is less quantity than there really is.
- If possible, samples should be taken from more than one location in the tank.
- When taking samples, wait at least two hours after the last fuel delivery to make sure water and contaminates have had adequate time to settle to the bottom of the tank.

If the fuel sample looks hazy (or waxy in cold weather), water is probably present. A field detection kit, available from petroleum equipment suppliers, can then be used to check the fuel for the presence of microbes and whether the fuel meets the appropriate fuel specification, such as ASTM D396 or D975. Independent labs can conduct in-depth analysis to determine the extent of any microbial contamination.

Tank bottom sampling – Tank bottom sampling tools, such as “bacon bombs” are available to collect samples directly from the bottom of the storage tank. Typically, samples are collected and placed in a glass container for visual analysis. In some cases, it is advisable to allow the sample to settle overnight to allow water and contaminates to separate from the fuel. The sample may show a clear separation of water and fuel, a clear separation of contaminate and fuel, or in some cases, three or more separate phases. If the fuel maintains a cloudy appearance, it is a good indicator that water or other contaminates have been absorbed into the fuel. If possible, bottom samples should be taken from multiple points across the bottom of the tank. When taking samples, wait at least 2 hours after the last fuel delivery to make sure water and contaminants have had adequate time to settle to the bottom of the tank.

Fuel samples from the nozzle – Visual evaluation of fuel quality can be accomplished by dispensing small samples of fuel from the nozzle into a clear glass container. It is recommended that these samples are taken during or immediately after a fuel deliver when the fuel in the tank has been stirred up and the likelihood of dispensing water or contaminates is high.

4.3 Heating Oil

Storage tanks containing oil for heating a building, whether installed inside or outside, must be checked for water annually, at a minimum.

4.4 Backup Generator Tanks

Recommendations for Heating Oil tanks above should be followed. In addition, you should discuss the shelf life of fuel with your supplier. Fuel should be changed or polished (see section 5.3) every two years if not used.

4.5 Heated Oil Tanks (No. 6)

Heated oil tanks should be monitored for temperature. In most instances, more than half the oil is returned to the tank through circulation, often at temperatures exceeding 160° F. If oil is circulated continuously during low boiler demand times, energy is wasted. The resulting excessive heat can cause sulfurs and other chemicals to be

cooked out of the oil and cause chemical reactions in the area above the liquid level. Excess heat in the tanks can be reduced by limiting circulation when oil in the tank exceeds 140°F or a temperature determined by the system designer. Auxiliary in-tank steam coils should also be controlled by a similar thermostat. High temperature coating should be used on these tanks.

5 HOW TO REMOVE WATER AND CONTAMINANTS FROM STORAGE TANKS

When it is determined that water or contaminants are present in a tank, action must be taken to remove them before the problems escalate. Uncontrolled water or contaminates can lead to phase separation, which may result in losing the entire tank of fuel or dispensing fuel that causes damage to internal combustion engines.

5.1 Multipoint water pumping

In traditional fuels, a clear separation of fuel and tank bottom water is typical. Your service contractor can readily insert a suction tube to the bottom of the tank and pump the water from the bottom of the tank.

It is advisable to pump water at all available access points from the tank. If it is determined that the pump or suction is at the lower end of the tank, the pump should be removed to facilitate water pumping at that point. Some specialty service contractors offer methods that use flexible suction tubes to remove water and loose contaminants from the entire length of the tank bottom.

Care should always be taken to ensure that tank bottom waste is disposed of properly.

5.2 Fuel Filtration/Polishing

Fuel filtration and polishing are methods that remove water and contaminates from the fuel without removing the fuel from the tank. There are many vendors that offer fuel filtration services. Fiber-optic technology or remote video cameras are two options to visually locate and observe the contaminate removal progress. Others use a variety of fuel circulation techniques to filter the water and contaminates out of the fuel.

5.3 Non-entry tank cleaning

There are a number of vendors that offer services to clean a tank without physical entry. Typically these techniques require the fuel to be removed from the tank and equipment is lowered into the tank to remotely pressure wash the tank. Some vendors supplement the washing process by using a remote video camera to monitor the progress. These techniques require contaminated wash liquids and solids to be disposed of properly.

