Piping - Post Installation Testing: A New Standard of Tightness

EPA UST/LUST Conference 2005

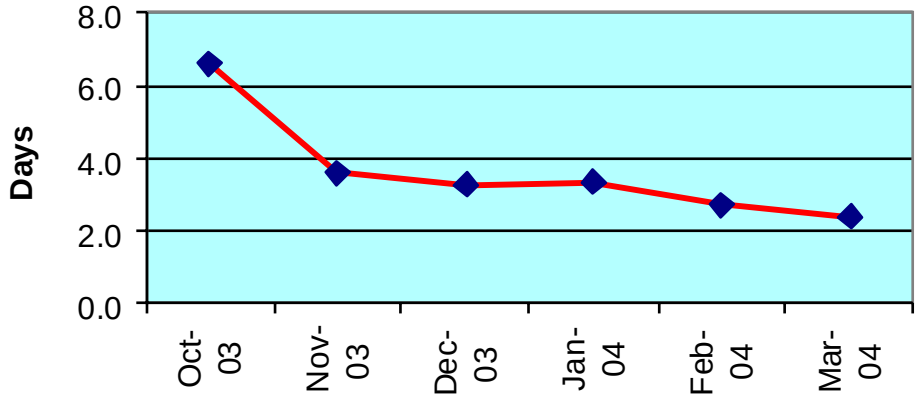
Seattle, WA

Key Topics

- Results of sensitive leak detection on newly constructed systems
- Survey of piping systems and problem areas
- Simple approaches to tighter piping systems and better construction

Average Number of Days for ELD Test by Month

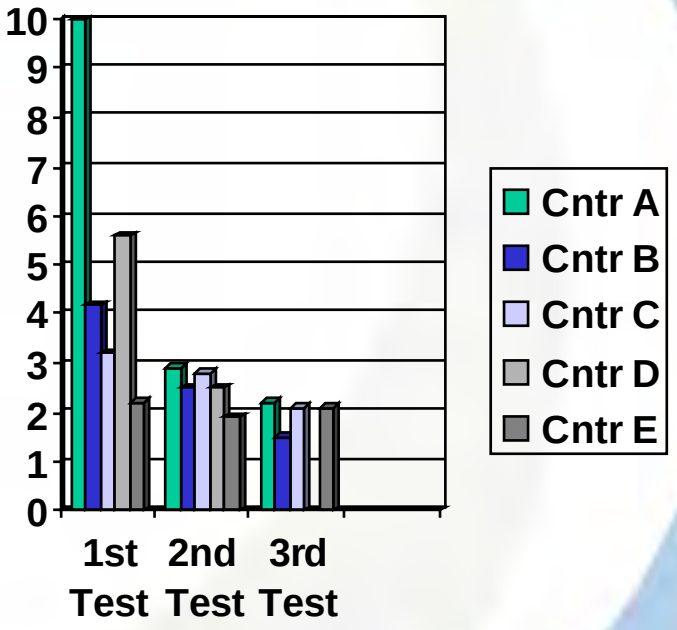
(Systems are getting tighter)



	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04
Avg Days for Pretest	6.6	3.6	3.3	3.3	2.7	2.4
Number of Facilities	4	17	25	37	27	14

Experience Gained by Contractors

- Contractors A, B, C and D lowered final test costs by assembling facilities with fewer leaks.
- Contractor E started well and displays consistent quality.
- Good assembly and pre-cover testing saves time and money.



Experience of Contractor A

- First Facility, not all technicians certified by manufacturer
  - 3 tanks, 6 dispensers
  - Facility paved before initial post-installation test
  - ~ 80 leaks identified and repaired
  - 60% of piping replaced by removing concrete
  - Several days of testing required to achieve tight system
  - Simple pressure tests of short duration as pre-burial test
- Second Facility, only certified technicians assemble systems
  - 14 acre truck stop
    - Several large tanks, dozens of dispensers
  - Initial pretest conducted before covering piping
  - After paving, final test completed in 2.5 days
    - 2 minor leaks discovered within UDCs
- Same crew, same materials, manufacturers recommended procedures, sensitive QC testing

Experience of Contractor E

- No buried leaks found during any final post-installation tests
- All installation technicians certified by manufacturer to install specific products
- System maintained under pressure for prolonged period without additions of air, daily pressure logged by site-supervisor
- Contractor experienced in identifying small leaks, small leaks repaired before backfilling

Quote by a Contractor to Inspector

"Now that ELD testing is required, it is taking me longer to install these systems because I have to do it the way the manufacturer recommends."

