

LDAR

Then and Now

**AWMA and Ontario Ministry of the Environment
Air Monitoring Workshop**

Nov 5 - 6, 2014

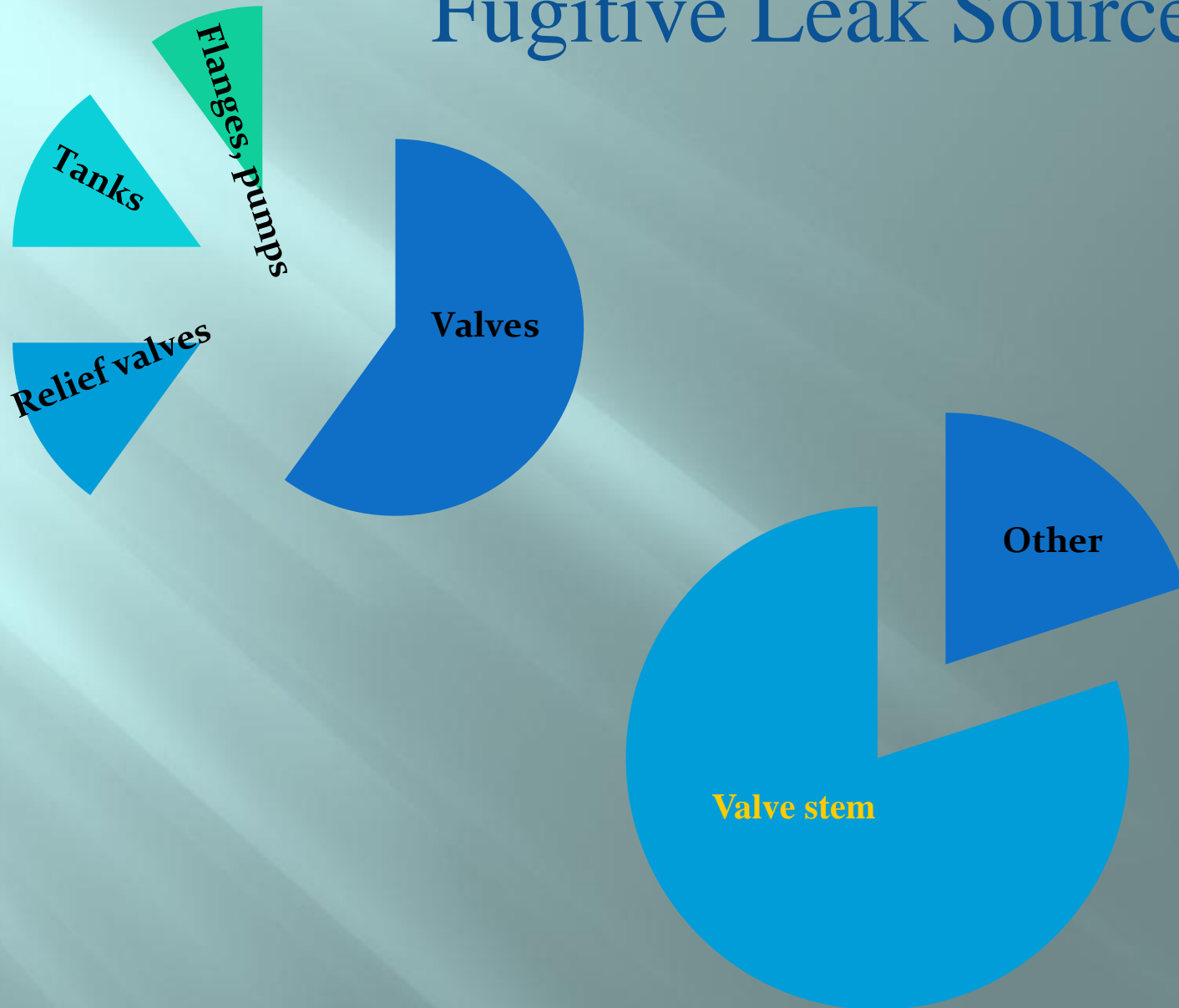
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NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

Topics

- ▣ Historical
- ▣ Refinery Global Settlements
- ▣ Progress
- ▣ Going Forward

Fugitive Leak Sources



LDAR

Remains an Agency Priority

Leak Detection and Repair (LDAR)

