How to Stop Spill Buckets from Draining You Dry

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Introduction

Based on a review of the most recent underground storage tank (UST) system releases it appears that the weakest component is the spill bucket.

- Side Walls
- Fill Pipe Riser Penetration
- Drain Valve
Spill Bucket as Part of the UST System

Diagram of an UST system

Regular wear and tear from constant fuel deliveries by carrier(s)
Based on 5 ppb benzene standard, 1 gallon of gasoline theoretically can impact approximately 1.2 million gallons of groundwater.
Percentage of UST System Failures Attributed to Spill Buckets

- Florida Leak Autopsy: 57%
- Sacramento and Yolo county field research: 70%
- California Inspection Report: 65%
- 2007-2008 Iowa Violations: 78%
- Spill Buckets Failed Testing in Utah: 41%

Legend:
- Spill Bucket Related
- Non-Spill Bucket Related
UST Leak Sources in Florida

373 Forms

- Spill Buckets: 43%
- Dispenser & Piping Sumps: 1%
- Dispensers: 12%
- Line Leak Detectors: 3%
- Submersible Turbine Pumps: 3%
- Piping: 16%
- Delivery Vehicles: 60
- Tanks: 12%
- Flex-Connectors: 2%
- Vent Lines: 1%
- Vandalism: <1%
- Stage I Vapor Recovery: <1%
- Customer Vehicles: 1%
- Shear Valves: 1%
- Fuel Filters: <1%
- Fill Pipes: 1%
- Remote Fills: 1%

March 06

373 Documented Releases
UST Leak Sources in South Carolina

2004

2005

Spill buckets are increasingly the highest percentage of leak sources. This is likely due to states requiring regular spill bucket inspections.
Spill Bucket Life Expectancy

- **5 years** — “UST Talk”, Issue 19, Vermont ANR DEC, 2008
- **5 – 8 years** — “Preventing Leaking Spill Containment Basins and Reducing the Resulting Environmental Impact” South Carolina DHEC, June 5, 2006
- **5 – 7 years** — “Utah Tank News”, Utah DEQ, Fall 2005
- **5 years** — Industry Council on the Environment Presentation Notes, Texas CEQ, September 15, 2005
Reasons for Spill Bucket Failure

- **Product Compatibility**
  - Failure to drain liquids after fueling, resulting in prolonged contact of HDPE with hydrocarbons

- **High Usage**
  - Wear and tear
  - Abuse during deliveries from hooks to open caps and delivery hose cam locks hitting or puncturing sides of buckets

- **Improper Installation**
  - Concrete installed directly against bucket
  - Warping and cracking from compression due to delivery trucks and other vehicles driving over buckets
Murphy Historical Leak Sources
(2006 – 2009)

Since 2006 71% of our releases are from spill buckets
Average Dollars Spent on Murphy Leak Sources (2006 – 2009)

<table>
<thead>
<tr>
<th>Source</th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>USTs</td>
<td>186,211</td>
</tr>
<tr>
<td>Dispenser/Lines</td>
<td>144,121</td>
</tr>
<tr>
<td>Spill Buckets</td>
<td>58,274</td>
</tr>
<tr>
<td>Other</td>
<td>116,552</td>
</tr>
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</table>

Proactive clean-up approach during closure minimizes cost
How many spill buckets do you see?
Examples of Leaking UST Spill Buckets

Cracked bucket where riser meets spill bucket

Product incompatibility (deformation)

Cracked side wall in ribbing
# How to Test a Spill Bucket

## Spill Bucket Hydrostatic Test Form

<table>
<thead>
<tr>
<th>Spill Bucket:</th>
<th>RUL</th>
<th>PUL</th>
<th>DSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial depth of liquid (inches)</td>
<td>9</td>
<td>10</td>
<td>N/A</td>
</tr>
<tr>
<td>End depth of liquid (inches)</td>
<td>9</td>
<td>9.65</td>
<td></td>
</tr>
<tr>
<td>Total drop (inches)</td>
<td>0</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Begin time</td>
<td>11:43</td>
<td>10:17</td>
<td></td>
</tr>
<tr>
<td>End time</td>
<td>11:55</td>
<td>11:27</td>
<td></td>
</tr>
<tr>
<td>Total test time (minutes)</td>
<td>12</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Pass/Fail</td>
<td>Pass</td>
<td>Fail</td>
<td>V</td>
</tr>
</tbody>
</table>

**Comments:** Checked TPOWs - all had fill port caps rather than monitoring well caps: SW (nearest to PUL) = no odors, dry, obstructed at 4.5'; NE = no odors, DTW = 10.72' BTOC, TD = 12.50'; SE = no odors, DTW = 11.08' BTOC, TD = 12.40'.

