Chemical Storage Tanks Management Plan: Regulations and Standards for Above Ground Storage Tanks

Project Description:

Glendale has at least 135 known above ground storage tanks. They need management to ensure tank permits are up-to-date, all operation requirements are met, and thorough inspections are conducted regularly. Our task was to research applicable standards and regulations for above ground storage tanks that are not covered under the scope of the SPCC requirement and RCRA. Our research and analysis resulted in a list of recommendations for Glendale’s above ground storage tank management program.

Process:

Compiled schedules and checklists to provide the city with standards for tank inspections.

Results:

City facility permits have conditions and requirements that need to be met for renewal. The International Fire Code, OSHA, and EPCRA require Hazardous Materials Management Plans, Hazardous Materials Inventory Sheets, and Safety Data Sheets for facilities with hazardous materials on site. NFPA 30, OSHA HazWopER, the State Fire Marshal’s Office, and NSF ANSI 61 contain requirements for hazardous material spill containment, fire protections, and hazard signage.

OSHA defines tanks as confined spaces, so a permit is required before entry work such as cleaning, per NFPA 623, and inspections.

The Steel Tank Institute and the American Petroleum Institute have published criteria checklists and inspection schedules based on tank capacity and corrosion rates.

Recommendations:

- Facilities should ensure compliance with permit and renewal conditions and submit appropriate and timely revisions as necessary.
- Any facilities meeting the applicability standards of the International Fire Code should submit current HMMP, HMIS, and all SDSs to the appropriate city’s Fire Marshal Hazardous Materials Unit and ensure that permits are renewed on time.
- Facilities using hazardous materials must also keep appropriate SDSs and an HMIS on site, according to OSHA requirements.
- Operate tanks containing flammable and combustible liquids, and possibly toxic and corrosive materials as well, over 1,320 gallons with overfill protections, as specified by NFPA 30, and maintain according to manufacturer’s instructions.
- Facilities should follow OSHA HazWopER requirements to prevent and contain spills, as detailed in 29 CFR 1920 Subpart H.
- Glendale facility supervisors should be familiar with proper protocol for tank entry and cleaning and should ensure outside contractors are following OSHA and NFPA 326 requirements.
- Managers should ensure the ASTs are inspected regularly following the STI or API, or a combination, inspection schedule. Inspections must follow the provided criteria checklists to ensure proper tank cleanliness, usability, and safety. Include API STD 653’s recommendations for thickness calculations and recording corrosion extent during scheduled inspections.

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**Figure 1: International Fire Code required forms**

| Hazardous Materials Management Plan | Includes a site and floor plan showing the location of emergency equipment, exits, above ground and underground storage tanks, and hazard classes of each area |
| Hazardous Materials Inventory Sheets | Provides a summary report for each area, and includes inventory amounts of solids, liquids, and gases, locations of tanks, and hazard classification |
| Safety Data Sheets | Contains information about the potential health, fire, reactivity, and environmental hazards of a chemical product, and how to work safely with it |

**Figure 2: Inspection standards comparison**

<table>
<thead>
<tr>
<th>STI/SPFA ST001</th>
<th>API STD 653</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodic Inspections</td>
<td>Conducted monthly and annually by the owner’s inspector using the monthly and annual checklists provided in the standard</td>
</tr>
<tr>
<td>External Inspections</td>
<td>Conducted every 5, 10, or 20 years, depending on tank capacity, by an STI Certified Inspector checking structure, thickness, and secondary containment condition</td>
</tr>
<tr>
<td>Internal Inspections</td>
<td>Conducted every 10, 15, or 20 years, depending on tank capacity, by an STI Certified Inspector checking for structure, thickness, and corrosion and cracking</td>
</tr>
</tbody>
</table>

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**Figure 3: Map of Glendale showing locations of project interest**