- ▣ Multiple Regulations
 - Industries
 - Chemicals
- ▣ What to Monitor
 - **Valves**, flanges, connectors, compressors, pumps
- ▣ Monitoring Frequency
- ▣ Repair Timeframes

Federal Regulations with Method 21

| 40 CFR | | Regulation Title |
|--------|---------|---|
| Part | Subpart | |
| 60 | VV | SOCMI VOC Equipment Leaks NSPS |
| 60 | DDD | Volatile Organic Compound (VOC) Emissions from the Polymer Manufacturing Industry |
| 60 | GGG | Petroleum Refinery VOC Equipment Leaks NSPS |
| 60 | KKK | Onshore Natural Gas Processing Plant VOC Equipment Leaks NSPS |
| 61 | J | National Emission Standard for Equipment Leaks (Fugitive Emission Sources) of Benzene |
| 61 | V | Equipment Leaks NESHAP |
| 63 | H | Organic HAP Equipment Leak NESHAP (HON) |
| 63 | I | Organic HAP Equipment Leak NESHAP for Certain Processes |
| 63 | J | Polyvinyl Chloride and Copolymers Production NESHAP |
| 63 | R | Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations) |
| 63 | CC | Hazardous Air Pollutants from Petroleum Refineries |
| 63 | DD | Hazardous Air Pollutants from Off-Site Waste and Recovery Operations |
| 63 | SS | Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process |
| 63 | TT | Equipment Leaks – Control Level 1 |
| 63 | UU | Equipment Leaks – Control Level 2 |
| 63 | YY | Hazardous Air Pollutants for Source Categories: Generic Maximum Achievable Control Technology Standards |
| 63 | GGG | Pharmaceuticals Production |
| 63 | III | Hazardous Air Pollutants from Flexible Polyurethane Foam Production |
| 63 | MMM | Hazardous Air Pollutants for Pesticide Active Ingredient Production |
| 63 | FFFF | Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing |
| 63 | GGGGG | Hazardous Air Pollutants: Site Remediation |
| 63 | HHHHH | Hazardous Air Pollutants: Miscellaneous Coating Manufacturing |
| 65 | F | Consolidated Federal Air Rule – Equipment Leaks |
| 264 | BB | Equipment Leaks for Hazardous Waste TSDFs |
| 265 | BB | Equipment Leaks for Interim Status Hazardous Waste TSDFs |

Note: Many of these regulations have identical requirements, but some have different applicability and control requirements.





Leak Detection and Repair (LDAR)

- ▣ Identify regulated components
- ▣ Monitor via Method 21
- ▣ **Repair leakers**
- ▣ Recordkeeping
- ▣ Reporting

Simply

“Find it and Fix it”

LDAR Evaluations

- ▣ Field measurements
- ▣ LDAR database evaluations

Favorite Quotes

“You (NEIC) look for leaks, we (Company) just monitor.”

“I’m 100% confident you (NEIC) won’t find any leaks.
We haven’t found any in the last three years.”

“Oh!? Should we be monitoring at 500 ppm?
Is that a problem?”

“I was afraid you were going to ask for the component
inventory.”

“Is there really an expiration date for the gas standards?”

