Field Based Research Update and Summary

UST/LUST Conference 2005

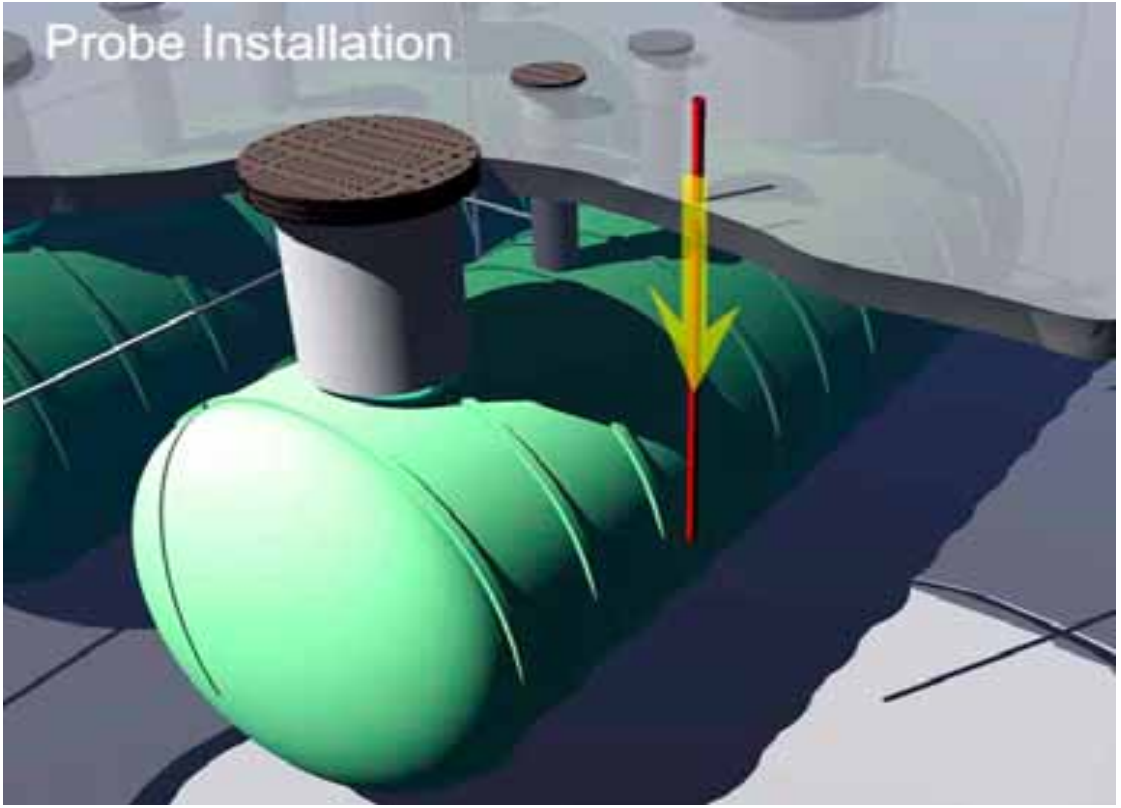
Key Topics

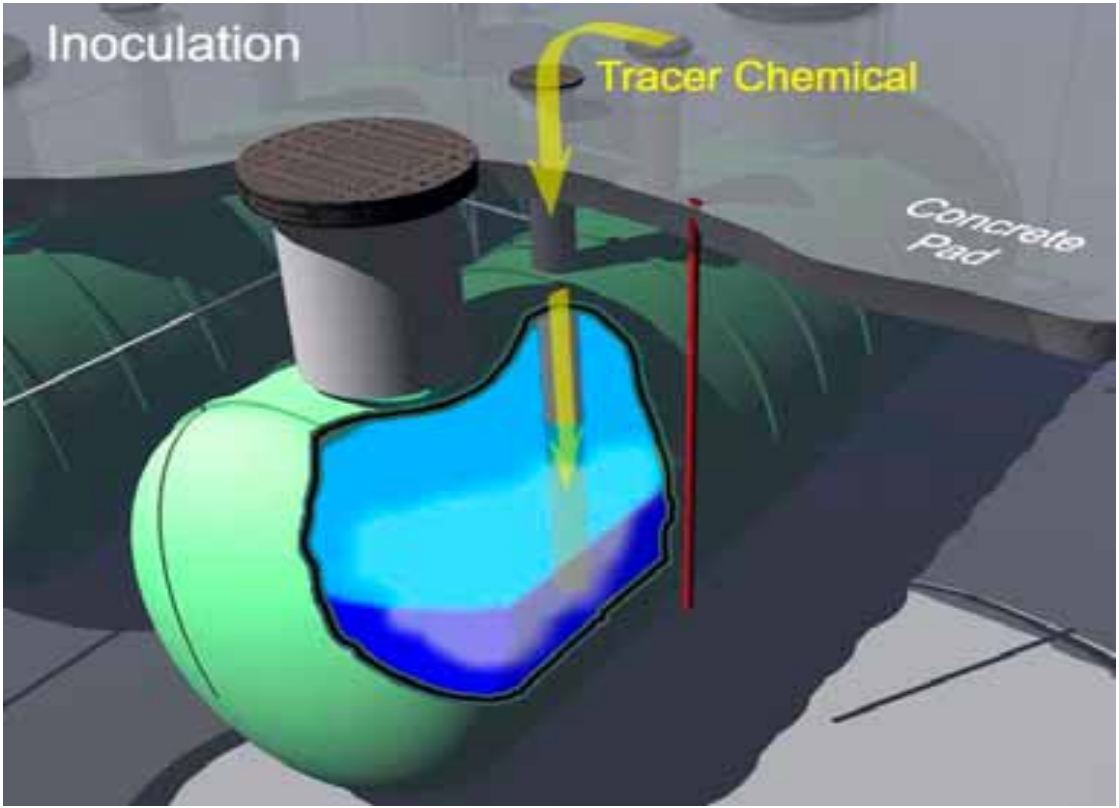
- Review Field Based Research Project objectives and Phase I findings
- Introduction to Phase II findings
- Overview of common problems and recommended solutions

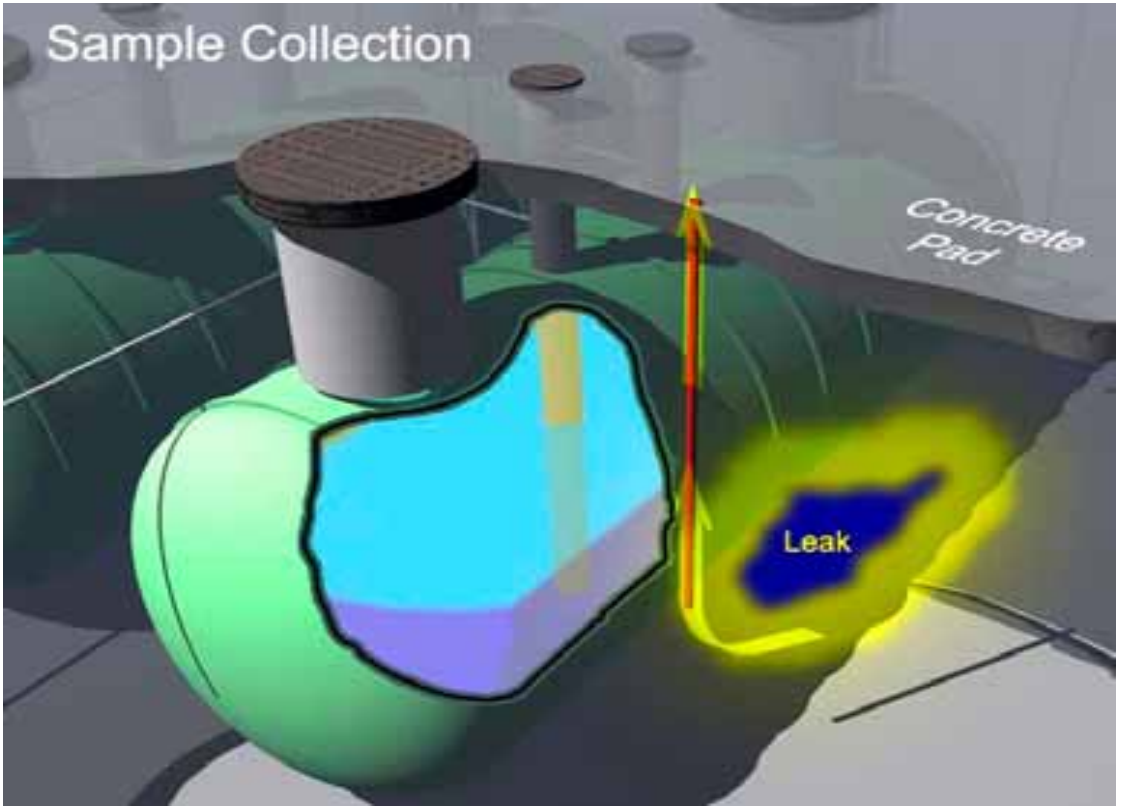
Key Points

- Tracer tests monitor the movement of the tracer chemicals from the interior of the system to the exterior. If the tracer gets out, the product follows the same pathway.
- Leaks were detected from a significant fraction of single wall piping.
- Vapor leaks seem to account for the majority of product released.
- Most vapor leakage is associated with tank top fittings.
- Technicians repair and maintain systems as guided by test results. The system is only as tight as the test.
- Spill buckets tend to contain high levels of product and tracer vapors. Keep drain valves tight and keep spill buckets clean and isolated from the backfill.