Email your project comments to: ProjectCities@asu.edu

Monica Rabb
Environmental Program Manager, City of Glendale
Project Lead

Megan Sheldon
Deputy Director of Water Services, City of Glendale
Project Lead

Al Brown
Senior Lecturer
Faculty Advisor

Ira A. Fulton Schools of Engineering
Arizona State University

Participants:

- Tennille Begay
- Johnnie Ehrlich
- Adelle Hill
- Alexis Rickets
- Brandon Sarhad
- Marie Schneider
- Johnpaul Sine
- Seaver Stockwill

Project Lead
Deputy Director of Water Services, City of Glendale
Megan Sheldon
Project Lead
Environmental Program Manager, City of Glendale
Monica Rabb
Faculty Advisor
Senior Lecturer
Al Brown
Chemical Storage Tanks Management Plan:
Benchmarking Study- Assessing Other Aboveground Storage Tank (AST) Programs

Project Description
The primary purpose of this project was to assist the City of Glendale in maintaining compliance with regulatory requirements and in developing a responsible, effective and efficient operations and maintenance (O&M) program for their ASTs. The City currently has 135 ASTs in-service and lack a formal compliance document to help regulate them. We have been tasked with creating a Standard Operating Procedure (SOP) for Glendale’s AST program.

Our Mission
Benchmark with other cities, governments, and businesses for their AST programs, Prepare and recommend an internal city compliance, operations and maintenance program to help Glendale maintain compliance with all ASTs.

Process

Methods used
• Research
• Literature Review
• Leveraged professional contacts of students and faculty.
• Collected internal data from industry and military contacts on AST documents and materials

Procedures followed
• Email and phone communications
• On-site field trip to Oasis WTP

Research Findings
• Few formal SOPs exist within the compliance range of ASTs. Owners and operators must rely on industry standards and best management practices to derive their own inspection system for their tanks.
• See Figure 2 for all data from benchmark study

Project Deliverables
• Created Comprehensive Project Report on Benchmarking of the municipal, military, and commercial sectors.
• Drafted a Sample Standard Operating Procedure (SOP) for the City of Glendale to maintain and manage their ASTs.
• Supplementary AST Inspection Criteria Checklists were made to accompany the SOP
• Amassed an appendix of over 20 documents of existing AST internal compliance data from multiple industries, military branches, and governments

Results

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Table: Benchmarking Summary of AST Management