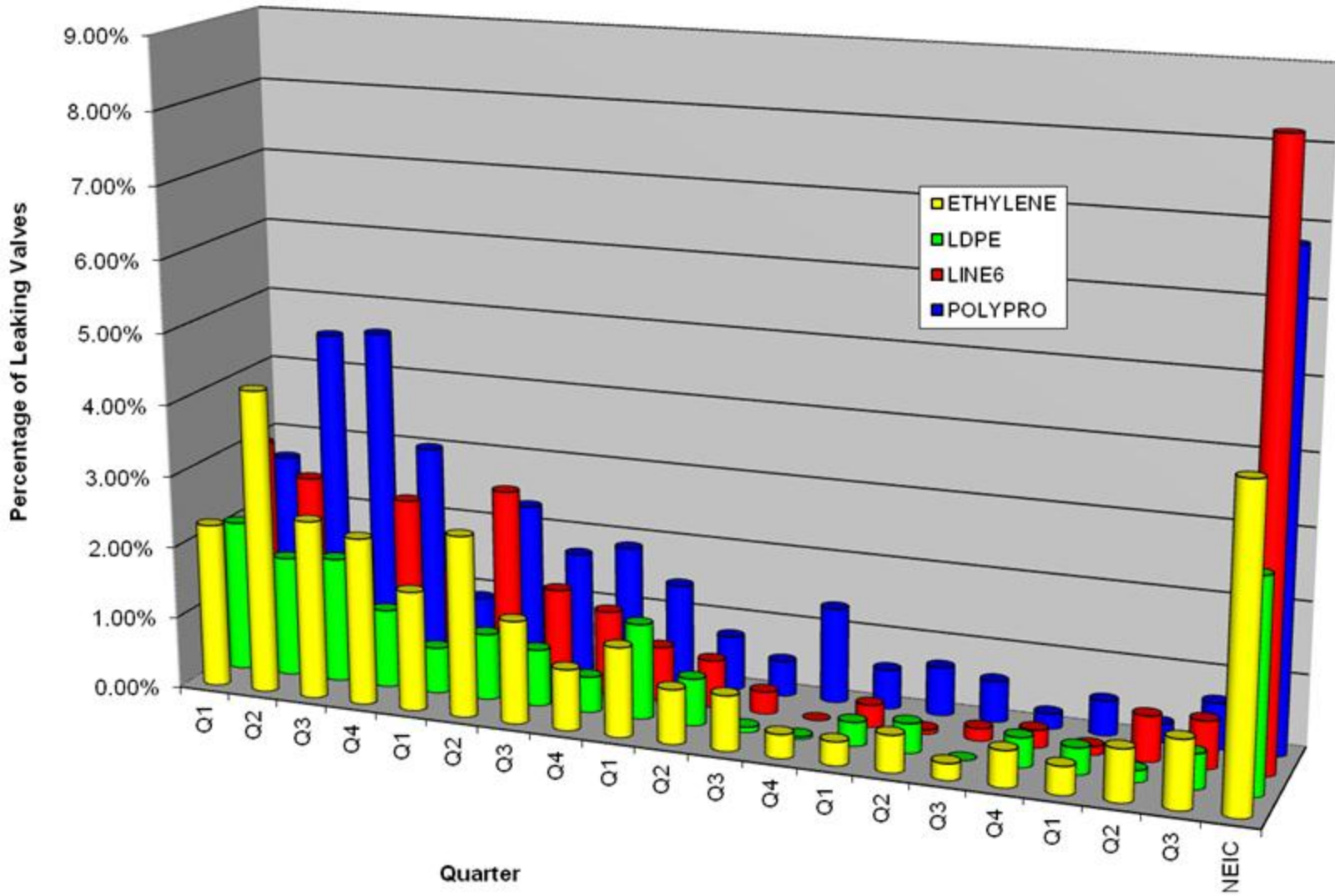
On-site Inspections

- ▣ Monitoring
 - One week
 - 2 – 4 people
 - 2,000 -4,000 valves
 - Similar monitoring instrument
 - Leak verified by company

Identified Issues

- ▣ Greater leak rates
- ▣ Inaccurate/incomplete inventories
- ▣ Not following Method 21
- ▣ Effective repairs
- ▣ Timeliness of repairs
- ▣ Not following Method 21
- ▣ Really not following Method 21