**Hydrostatic Test Procedure:** Each bucket is filled with water to ~1-2" below the top of the fill pipe. Record begin and end times and begin and end depth of liquid in bucket. After the test is complete, drain water into tank.

**Valve Test Procedure:** Generally, spill buckets are filled with liquid to just above the valve. In these cases, the valve is opened and the liquid drained down ~1/4-inch. The valve is then closed to see if the liquid level holds.

Failure = >1/8” drop over 1 hour
Actions to Take for a Confirmed Leaking Spill Bucket

(Confirmed means failed hydrostatic test or obvious crack in spill bucket)

*Immediate actions:*

- Remove any residual free product from spill bucket
- Check tank basin wells for the presence of product or vapors
- Evaluate and remove any potential source material from wells in tank basin.
Actions to Take for a Confirmed Leaking Spill Bucket

**Short term actions:**

- Report release to appropriate state agency prior to state-specific deadline
- Schedule replacement of defective spill bucket
- Continued removal of free product to maximum extent possible
- If applicable in your state, conduct a site assessment
  - Include all relevant information about the release and actions taken to mitigate fire and vapor hazards
  - Determine if there is soil or groundwater contamination
Actions to Take for a Confirmed Leaking Spill Bucket

*During spill bucket replacement:*

- Replace any spill buckets that didn’t fail if they are greater than 5 years old
  - (Experience indicates that all spill buckets at a site should typically be replaced when one spill bucket has failed.)
- Screen soil beneath spill bucket
- Remove as much impacted soil as possible
- Collect excavation sidewall samples before backfilling with clean fill
- Collect groundwater samples from compliance wells
Actions to Take for a Confirmed Leaking Spill Bucket

**Long term actions:**

- Perform interim extraction events to reduce any residual soil contamination and to remove groundwater contamination
- Determine vertical and horizontal extent of contamination
- Identify what, if any, remediation measures must be taken
- If additional remediation is necessary, submit a Corrective Action Plan to state UST program
- Once the plan is approved, implement it to remediate soil and groundwater to applicable cleanup levels
BMPs During Spill Bucket Replacement Activities

- Have trained personnel on-site during spill bucket replacement to ensure that the following actions are taken as needed:
  - Collect soil and/or water samples
  - Define extent of impacted backfill
  - Remove impacted backfill to the maximum practicable extent
  - Continue to remove free product, if present
Methods of Source Removal

Soil/pea gravel extraction or Multi-phase Extraction

Soil excavation by hand
Case Study 1

- Received a report of product and vapors in utility line. The UST system checked tight. It was determined that the release occurred due to spill buckets.
Case Study 1 Air Photo
Case Study 2

- System tested tight, however free product was present in the tank pit observation wells. Spill buckets failed and are the source of the free product.
Case Study 2 Cross-Section
Case Study 3

- Spill bucket was replaced and multi-phase vacuum (MPE) extraction performed. Concentrations began to drop, then spiked up.
- Another spill bucket had failed.
- The remaining spill buckets were replaced, MPE was repeated. Concentrations have declined to NAM levels.
# Case Study 3 Concentration Trend

<table>
<thead>
<tr>
<th>Sample</th>
<th>Date</th>
<th>Benzene</th>
<th>Toluene</th>
<th>Ethylbenzene</th>
<th>Total Xylenes</th>
<th>MTBE</th>
<th>EDB</th>
<th>Naphthalene</th>
<th>1-Methyl-Naphthalene</th>
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<td>160</td>
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<td>32 LB</td>
<td>44 L</td>
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</table>
Summary

- Based on the data, spill buckets are the primary source of new UST system releases.
- Spill buckets should be inspected and tightness tested on a regular basis.
- If the spill buckets have failed:
  - Always check for free product and vapors in tank basin observation wells.
  - Remove impacted media during the bucket replacement and the cleanup timeframe and cost can be dramatically reduced.
  - Replace with removable insert liner or dw spill bucket.