Note: All piping manufactures require technicians are installation certified for their products.

After the Enhanced Tracer Tight experience:

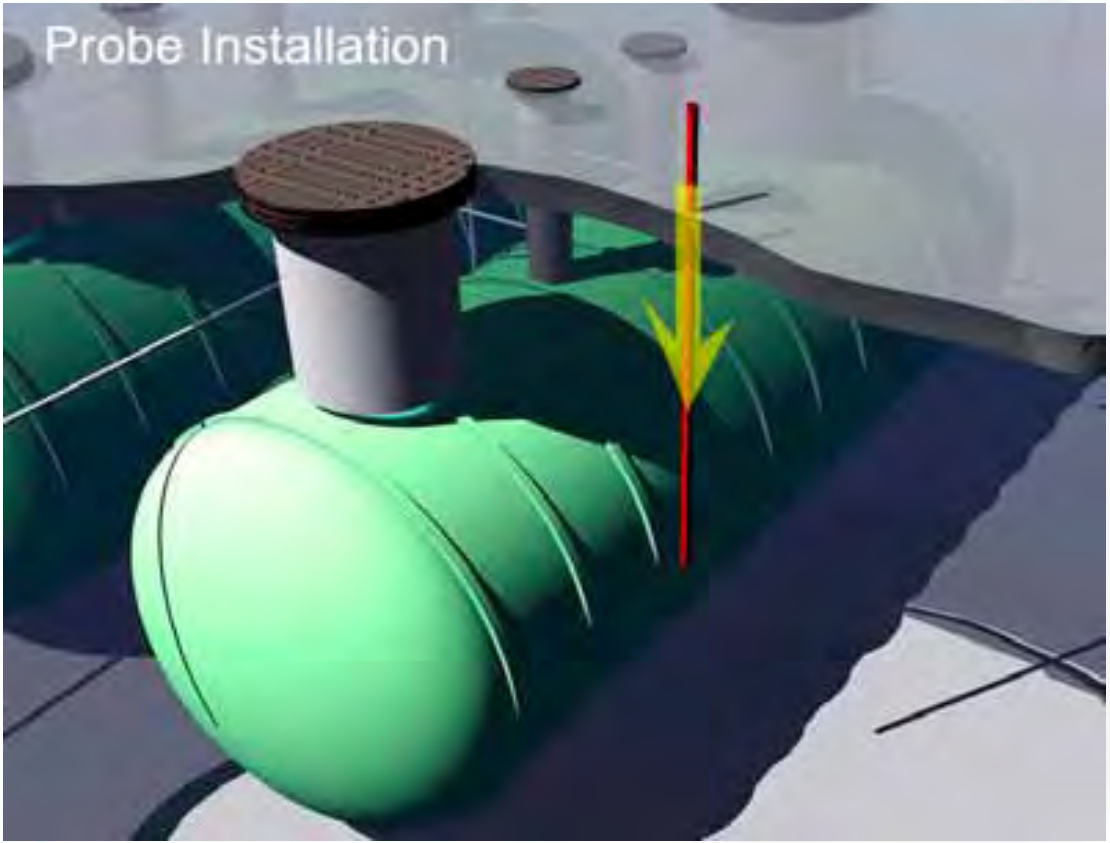
"Shell has been utilizing Praxair throughout the country for pre-backfill Tracer testing and is looking to continue to utilize Praxair in the future ."