Historical Process Unit Leak Rates at 500 ppm



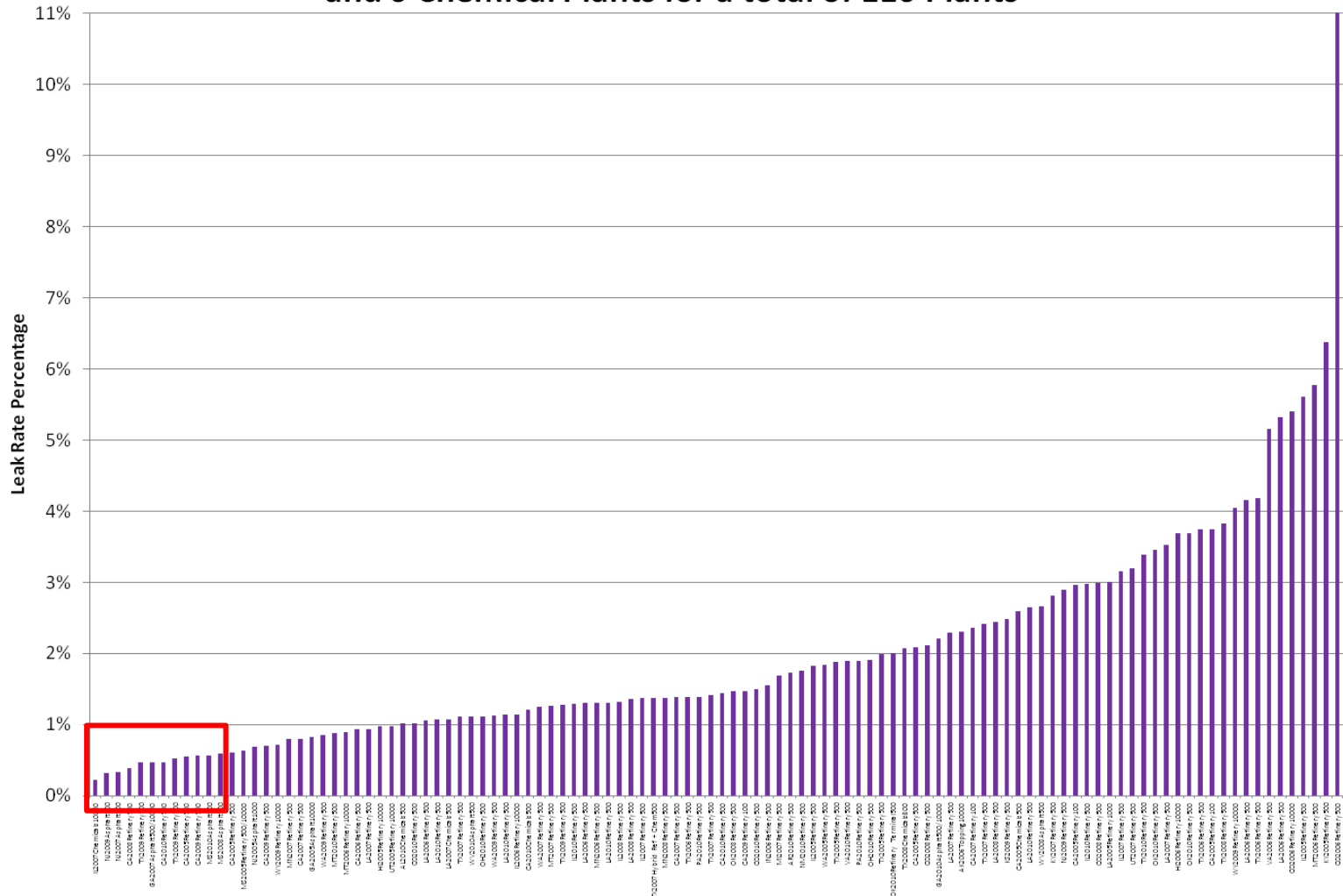
Refinery-Wide Comparative Monitoring Results

% leaking valves

| Refinery | Company | NEIC |
|----------|---------|------|
| A | 2.3 | 10.5 |
| B | 2.8 | 6.3 |
| C | 0.6 | 5.4 |
| D | 1.2 | 1.4 |
| E | 0.7 | 5.3 |
| F | 0.3 | 1.7 |
| G | 1.6 | 6.1 |
| H | 3.6 | 5.3 |

Leak Rates from California

2005 to 2010 USA Valve Leak Rates for 94 Refineries, 10 Asphalt Plants and 6 Chemical Plants for a total of 110 Plants



Streamlining Program/Records Evaluations

Look through boxes



Or

Use a
database!



Recurring Database Findings

- ▣ Failure to include subject components in the LDAR program
- ▣ Failure to monitor components in required timeframe
- ▣ Quarterly NSPS monitoring not performed in first month of quarter

Recurring Findings – cont.