<table>
<thead>
<tr>
<th>SOP</th>
<th>Regulating Agencies/ Standards</th>
<th>Tanks Type/ Chemicals</th>
<th>Inspection Criteria</th>
<th>Frequency of Inspection</th>
<th>Recordkeeping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of Pennsylvania</td>
<td>PA DEP, of Environmental Protection, SPCC</td>
<td>APL, STI, Petroleum Equipment Installs RP-200, NACE int</td>
<td>checklists</td>
<td>Every 7 hrs. (initial)</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>NASAP</td>
<td>National Association of reps from state ASTM agencies</td>
<td>checklists</td>
<td>varies by state</td>
<td>varies by state</td>
<td></td>
</tr>
<tr>
<td>Navajo Nation (T)</td>
<td>Navajo Nation Council, Navajo Nation Storage Tank Program, NNCWA, NV Pollution Prevention Regs., SPCC</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
<td></td>
</tr>
<tr>
<td>Apache (T)</td>
<td>NPSDE, NPSRA, SPCC</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
<td></td>
</tr>
<tr>
<td>Military:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airforce</td>
<td>Airforce, USAF, DOD, MIL, STI, ELTs</td>
<td>Flammable/ Combustible liquids, motor &amp; aviation fuels, oids</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>Army</td>
<td>Army, NFPA, SFO, Army Environmental regs,</td>
<td>/</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>Navy &amp; Marines</td>
<td>Marine Corps Ord, STI, MOB ESSP, SPCC</td>
<td>/</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>Coast Guard</td>
<td>EPA, AR 200-1, AR 200-3, SPCC</td>
<td>Fiberglass, steel</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>International Bases</td>
<td>SPCC, AR 200-1, AR 200-3, EU</td>
<td>/</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>Commercial:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honeywell (I)</td>
<td>SPCC, STI, APs, HHSE</td>
<td>Oil, chemicals</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>Boeing (I)</td>
<td>TIFRA, CWA, ROA, RCI, SPCC</td>
<td>Flammable/ Combustible liquids, motor &amp; aviation fuels, oids</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>NXP &amp; PRECHEM (I)</td>
<td>SPCC, STI</td>
<td>Oil, chemicals</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>APS (I)</td>
<td>SPCC, API, STI</td>
<td>/</td>
<td>checklists</td>
<td>3 yrs. min.</td>
<td></td>
</tr>
<tr>
<td>ASU EH&amp;S (I)</td>
<td>EMS, POM Guidelines, SPCC</td>
<td>Hydrantic Fluid</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>FAA (I)</td>
<td>SPCC</td>
<td>Fuel</td>
<td>checklists</td>
<td>3 yrs. min.</td>
<td></td>
</tr>
<tr>
<td>LAX (I)</td>
<td>Fuel Storage, LP, NPSRA, FAX, SPCC, UP, CUPA</td>
<td>Fuel</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>PHX (I)</td>
<td>SPCC</td>
<td>Fuel</td>
<td>checklists</td>
<td>Every 30 days</td>
<td>3 yrs. min.</td>
</tr>
<tr>
<td>FedEx, UPS, U-Haul (I)</td>
<td>/</td>
<td>/</td>
<td>checklists</td>
<td>/</td>
<td>3 yrs. min.</td>
</tr>
</tbody>
</table>

Key: (T) - Tribal; (I) - Industry; (t) - Transportation; Data not found or none - /; Present - ü; Not Present - û

Figure 2: Background data collected from benchmarking study

General Recommendations
• Implement a Mandatory SOP Plan Incorporating Industry Standards and Derived Best Practices
• Create a Spill Plan that Marks Where Contamination Could Occur in the Event of a Release
• Delegate Record Keeping and Compliance to a Responsible Party

Recommended Best Management Practices
• Routine visual inspections every 72 hours
• Visual inspection of grass for leak detection
• Mandatory reporting of any upgrade, change in use, or
• Inspection of grass for leak detection
• Mandatory reporting of any upgrade, change in use, or
• Use of double-wall tanks

Recommendations
• Daily/weekly/ monthly/ annual checklists,
• Minimum recordkeeping for 5 years minimum
• Routine annual training of employees
• Monitoring of pollution by vapors in soil and groundwater
• Interstitial monitoring, use of double-wall tanks
• Use of double-wall tanks
• Creation of specific regulations for storage and containment areas including provisions for outdoor storage and secondary containment wall height

Figure 3: Fall, 2019: 24 students from ASU Polytechnic, Tempe and Online campuses toured the Glendale Oasis Water Treatment Plant (WTP), to learn firsthand what policies and practices were already in place, as well as to get a sense of the overall scope of their project.

Figure 4: Glendale’s Monica Rabb and Jamie Teatsworth led students on a comprehensive tour of 5 sites with relevant ASTs and other potential contamination hazards, including the Oasis WTP, the West Water Reclamation Facility (WRF), Glendale’s landfill/MRF center, the Glendale public safety training facility, and Glendale’s municipal airport.
Project Description:
To ensure that Glendale’s facilities with tanks are following all required rules and regulations set forth by governing agencies as well as keeping up with the industrial standards, the City of Glendale has partnered with ASU (Arizona State University). In doing so the City hopes to maintain compliance with all AST (Aboveground Storage Tank) regulatory requirements. The ERM 401/501 task reviewed commonly used AST practices used by similar cities to ensure the integrity of the tanks and financial responsibility for the city.