Vertical Sampling Probe Array

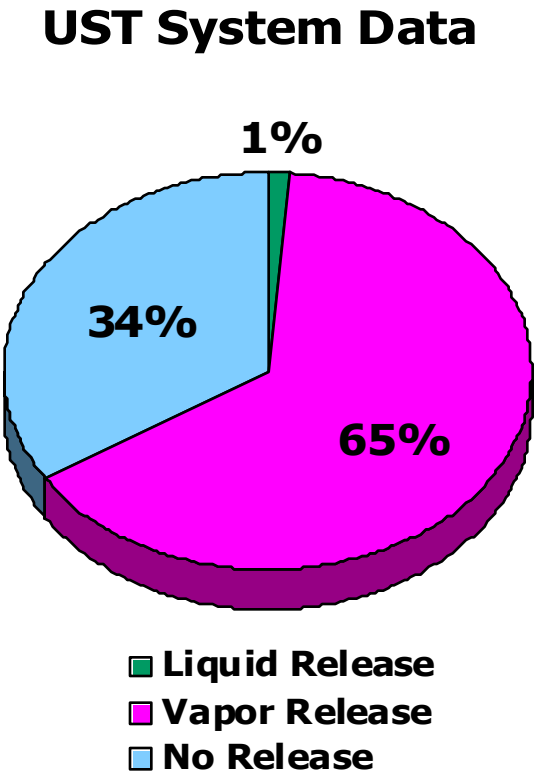






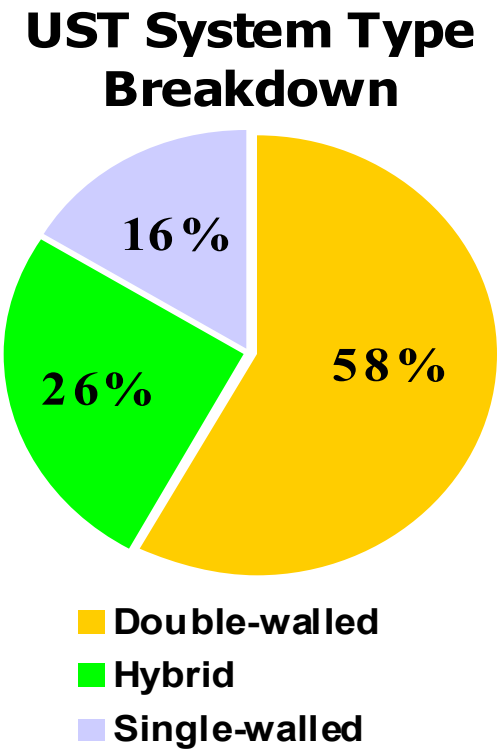
Sacramento and Yolo Counties Data

- Total UST Systems Tested: **73**
- UST Systems with **NO Release: 25**
- UST Systems with **Suspected Vapor Release: 47**
- UST System(s) with **Liquid Release: 1**



Composition by UST System Type

- Total: 73
  (at 23 facilities)
- Double-walled: 42 (58%)
- Hybrid: 19
  (26%)
- Single-walled: 12 (16%)



Leaks from Single Wall Piping

- Single wall piping systems with detected leaks: 8%
- Facilities (single wall piping) with at least one leak: 25%

Vapor Recovery System by Type

System Type	Fail/Total	Fail %	Tracer Average
Balance	30/48	62%	0.8
Assist	18/25	72%	3
Diesel	10/30	33%	0.4

Evaluation Tracer Mass Balance Model

Tracer	Mass of released to UST backfill (mg)	Mass of tracer release estimated from soil vapor levels (mg)
A	175	165
B	90	96
W	235	196
R	6.7	8.7

Vapor Leaks

- Systems with detectable vapor leaks: 60%
- Facilities with detectable vapor leaks: 80%
- Facilities releasing approximately 1,000 pounds/yr: 7%
- Facilities releasing 10 to 100 pounds/yr: 38%

Investigation of Leak Locations

- Facilities with tracer detections, initial test: 80%
- Failed systems that failed second test after unaided repairs: 82%
- *Failed systems that failed second test after guided repairs: 8%

- "Guided repairs" were assisted with on-site analytical for identifying leaking components and immediate re-test of repairs.
- Except for leaks designated as probable liquid leaks, repairs were made only to accessible or non-buried fittings.
- To test the hypothesis that these were mostly vapor leaks, tanks selected for guided repair had all tank top fittings within sumps.