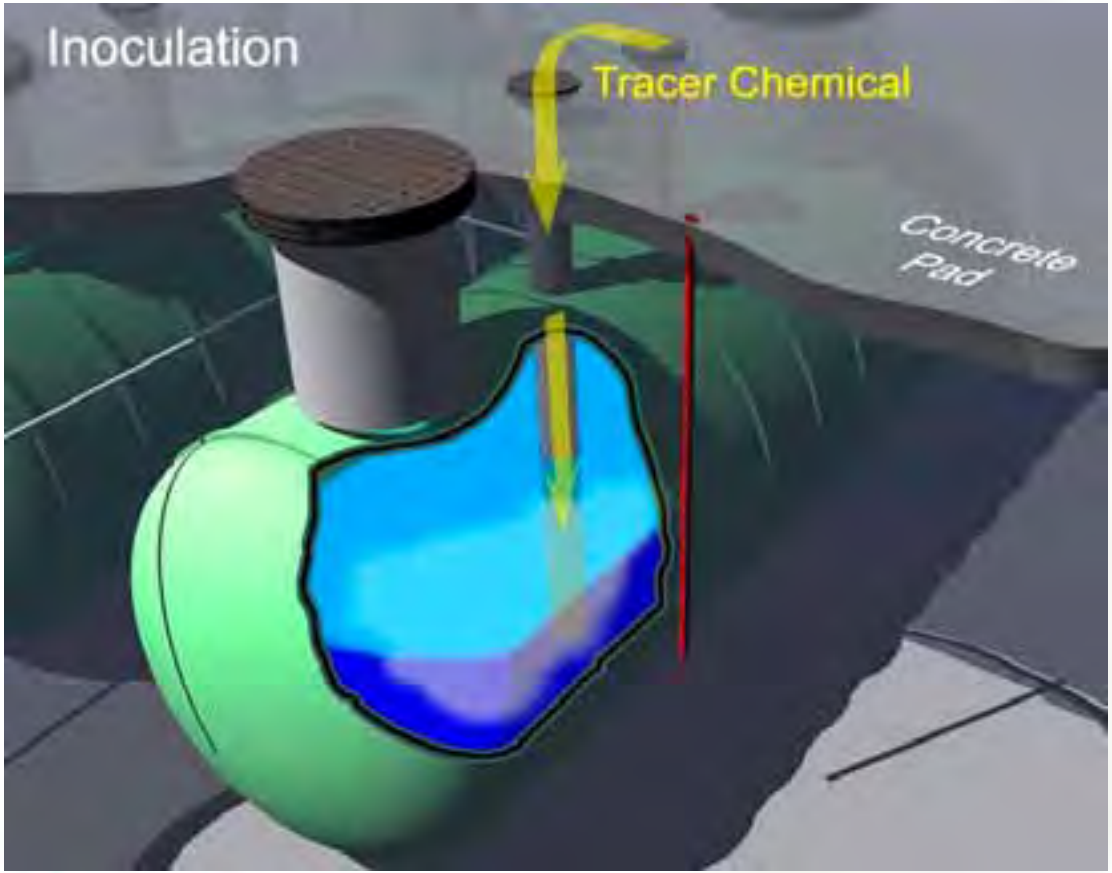
Shell Oil Products US

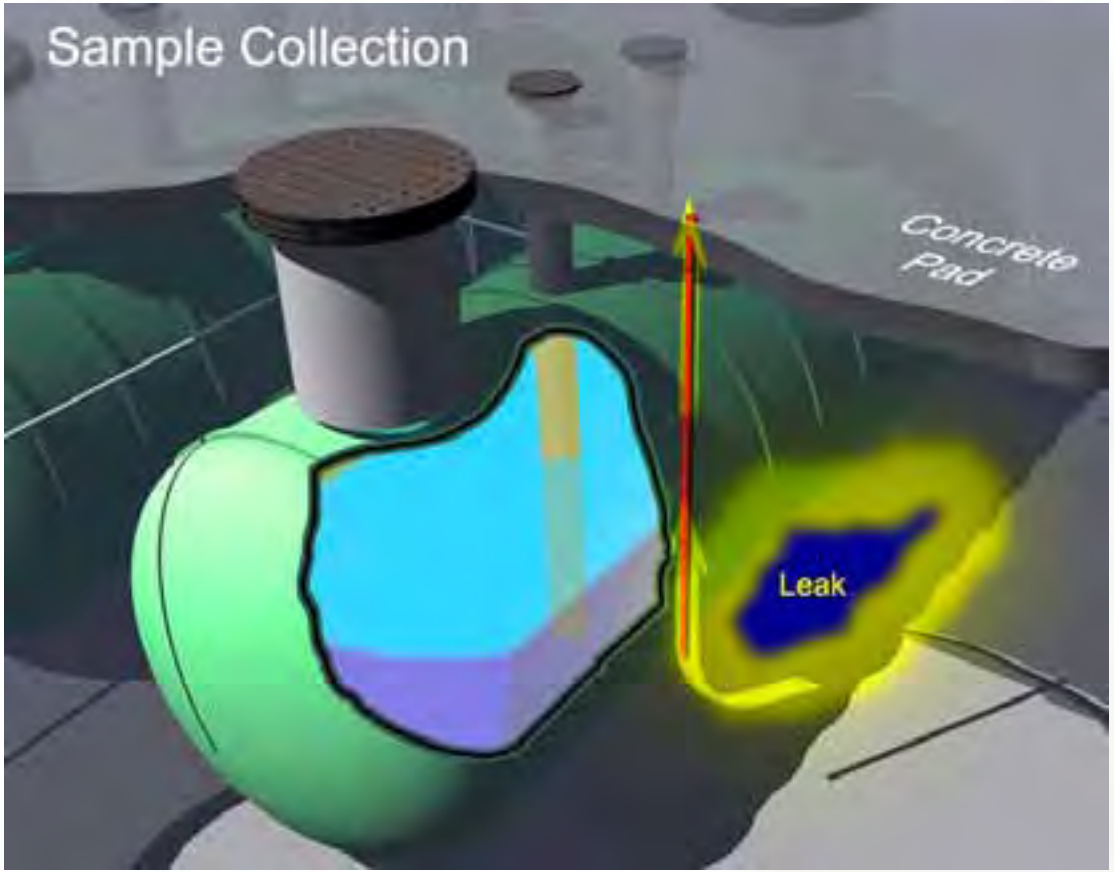
Tracer Basics

- Install sampling system.
- Add leak indicating tracer compound.
- Collect vapor samples.
- Test for the presence of tracer compound in the samples taken from probes.

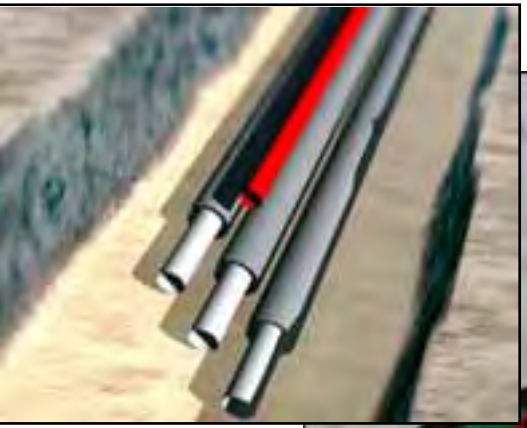
