

Remote Infrared VOC Sensing

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Remote Infrared VOC Sensing

- Why did we decided to use remote IR VOC sensing (GasFind IR camera)
- What is the GasFind IR camera and how does it work
- Studies and findings
 - ◆ 1,3 butadiene Milby Park study
 - ◆ Texas Air Quality Study II (TxAQSII)
“Find it and Fix it”
- What were the actions taken
- What is the agency’s policy on the use of the camera



Why did we decided to use remote IR VOC sensing? (GasFind IR camera)

In the past couple years the agency has been studying the use of the cameras as a tool to bring about air quality improvements as expeditiously as possible



Why use the camera?

- Specifically there are two main areas that are driving our interest in the abilities of the cameras
 - ◆ First, to help in determining if there are significant VOC emissions that were previously unknown or unaccounted from unconventional sources, thus helping to “true up” the agency emission inventory
 - ◆ Second, the cameras will also be used to help the agency identify individual sources of emissions in areas with elevated air concentrations of pollutants



What is the GasFind IR camera and how does it work?



The infrared gas-imaging camera consists of a modified Indigo (FLIR/Indigo Systems Corp., Goleta CA) Merlin MID camera with a nominal spectra range of 1- 5.4 micrometers

- The spectral range is limited with the use of a notch filter specifically designed for the detection of hydrocarbon infrared adsorptions in the 3-micron region. The narrow bandpass range of the filter is less than the infrared spectral absorption of gas phase hexane. The filter notch is positioned such that alkane gases have a significant response within the bandpass range.



Camera Imagery Example



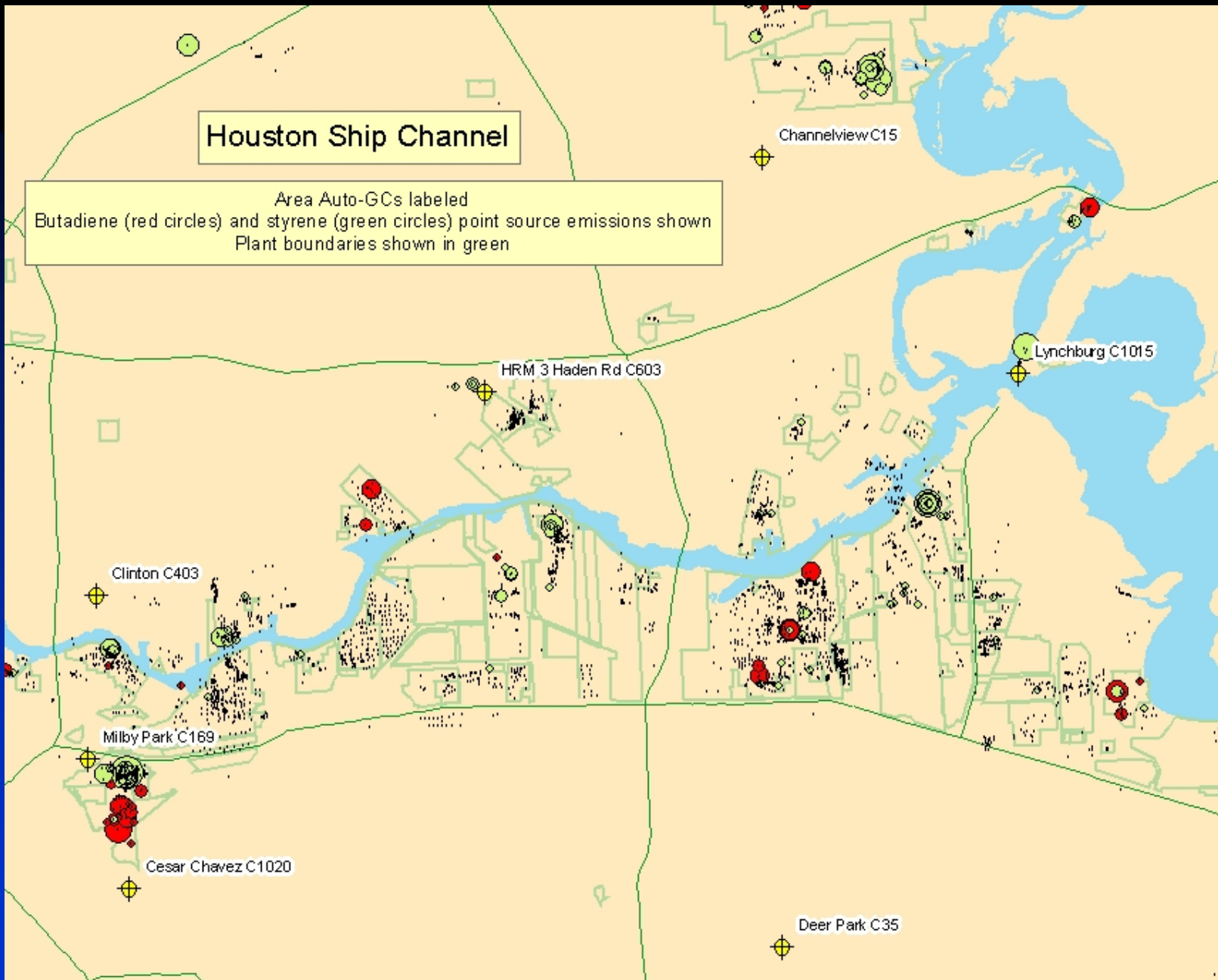
Assuming 3.637 grams/gallon at a fill rate of 8 gpm over
24 hr/day, 365 days/yr = approx 16.8 tons/yr of VOCs