Task 3 for this project focused on answering the following questions for ASTs less than 1320 gallons containing fuel products.

1. Is the STI-S001 Standard the correct one to use for these tanks? Are other industry standards recommended for certain types of tanks? (steel vs. fiberglass)

2. Does diesel fuel age? Many of Glendale’s back-up generator fuel tanks do not run that often, but must work in an emergency. How can/should a fuel testing program be integrated into the program?

3. Is checking the tanks on a backup generator standard practice for contractors (Cummins, GenTech, etc.)?

Process:
- Utilize reference files provided by the City of Glendale to define size and location of the various tanks present on the city facility sites. Files used include “SPI SP001 Inspection Guidance”, “SP001 6th edition Jan 2018”, “Diesel Fuel Long Term Storage”, and “2018 Inventory of ASTs_rev2”.
- Individual research completed by each team member focused on finding testing methods and standards of independent contractors. This research would then be used to make recommendations based on other successful operations.
- To understand the standards that apply to the tanks on City of Glendale facilities, STI-SP001 and API Standard 653 were analyzed. The applicable conditions were compared against the conditions of the Glendale facilities.
- To answer the question of backup generator standard practice, online research of independent contracting company practice was combined with observations and technician comments during a onsite tour of the Glendale water treatment facility.

Results:
- It is best practice to check the user’s and construction manual of each tank, to find the appropriate inspection methods recommended by the manufacturer.
- Calculate total oil storage capacity yearly to ensure SPCC rule applicability. The SPCC rule only applies when the total aboveground oil storage capacity is greater than 1320 gallons of oil. Though this plan is intended for fuel tanks that are under 1320 gallons, the total fuel capacity of each facility should be regularly calculated to determine if new SPCC tanks have been added.
- Based on the analysis from BP oil, AST fuel storage has a 1-2 year lifespan under good conditions with an ambient temperature of 20 °C. When an ambient temperature higher than 30 °C was observed, BP found fuel deteriorated within 6 - 12 months.
- The back-up generators and related tanks should follow inspection schedules recommended by STI-S001, based on the material, construction, and the substances within the tanks present at the facilities.

Recommendations:
- To determine correct inspection schedules, look to the manufacturer’s instructions, and the regulation that the tanks were built to (UL, AST, etc.) to determine correct inspection schedule.
- If qualified, a hybrid inspection program may be made, but only under the guidance of a certified P.E.
- Each individual tank must be evaluated, and knowledge of the manufacturing regulation, method of fabrication (shop vs. field-erected), material, size, and specific gravities of the containing substance must be known.
- Utilize STI-S001 for standards regarding storage of diesel in ASTs.
- As SP001 only covers storing stable, flammable, and combustible liquids at atmospheric pressure with a specific gravity less than approximately 1.0, consider creating a hybridized standard for other substances being stored onsite.
- Calculate total oil storage capacity yearly to ensure SPCC rule applicability. The SPCC rule only applies when the total aboveground oil storage capacity is greater than 1320 gallons of oil. Though this plan is intended for fuel tanks that are under 1320 gallons, the total facility should be regularly calculated.
- Provide general secondary containment material for common oil spills. Common oil spills may occur during the transfer between containers. This prevents further contamination of water sources.
- Use non-flammable containers for fuel storage. This includes material such as steel alloys.
- Perform routine maintenance inspections that City of Glendale has implemented and practiced with the contractors. This includes annual inspections of back-up generators along with quarterly maintenance.
- Continue fuel vendor contracts that include diesel fuel maintenance.
- Record all maintenance activities and inspections to assess operating costs.
- Per EPA Power Resilience Guide a sample of oil should be sent to a lab for metals testing. Metals could indicate engine wear, which may indicate that other repairs are needed.
- Run generators regularly to test them for continued proper operation. This ensures proper operation during power outages.
- Replace diesel fuel at least once a year, especially after the summer months due to the high heat and possibility of water from monsoons.