- ▣ Failure to repair/attempt to repair leaking components in required timeframe
- ▣ Improper use of DOR exemptions
- ▣ Failure to report missed repairs
- ▣ Historical failure to monitor per Method 21

Refinery Global Settlements

- ▣ Plan
 - Identify components
 - Leak goal
- ▣ Leak Definition (ppm)
 - 500 valves
 - 2000 pumps
- ▣ Monitoring Frequency
 - Quarterly
- ▣ Minimize Delay of Repair
 - **Drill and Tap**

Refinery Global Settlements (cont.)

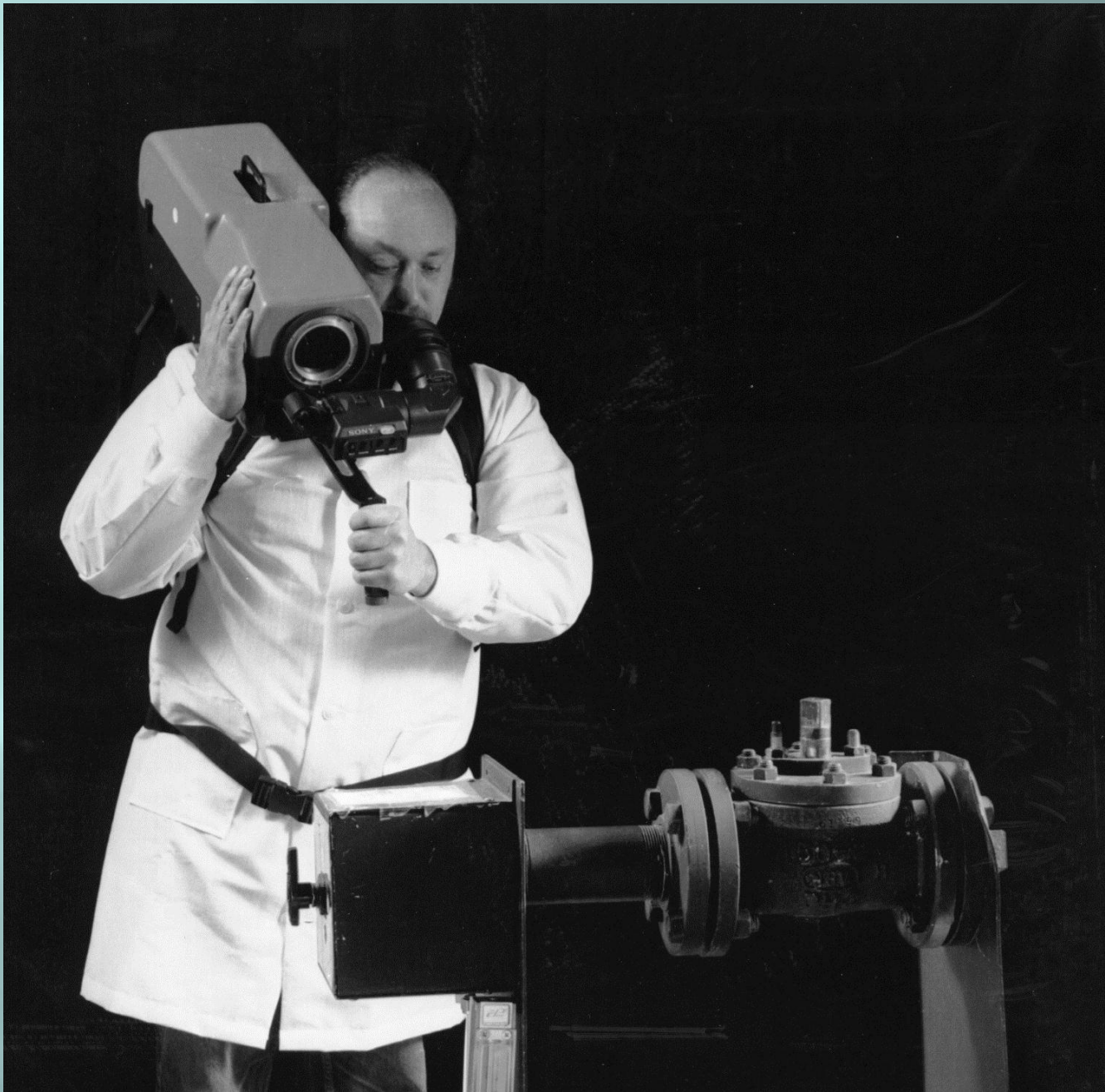
- ▣ All electronic data
- ▣ Calibration drift
- ▣ Training
- ▣ **Audits**
 - Internal
 - 3rd Party
- ▣ First attempt - 100 ppm