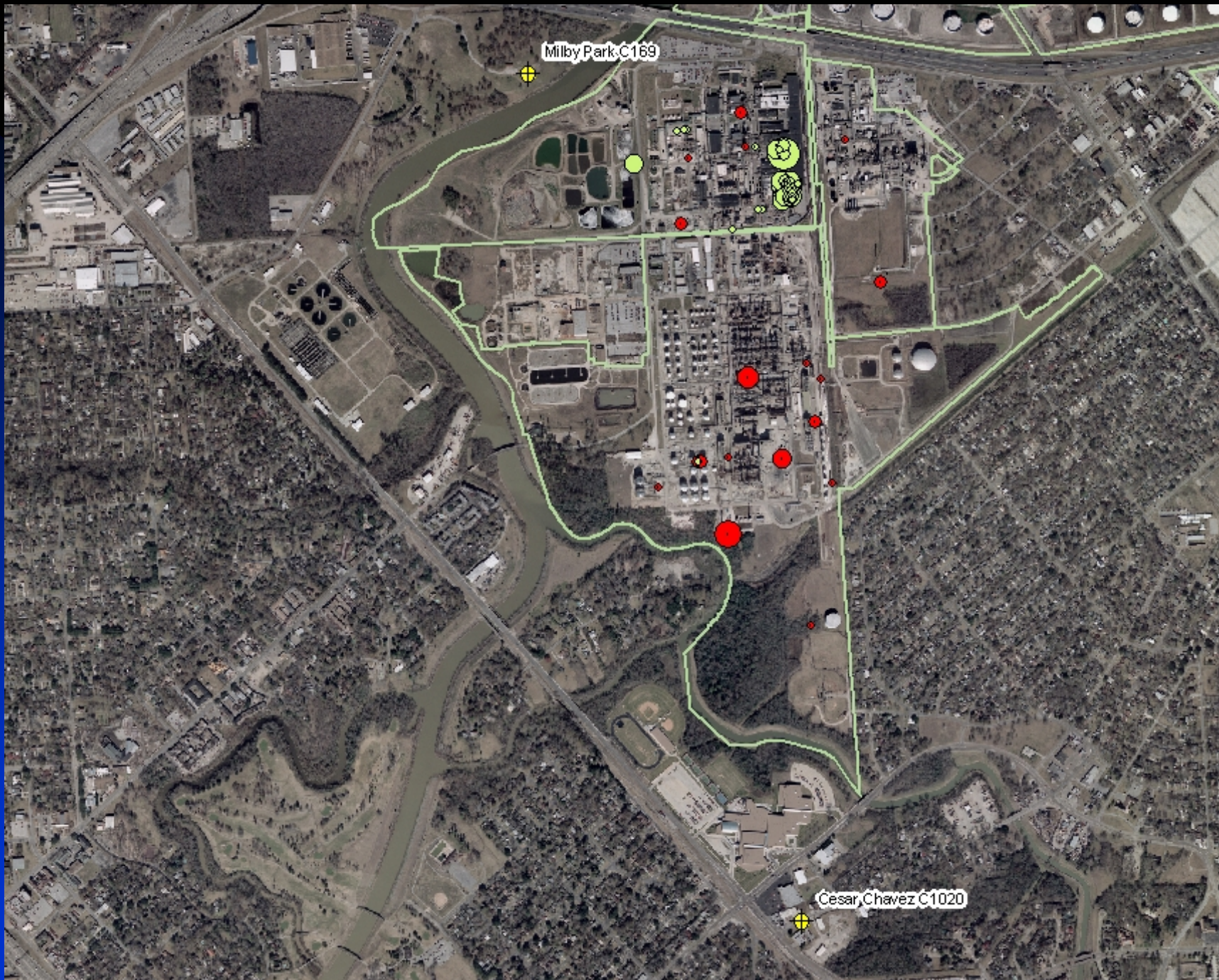
1,3-Butadiene study in the Milby Park area of Houston.