What were the common problems?

- Automatic Tank Gauge access riser caps and signal cable penetrations
- Spill Bucket connections and significant leaks from drain valves
- Tank top connections: joints in risers, threaded fittings without joint compound, improperly seated o-rings and gaskets
- STP heads: mounting plate gaskets, weeps from flex connectors and joints, leaking pressure return lines
- Piping: adhesion failures, threaded fittings, buried flex connectors

Estimates of Frequencies from Current Tests

- Facilities requiring:
  - some repair before testing: ~100%
  - repair to fittings in turbine sumps, turbine head connections: ~ 30%
  - repairs to tank risers or spill bucket to riser connections: ~50%
  - drain valves: ~ 40%
  - Replacement of buried spill buckets that release liquid to the soil : ~ 30% of facilities with direct-bury spill buckets
  - repairs to ATG caps or penetrations: ~80%
  - repair to vapor or vent piping: ~5%
  - repair to buried product piping: ~2% (much of the piping is double wall, leak in primary)

Leak at ATG cap cable penetration

PRAXAIR

Praxair Business Confidential

ATG Riser Cap – Stripped Threads

A common leak location at the spill bucket mounting ring

Leak at threaded riser-adapter connection

Closer view of the “square” end, gasket leaked

Water level in spill bucket 15 minutes after filling with water, leak direct to backfill

PRAXAIR

Praxair Business Confidential

Condensing vapors leak through the mounting plate bolt holes

Condensing vapors helped preserve the original black coating

Corroded conduit providing pathway from sump to backfill

Areas of Focus

- Single walled systems need to be proven tight to a higher standard.
- Tank top leaks need to be addressed.
- Petroleum liquids and vapors need to be segregated from water and soil.
  - Keep the leaks in the sumps.
  - Keep the sumps and spill buckets clean.
  - Isolate the sumps and spill buckets from the soil.

Examination of Leak Detection Standards

- At what magnitude is a leak too big to ignore?
  - 10 pounds per year
  - 100 pounds per year
  - 1,000 pounds per year
- 13 pounds per year (2 gallons liquid, 2000 gallons vapor):
  - 0.0002 gallons per hour of liquid
  - 0.2 gallons per hour of vapor
- It is likely that the mass of gasoline released sets the level of the contamination.

How Tight Should Systems Be?

- 0.1 gph (liquid test fluid)
  - Each system can release 6,000 pounds (3 tons) of gasoline each year.
- 0.005 gph (liquid test fluid)
  - Each system can release 44 gallons or 300 pounds each year.
- 0.0002 gph (liquid test fluid)
  - Each system can release 2 gallons or 13 pounds each year.
- Any desired level of sensitivity can be achieved.

Third Party Evaluations

- As the UST testing market matured, the Tracer Tight methods were designed to be less sensitive and leak rates evaluated by third parties were raised.
- Midwest Research Institute, 1987
  - 0.0005 gph, (not EPA protocol)
- Ken Wilcox Associates, 1990
  - 0.05 gph, P(D) 0.97, P(FA) 0.03
  - 0.005 gph, P(D) 0.97, P(FA) 0.03
- Control Strategies Engineering, 1992
  - 0.05 to 0.1 gph P(D) >.99, P(FA)<0.01
  - relationship between tracer sensitivity was reported quantitatively, data can be used to support system certification at lower leak rates

Summary

- Significant vapor leaks from USTs are common (~40% of facilities).
- Vapor leaks at existing stations can be addressed, but changes need to occur in maintenance and operating practices.
- Small leaks are common at facilities with single wall piping (up to 25%).
- Due to the frequency of significant vapor leaks from double wall systems, single wall systems that pass a sensitive tightness tests may present no more risk than untested double wall systems.
- Tracer methods can be used to estimate release rates.
- It is likely that the mass of product released, whether as a vapor or liquid, determines the risk of contamination.
- Current leak detection standards are not good enough. 900 gallons or 3 tons of gasoline per year is too much to ignore.