Leak Percent of Active Inventory by Manufacturer

| Manufacturer | 2005 | 2006 | 2007 | 2008 | 2009 | Average Leak Rate at 500 ppm |
|-------------------|-----------------|------------------|------------------|------------------|------------------|------------------------------|
| COMPANY 1 | 96/12852 - 0.7% | 156/13874 - 1.1% | 161/15969 - 1.0% | 155/19706 - 0.8% | 135/21726 - 0.6% | 0.84% |
| COMPANY 2 | 30/2673 - 1.1% | 57/3544 - 1.6% | 45/4511 - 1.0% | 53/6125 - 0.9% | 63/6569 - 1.0% | 1.12% |
| COMPANY 3 | 108/6737 - 1.6% | 182/7127 - 2.6% | 193/7954 - 2.4% | 211/9445 - 2.2% | 139/9937 - 1.4% | 2.04% |
| COMPANY 4 | 59/2314 - 2.5% | 69/2847 - 2.4% | 70/3527 - 2.0% | 79/4381 - 1.8% | 79/4736 - 1.7% | 2.09% |
| COMPANY 5 | 0/31 - 0.0% | 3/31 - 9.7% | 2/417 - 0.5% | 1/504 - 0.2% | 1/572 - 0.2% | 2.11% |
| COMPANY 6 | 2/59 - 3.4% | 1/61 - 1.6% | 3/71 - 4.2% | 2/82 - 2.4% | 5/86 - 5.8% | 3.50% |
| COMPANY 7 | 1/43 - 2.3% | 3/45 - 6.7% | 2/48 - 4.2% | 1/54 - 1.9% | 2/52 - 3.8% | 3.77% |
| COMPANY 8 | 24/409 - 5.9% | 28/450 - 6.2% | 30/483 - 6.2% | 37/571 - 6.5% | 35/617 - 5.7% | 6.09% |
| COMPANY 9 | 96/1433 - 6.7% | 121/1595 - 7.6% | 108/1801 - 6.0% | 109/2204 - 4.9% | 132/2422 - 5.5% | 6.14% |
| COMPANY 10 | 91/1406 - 6.5% | 92/1482 - 6.2% | 132/1655 - 8.0% | 119/1860 - 6.4% | 155/1947 - 8.0% | 7.00% |
| COMPANY 11 | 52/677 - 7.7% | 54/738 - 7.3% | 67/857 - 7.8% | 95/1047 - 9.1% | 100/1078 - 9.3% | 8.23% |
| COMPANY 12 | 81/1219 - 6.6% | 110/1244 - 8.8% | 136/1322 - 10.3% | 118/1522 - 7.8% | 207/1678 - 12.3% | 9.17% |

IR Cameras

- ▣ Increased use of camera
- ▣ Powerful images
- ▣ Other purposes
- ▣ Safety Monitoring



IR Camera



Moving Forward

- ▣ Lower Leak Definition
- ▣ Additional components
- ▣ Fewer Delay of Repair
- ▣ Packing upgrades
- ▣ Valve Replacement

Improved Equipment

- ▣ Warranted/Guaranteed Packing materials
- ▣ Increased number of manufacturers
- ▣ Small incremental costs
- ▣ Valve manufactures
- ▣ End user specifications

Low – E Packing

- ▣ Ring sets ~ few cents to dollars/ring
- ▣ Valves ~ materials < \$100
- ▣ Valves warranty ~ more