Houston Ship Channel

Area Auto-GCs labeled
Butadiene (red circles) and styrene (green circles) point source emissions shown
Plant boundaries shown in green





Milby Park C169

Cesar, Chavez C1020



Type of leaks found (tanks)



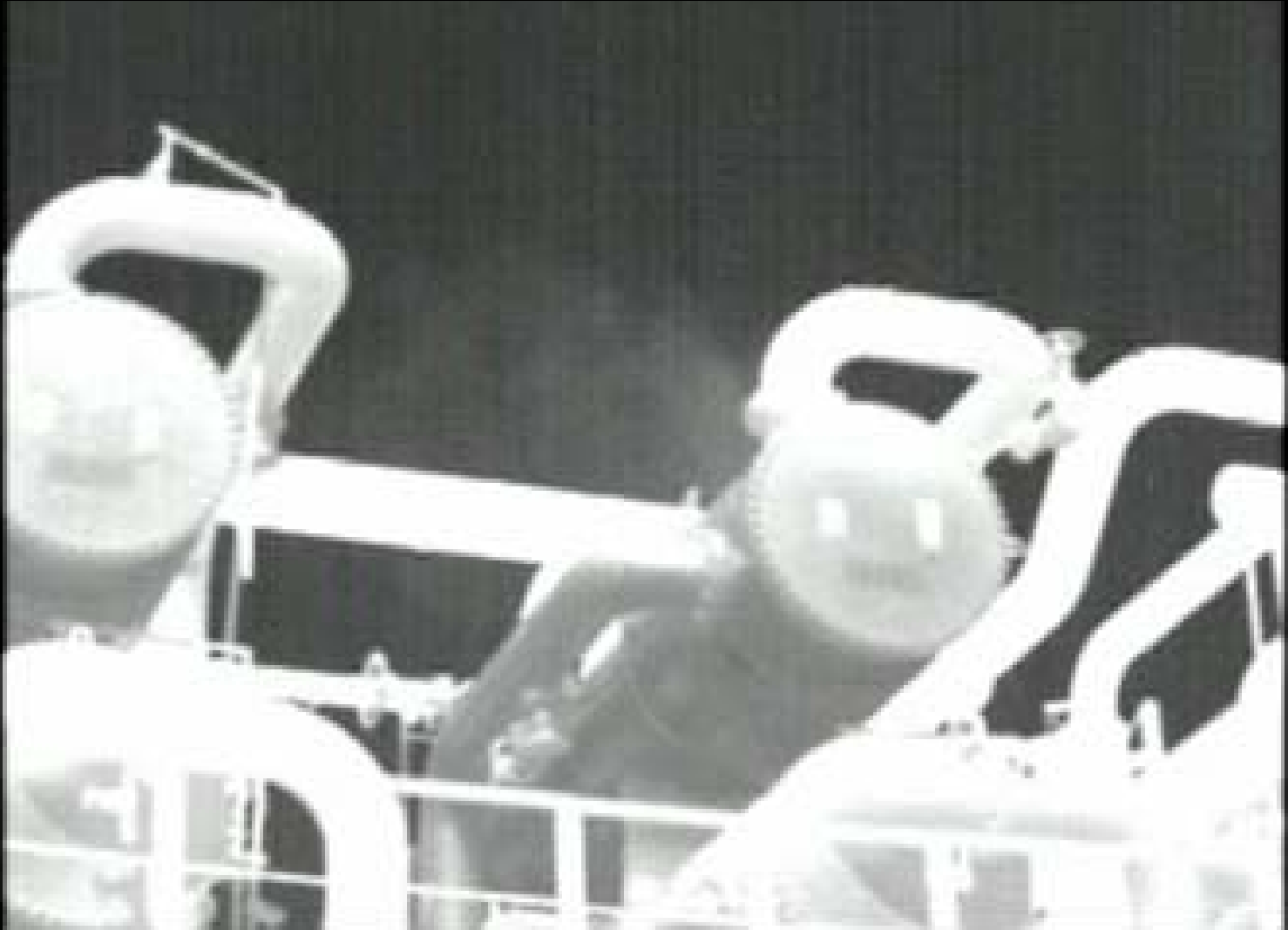
Rail Car Loading



LDAR Components



Nontraditional Sources (heat exchangers)



Wastewater Collection



Texas Air Quality Study II (TxAQS II)



Study Area and Types of Observation Platforms

- Study area covered was the Houston Ship Channel, Texas City area, and the Beaumont area
- Observation platforms included the use of:
 - ◆ Helicopter;
 - ◆ Texas Parks and Wildlife boat;
 - ◆ TCEQ vehicle; and
 - ◆ San Jacinto Monument



Summary of Results

In two weeks of observation time, or 45 hours of flight time:

- In the Houston / Texas City area:
30 sites with noted visible IR plumes
- In the Beaumont / Port Arthur area:
11 sites with noted visible IR plumes



Storage Tanks

- 10,700 total storage tanks in the study area
- 5,400 were observed with the camera
- 71 noted with visible IR plumes

Result: 1.3 percent of tanks with a visible IR plume



TCEQ Shipchannel Flyover

5-11 thru 5-21-2005



Barges

- Visible IR plumes were also noted from barges that were either
 - ◆ docked at one of the earlier noted facilities and being loaded or unloaded,
 - ◆ in a barge parking lot, or