Vertical Sampling Probe Array

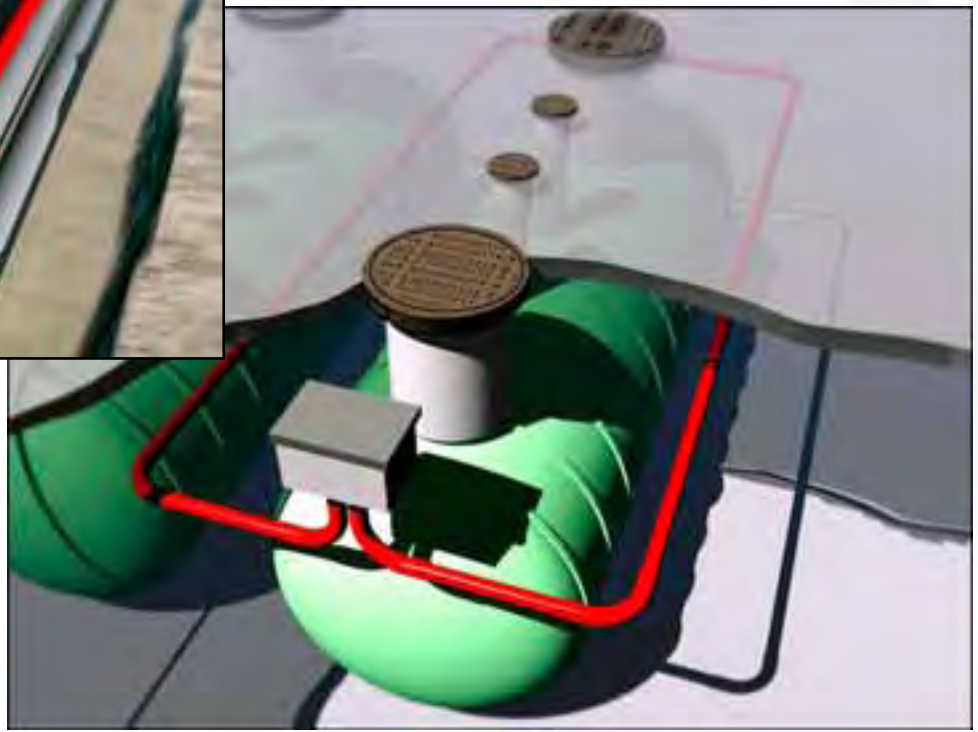



Inoculation
Tracer Chemical
Concrete Pad


Sample Collection
Concrete Pad
Leak

Horizontal Sampling Probe Array





Classes of Piping

- Rigid piping (Ameron and Smith)
- Semi-rigid piping (UPP, NUPI, KPS)
- Flexible piping (Environ, OPW, Western Fiberglass, APT, TCI)