5.4 Physical entry tank cleaning

In cases where it is determined that the amount or severity of the tank contaminants is extreme, a manned entry cleaning may be required to clean the tank adequately. Manned entry allows for the entrant to physically scrub contaminants from the tank wall.

APPENDIX A: FACILITY DESCRIPTION FORM

Company Name_____

Company Address

_____

_____

Tank #			
Capacity			
Vessel Dimensions			
Contents			
Construction			
Orientation			
Date of Installation			
Tank Manufacturer			
UL Number			
Piping			
Ancillary Equipment			
Venting System			

APPENDIX B: FACILITY SITE MAP

In this area, draw a map of all main roads, buildings, emergency evacuation routes, and locations of tanks and fire extinguisher.

APPENDIX C: STORAGE TANK SYSTEM MONTHLY INSPECTION CHECKLIST

Tank Number:_____

Facility Name:_____

Date/Time: _____

	Yes	No	N/A
Tank visually inspected			
Piping visually inspected			
Monthly monitoring method for tank is performed			
Monthly monitoring method for piping is performed			
Operations and Maintenance Plan in place and is being followed			
Spill containment free of fuel, water and debris*			
Overfill alarm is operational			
Overfill prevention equipment is operational			
Normal vents(s) operational			
Emergency vent(s) lift freely			
Tank coating in serviceable condition			
Secondary containment is free of cracks, holes, tears, or other damage			
Secondary containment free of fuel, water, and debris*			
Concrete secondary containment coating is free of cracks, flaking, or other damage			
Secondary containment drain valve is closed			
Tank checked for water. Height in inches, if found:			
Interstice of double-walled tank checked for liquid. Height in inches, if found:			
Remove water.			
Check water for microbial activity and treat, if needed.			
Regulated substance found in interstice of tank. Height in inches, if found: If measurable amount of liquid found, contact your service provider.			
Transition sump free of fuel, water and debris*			

	Yes	No	N/A
Transition sump liner in serviceable condition. Transition sump sensor at proper height & orientation.			
Dispenser sump free of fuel, water, and debris*			
Dispenser sump liner in serviceable condition			
Dispenser sump sensor at proper height and orientation			
All fuel, water and debris removed from tank system have been disposed of properly			

**Sumps should be checked within one week of a rainfall event.*

Comments and Follow Up Needed:

_____
_____
_____
_____
_____
_____
_____

Operator Name (Print): **Operator Certification Class:** **Signature**

APPENDIX D: RESOURCES

American Petroleum Institute (API)
1220 L Street, NW
Washington, DC 20005-4070
Phone: 202-682-8000
Web: www.api.org

The Filtration and Dehydration of Aviation Fuels - Sources of Dirt and Water - Methods of Detection and Removal - Maintenance of Equipment (API 1501, Revision 65). Recommended Practices relevant to water monitoring and removal for aviation fuel systems.

Bulk Liquid Stock Control at Retail Outlets (API RP 1621). Recommended Practices applying to underground storage of motor fuels and used oil at retail and commercial facilities, involving controlling stock losses, safety & pollution control to maximize profits.

Design, Construction, Operation, Maintenance & Inspection of Terminal and Tank Facilities
(API Standard 2610). Includes standards on pollution prevention and waste management, safe operations, fire prevention and protection, tanks, mechanical systems, product transfer and corrosion protection.

ASTM International
100 Barr Harbor Drive
PO Box C700
West Conshohocken, PA 19428-2959
Phone: (610) 832-9585
Web: www.astm.org

Standard Guide to Microbial Contamination in Fuels and Fuel Systems (D-6469). This guided provides an understanding of the symptoms, occurrence, and consequences of chronic microbial contamination and the control of microbial contamination in fuels and fuel systems. Applies primarily to gasoline, aviation, boiler, industrial gas turbine, diesel, marine, and furnace fuels.

Fuel and Fuel System Microbiology: Fundamentals, Diagnosis, and Contamination Control (MNL-47). A guide providing sampling strategies and techniques, recommendations for disinfecting and removing microbial contamination from fuels and fuel systems, and a variety of diagnostic tests. This guide is designed to complement Guide D-6469.