 - ◆ in transit
- Plumes were primarily noted at the hatches and pressure relief vents





Oil and Gas Production

Approximately 50 visible IR plumes were noted from oil and gas production facilities during flights between the Beaumont and Houston areas.



FLIR HI

AUTO

HIST WH

1/18/08 2:42:19PM



What were the actions taken?



An Initial Voluntary “Find it and Fix It” Program

- All of the identified point sources were contacted and asked to provide emission information.
- Received responses back from all of the companies. Some responses were better than others. A few investigations were performed based on responses.
- Based on findings, bulk terminals in HGB have been requested to revise 2002 to 2005 EI for emissions due to landing and refilling emissions from floating roofs.



Barge Owners and Operators

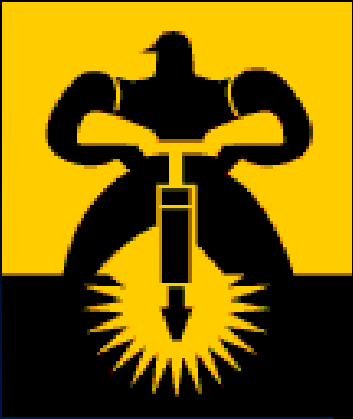
- **The agency has been working with the American Waterway Operators, the Coast Guard, and the Louisiana DEQ to address the problems noted with barges.**
- **AWO has developed “Recommendations for Best Management Practices to Control and Reduce Inadvertent Cargo Vapor Emissions in the Tank Barge Community”**



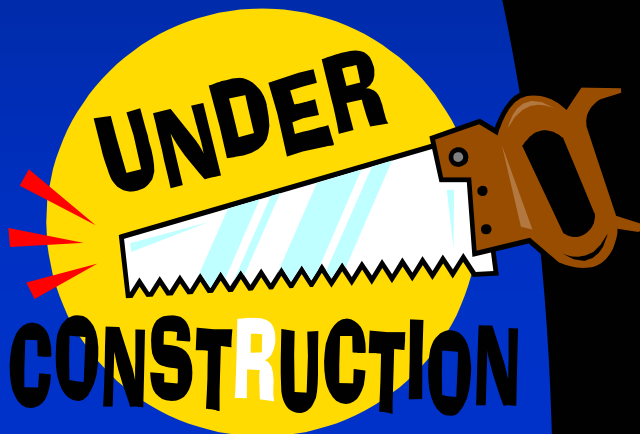
Oil and Gas Production

Working with HARC to study the flash emissions from storage tanks at oil and gas production sites.