Rigid piping

- Strengths
  - Inner and outer wall fully compatible with petroleum products
  - No decrease in expected product life when maintained in contaminated environment
  - Product easy to test
  - Leaks easily identified and repaired
- Vulnerabilities
  - Quality of field assemble joints dependent on the care and expertise of the technician
  - Product vulnerable to abusive handling practices
  - Low volume secondary containment vulnerable to plugging with excessive glue. End to end continuity test is critical.
  - Single wall piping not covered by protective layer

Improper preparation of joint

Abuse of cleaned secondary piping, possible future adhesion failure

Leak manifested after burial stressed improperly cured joint

Star crack, impact damage

Semi-rigid Piping

- Strengths
  - Field assembly of joints less vulnerable to variability between technicians
  - Good field record with post-installation tracer testing (small sampling set)
- Vulnerabilities
  - Determined field technicians can accomplish improper assembly
  - Statistical performance of product not supported by large data base of facilities
  - US contractor experience minimal
  - Outer wall not compatible with fuel
  - Protective layer not required for single wall piping

Flexible Piping

- Strengths
  - Near absence of leaks from primary piping possibly related to:
    - Absence of field assembled joints between sumps
    - Protection of primary wall by the secondary wall during shipping and handling
    - Secondary containment required in all installations
- Vulnerabilities
  - Leakage at end-fittings needs to be carefully checked for clean sumps and long-term life of product.
  - Manufacturer's recommended practices for installation and maintenance require strict adherence.
  - Outer wall not fully compatible with fuel (product dependent)

Leak at the same joint in both elbows

Fuel in a sump after problem piping was replaced and drained into the sump that was connected to a non-tight rock guard

What are the common piping problems?

- In order of descending frequency of occurrence
  - Improper joints, improperly seated rings and gaskets, moving joints while curing or installation in cold weather
  - Improper coupling of flexible piping
  - Threaded fittings, FRP to steel, scarred threads from bad dyes
  - Bruised or crimped piping
  - Flex connectors (avoid buried connectors)
  - Shear valves
  - Access to the flex pipe chase outside of double wall UDCs

Estimates of Frequencies at New Facilities

During testing prior to backfilling

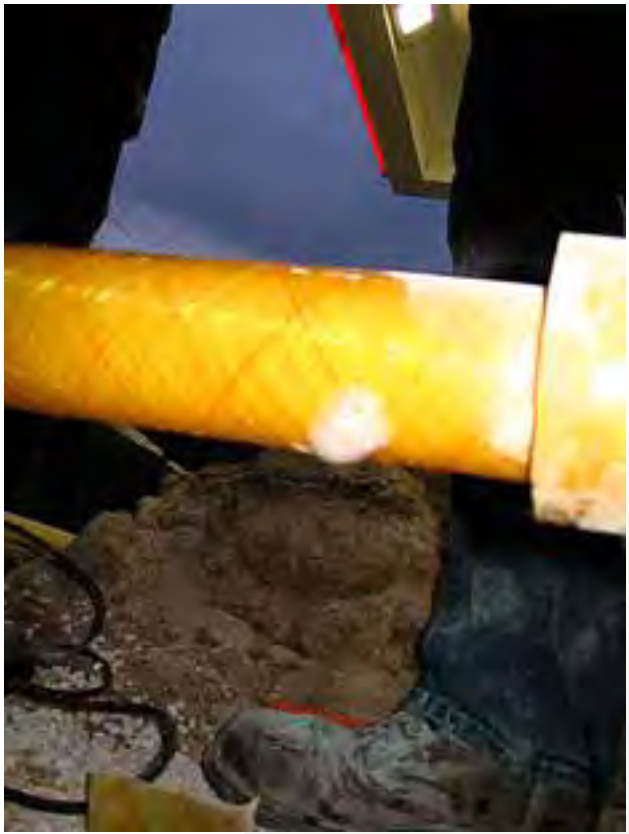
- Repair to primary product piping: ~10%
- Repair to vapor or vent piping: ~10%

During testing after covering and paving

- Repair of buried piping that was not pre-tested: ~20%
- Pre-tested facilities that require more than 1 to 5 minor repairs during final testing: <3%

Series of “micro-leaks” along section of piping

Small leak, camera below pipe



No visible problem, multiple “micro-leaks” across outlined section, no soap signal

Lining fault In flex-connector

Fairly common leak at actuation arm for shear valve

Leak around crimped o-ring

Summary

- Single walled systems can be reasonably installed but need to be proven tight to a higher standard.
- All products need to be installed and maintained according to manufacturers recommended practices.
- Sensitive confirmation tests keep installation practices at a high level of quality.
- You get what you measure.

Questions & Answers