Practice for Manual Sampling of Petroleum and Petroleum Products (D-4057). Recommended procedures for sampling fuel that should become an integral part of a fuel quality program. Among other things, D-4057 states that (a) samples should be analyzed visually for water, dirt and other solids; (b) fuel should be clear and bright, not dirty or cloudy.

D7464, Standard Practice for Manual Sampling of Liquid Fuels, Associated Materials and Fuel System Components for Microbiological Testing. These practices for microbiological sampling decrease the risk of contaminating samples with extraneous microbes.

D7463, Standard Test Method for Adenosine Triphosphate (ATP) Content of Microorganisms in Fuel, Fuel/Water Mixtures and Fuel Associated Water. This test method provides a protocol for capturing, extracting, and quantifying the adenosine triphosphate (ATP) content associated with microorganisms found in conventional liquid fuels.

Standard Specification for Diesel Fuel Oil (D-975). A specification which references that "contamination levels in fuel can be reduced by storage in tanks kept free of water."

Clean Diesel Fuel Alliance
http://clean-diesel.org
Guidance for Underground Storage Tank Management at ULSD Dispensing Facilities
This document is intended to provide basic information UST maintenance recommendations.

Coordinating Research Council, Inc.
5755 North Point Parkway, Suite 265
Alpharetta, Ga 30022
Diesel Fuel Storage and Handling Guide, CRC Report No. 667
This document provides guidance to users for the storage and handling of diesel fuel.

Gas Technology Institute
1700 S Mount Prospect Road
Des Plaines, IL 60018-1804
Web: www.gastechnology.org

Characterization of Microbial Communities in Gas Industry Pipelines
A technical study about microbial contamination pertaining to natural gas infrastructure.

National Oilheat Research Alliance (NORA)
211 N Union Street, Suite 100
Alexandria, VA 22314
Web: www.nora-oilheat.org

Oilheat Technician's Manual. A manual pertaining to the heating oil industry that includes guidelines for water monitoring and removal.

The Oilheat Research Program - Fuel Technology. Ongoing research into the issue of heating oil fuel quality during transportation and storage, including the development of field monitoring/test procedures for water and other quality indicators which service technicians can implement.

Petroleum Equipment Institute
PO Box 2380
Tulsa, OK 74101-2380
Phone: (918) 494-9696
Web: www.pei.org

Recommended Practices for Installation of Underground Liquid Storage Systems. (RP100). Provides information on engineering and construction practices regarding proper installation of underground liquid storage systems, including excavating, piping, cathodic protection, secondary containment, and other aspects of tank system installation.

UST Inspection and Maintenance (PEI RP900). This recommended practice was written to promote proper inspection, operation, and maintenance of underground storage systems.

Recommended Practices for Inspection and Maintenance of Motor Fuel Dispensing Equipment (PEI RP500). PEI produced this recommended practice to minimize the possibility of fuel-dispensing system failure, to reduce fire hazards, promote fueling safety, and minimize environmental problems.

United States Department of Energy (DOE)
Maintenance and Storage of Fuel Oil for Residential Heating Systems (BNL 48406). Guideline addressing residential heating oil that includes recommendations to monitor the fuel during prolonged storage as "an essential part of maintaining good fuel quality…Contaminants in the old fuel, such as sludge and water in the tank, can degrade the quality of the new fuel."

BNL 48406 further recommends that "fuel specifications should become an integral part of the contractual agreements between the fuel supplier and the purchaser. In other words, a bulk sample of fresh fuel oil used for heating, should at least meet all of the limits in specification ASTM D-396."

United States Environmental Protection Agency (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460
Phone: 202-272-0167
Web: http://www.epa.gov/oust

Operating and Maintaining Underground Storage Tank Systems: Practical Help and Checklists (EPA 510-K-16-001)
A booklet describing quality operations and maintenance practices, compiled by State and Federal environmental regulators.

UST System Compatibility with Biofuels (510-K-15-002)
A booklet describing federal compatibility requirements when storing biofuels and petroleum-biofuel blends.

States

Check with your state authorities, commonly the Department of Weights and Measures, for regulations controlling the quantity of water allowed in fuel tanks at service stations.

DISCLAIMER

Although the information in this pamphlet is believed to be accurate and reliable, STI makes no warranties, express or implied, including NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, as to any of the ideas, information or guidance in this Recommended Practice.

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