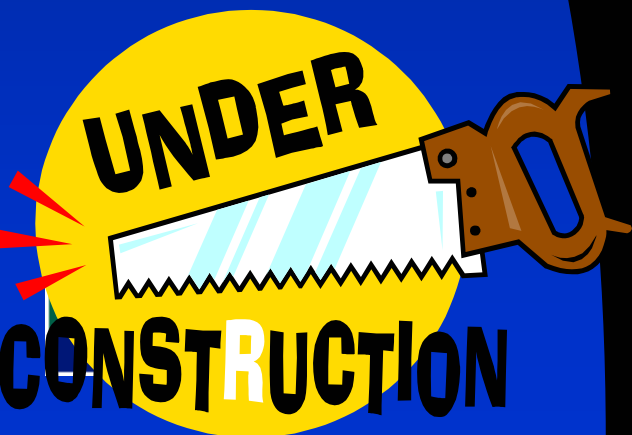


What is the agency's
policy on the use of the
camera



“Find it and Fix It” Part II

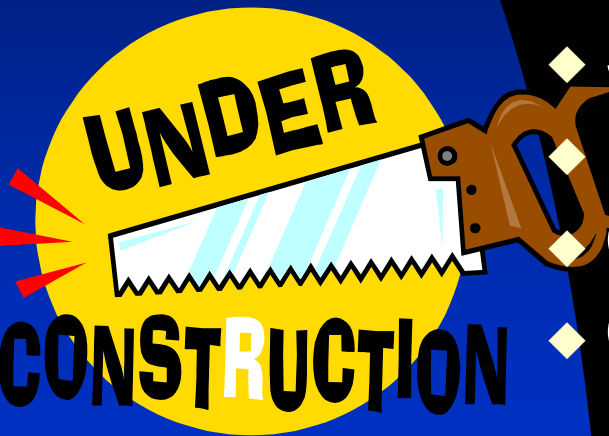
Initiate a long-term program where companies are encouraged to use the camera to identify leaks and make the appropriate repairs in an expeditious manner. A follow-up assessment using either the camera or conventional means (TVA, etc.) will be necessary to ensure that the leaks identified were repaired.



Help with Agency Workload

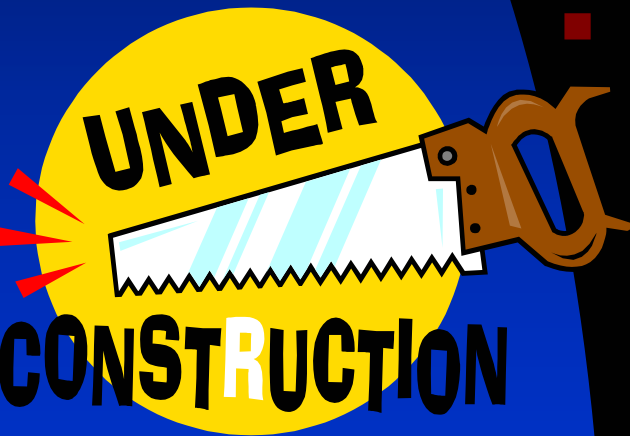
The data obtained from the camera will be used to identify potential pollution sources to help focus existing agency resources:

- ◆ Screening tool
- ◆ Risk base investigation strategy
- ◆ Compliance assistance efforts
- ◆ Commencement of source type initiatives



Potential Industry Incentives: External Floating Roof Tank

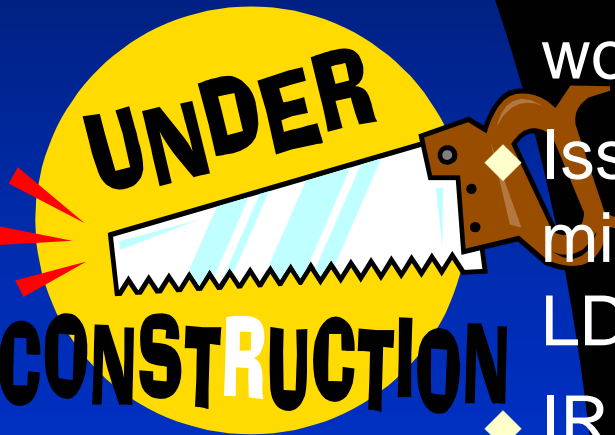
- Use the IR VOC camera in lieu of the annual gap seal measurements
- However, use would not replace the 10 year shut-down and complete tank inspection requirements