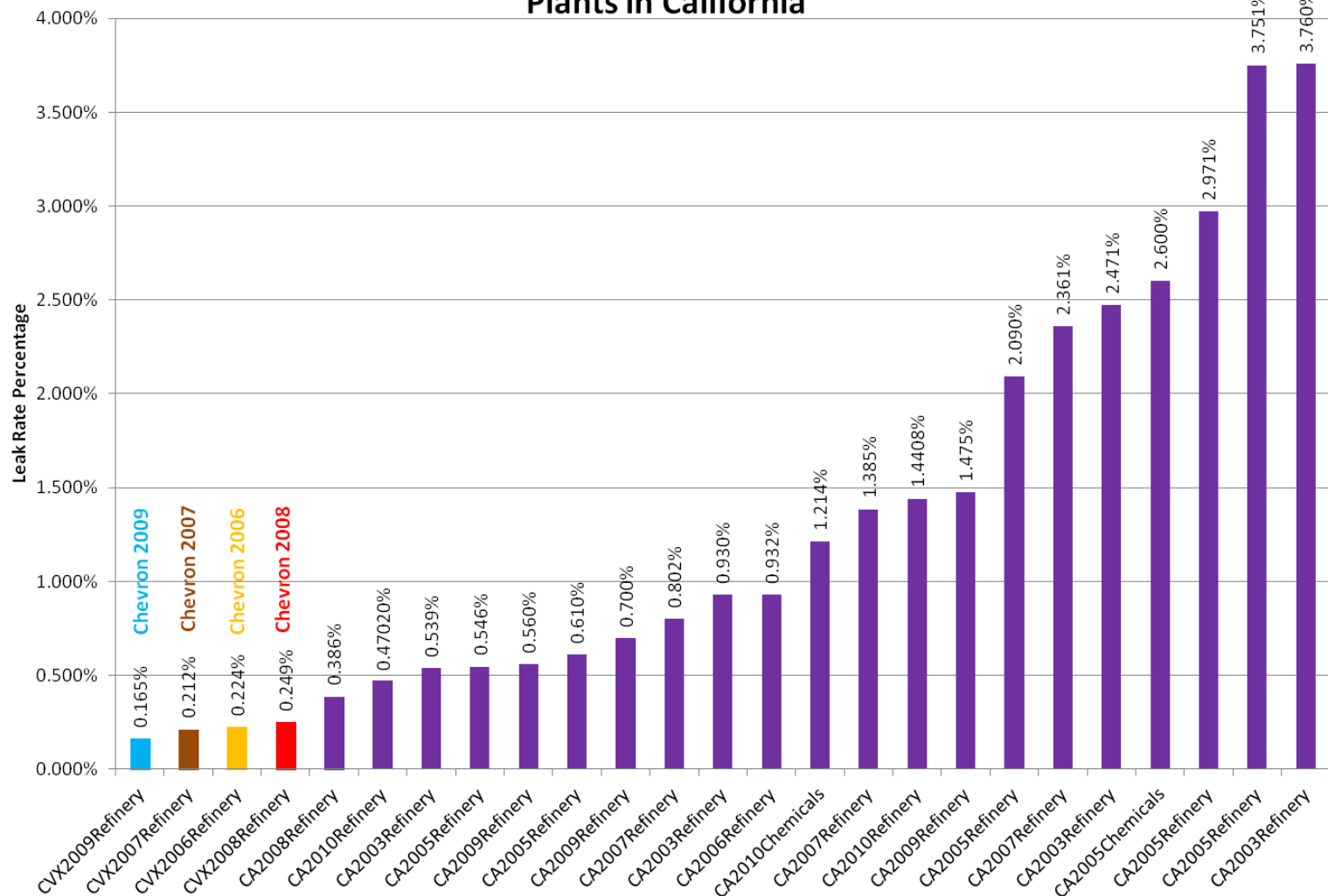
Valve Testing

- ▣ Specific companies
- ▣ Many Different Testing methods
- ▣ Thermal cycles
- ▣ Mechanical cycles
- ▣ Valve repair companies
- ▣ **Re-torque** allowed or not

Newer CD Requirements

- Use “Certified Low-Leaking Technology” for new and replaced valves installed unless commercially unavailable
- Repack or replace every valve that leaks above lower leak standard (> 250 ppm)
- Connectors that leak at 250 ppm or above 2 out of any 3 consecutive monitoring events must be replaced/improved

Yearly Valve Leak Rates 2003 to 2010 for 19 Refineries and 2 Chemical Plants in California



Testing Methods

API 622 - Valve Packing

API 624 - Valves (higher temp)

100 ppm

3 thermal cycles

API 6?? - Valves (lower temp)

API - Quarter turn valves

Future Efforts

- ▣ Packing selection
- ▣ Valve manufacturing warranties
- ▣ **Re-torque**
- ▣ Optical Gas Imaging
- ▣ Regulation updates
- ▣ Remote sensing

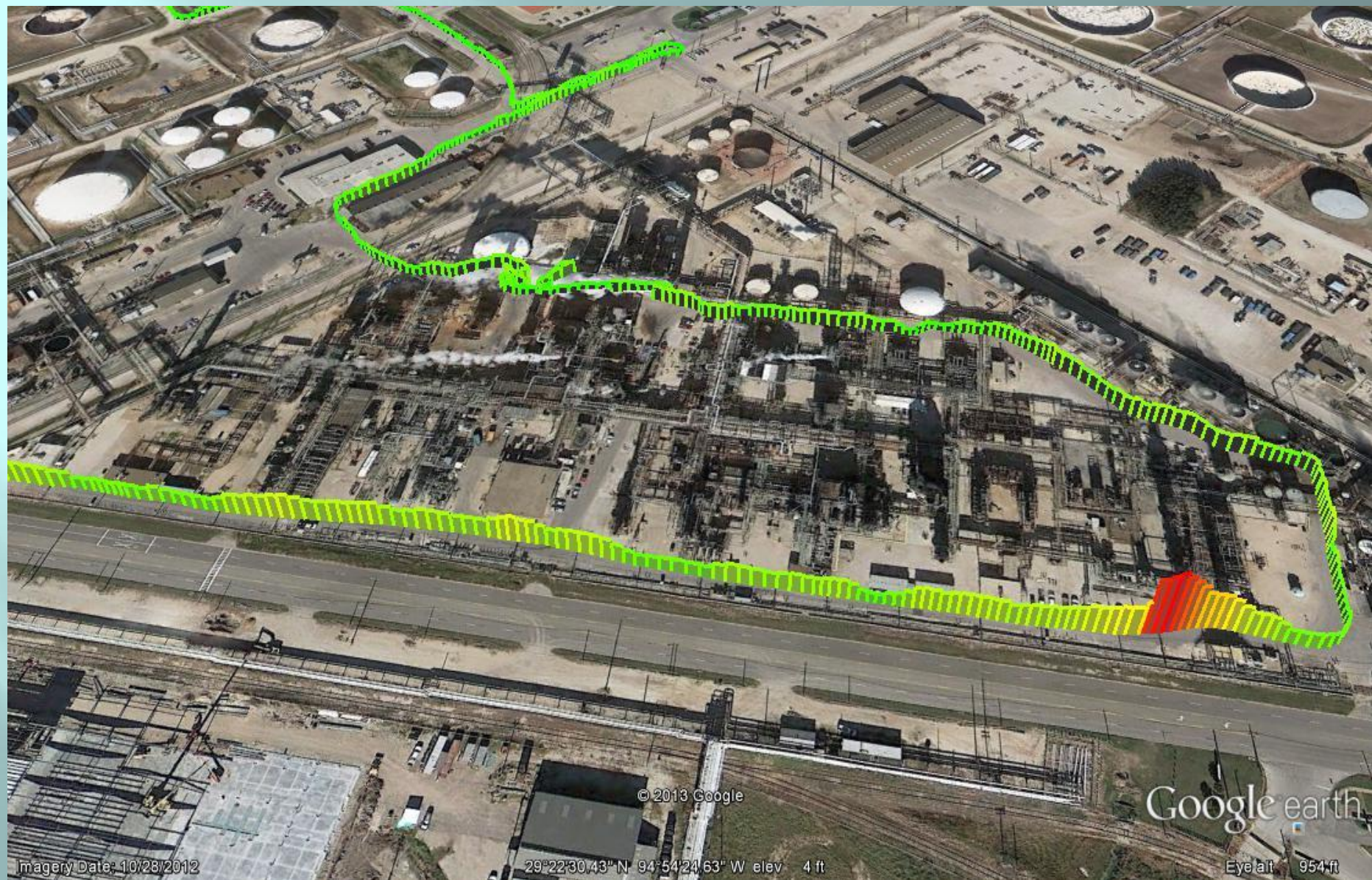
Progress

From:

“Find it and Fix it”

Towards:

“Replace or Repair it Right
and Forget it”



Benzene Map 1, winds from North, 04/24/13



Multiple overlays, 04/24/13 and 04/25/13