Potential Industry Incentives: Leak Detection and Repair Program

Use the IR VOC camera in conjunction with traditional State VOC LDAR programs

- ◆ The use of the camera would be aimed at complementing the LDAR program, but would not replace the LDAR program
- ◆ Issue concerning undefined camera minimum detection limit (MDL) vs. current LDAR regulatory limits and method MDL
- ◆ IR VOC camera will allow more frequent and more inclusive monitoring of regulated and unregulated components



Potential Industry Incentives: Leak Detection and Repair Program (cont.)

- The use of the IR VOC camera could allow additional skip periods for routine Method 21 leak detection

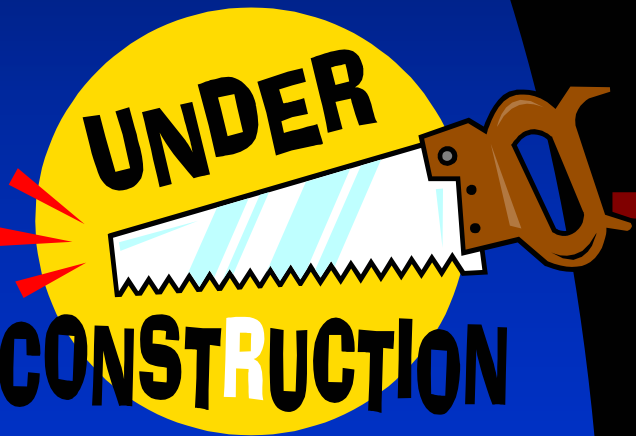
**UNDER
CONSTRUCTION**

Difficult-to-Monitor components -
Frequent use of the IR VOC camera could replace the annual monitoring requirement in Chapter 115



Downside: Need for Flexibility of State and Federal Regulations

- These incentives would require the flexible application of federal and state regulations and would need agreement by EPA

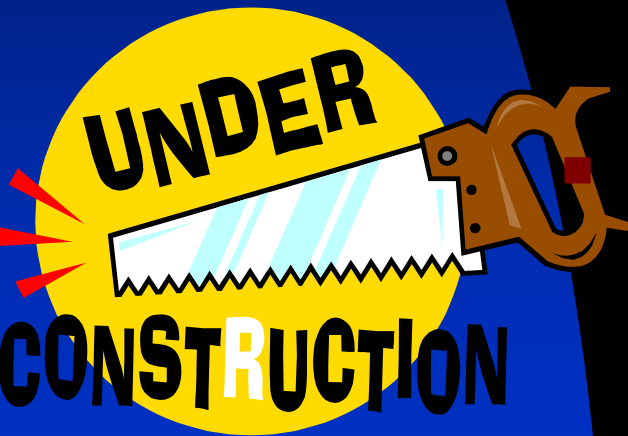


■ Another key concern would be Title V deviation reporting. Some type of relief from deviation reporting would be needed for this type of voluntary program



Potentially New and/or Revised State Regulations???

- Rule effectiveness review of storage tank rules:
 - ◆ limiting number of roof landing
 - ◆ better controls on tank fittings



Watch for a stakeholder meetings to be announced:

<http://www.tceq.state.tx.us/implementation/air/sip/sipcontact.html#Listserve>



Federal Regulations

- The agency is reviewing the EPA's voluntary alternative work practice for finding leaking equipment using optical gas imaging and determining if the agency will provide comments to EPA.
- Comment period was extended 30 days past the original June 5, 2006, date.
- A draft can be found in Volume 71, *Federal Register*, pages 17401 to 17409



Summary

- Technology holds promise in identifying unsuspected sources of VOC
- Technology cannot speciate or provide quantity, but can detect VOC emissions
- Future uses:
 - ◆ Characterization of source emissions
 - ◆ Additional LDAR Tool



Questions?

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