

Oil and Natural Gas Industry Compliance Assistance Presentation



VOC Gas Emissions



- Methane
- Ethane
- Propane
- Butane
- Hexane
- Ethylene
- Propylene
- Benzene
- Toluene
- o-Xylene

What is LDAR?

Leak Detection And Repair:

- Efficiently try to locate and repair a relatively small number of leaks in a large population of process equipment
- You can find leaks, but not necessarily the “problem” leaks

Problems Seen with LDAR

- Time consuming
- Labor intensive
- **Expensive**



Method 21

Place the probe inlet at the surface of the component interface where leakage could occur.

Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained.

Leave the probe inlet at this maximum reading location for approximately two times the instrument response time.

Method 21

- Imagine doing this procedure for 10,000 components/unit.
- There can be multiple process units at a facility.

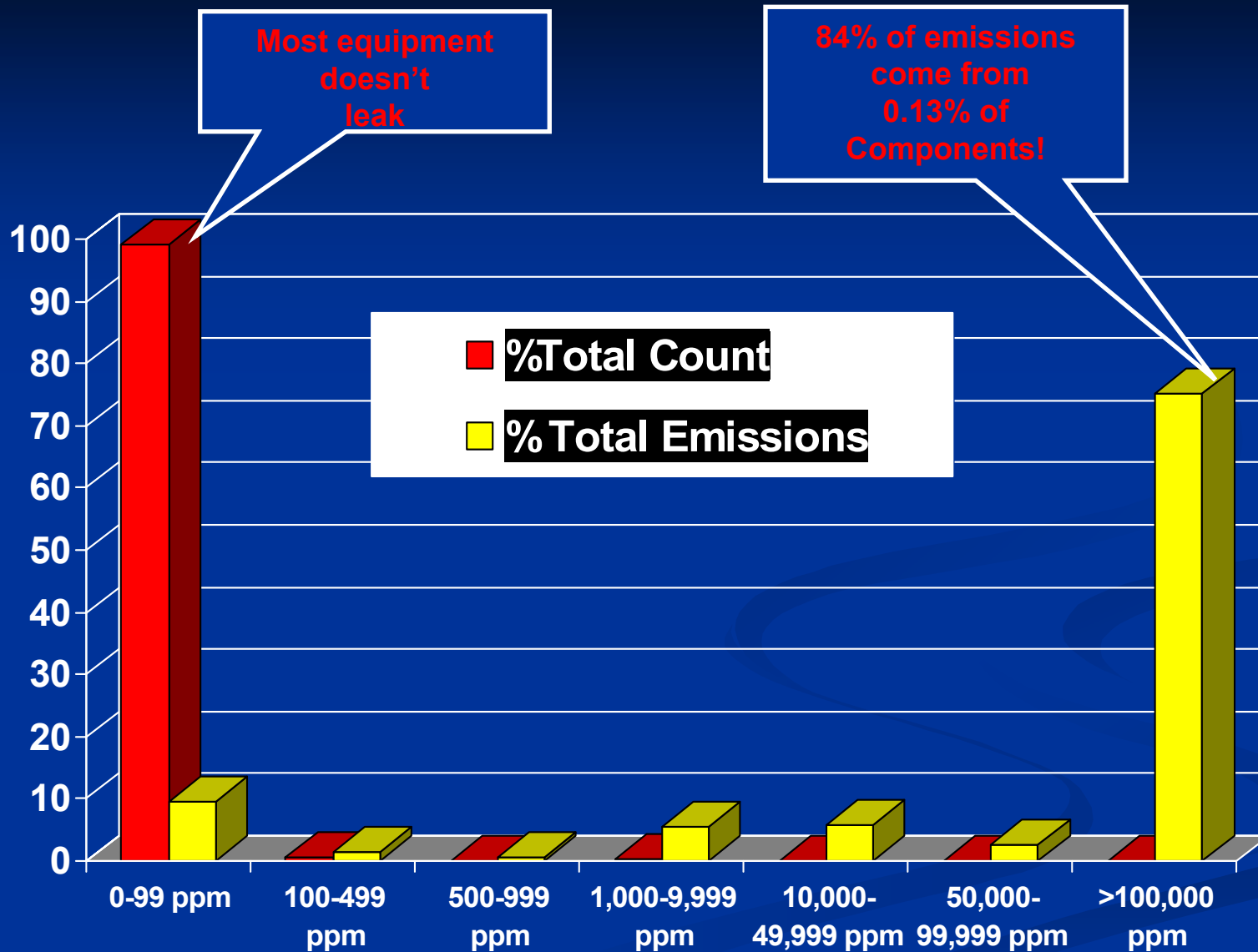


Organic Vapor Analyzer

- An alternative work practice should be effective in 2007.

“Why worry about some little leaks?”

- On average natural gas processing plants lose between 0.05 to 0.5% of their total production to fugitive emissions
- Up to 95% of these emissions can be prevented by identification and repair
- Based on facility production, fugitive gas losses may amount to between \$2,000,000 and \$20,000,000 USD per year
- This provides a significant opportunity to increase production through fugitive emission reduction
- Majority of fugitive emissions arise from a minority of leaking components



Taback et al., 1997, API Publ 310, "Analysis of Refinery Screening Data"

WHY LET \$ ESCAPE INTO THE AIR?

Besides being an environmental hazard, escaping vapors actually cost the operator money. What money? Uncaptured profits!!



Sources of Methane Losses

- Approximately 26.6 Bcf/yr of Methane are lost from storage tanks
 - Flash losses
 - occur when crude is transferred from containment at a high pressure to containment at a lower pressure
 - Working losses
 - occur when crude levels change and when crude in the tank is agitated
 - Standing losses
 - occur with daily and seasonal temperature and pressure changes

Source: Natural Gas STAR Partners

VAPOR RECOVERY SYSTEMS

PURPOSE

- Vapor Recovery units are designed to comply with EPA standards, provide additional profits to the oil producer and eliminate the emission of stock tank vapors to the atmosphere.
- Most vapors contain varying amounts of methane, ethane, isopentane, propane, and butane and contribute to the gravity of lease crude.
- Dissipation of these products to the atmosphere on a conventional tank battery means a reduction in gravity of the liquid in the tank, thereby decreasing its value.

Benefits of Vapor Recovery Units

- Capture up to 95 percent of hydrocarbon vapors that accumulate in tanks
- Recovered vapors have much higher Btu content than pipeline quality natural gas
- Recovered vapors can be more valuable than methane alone
- Reduce regulatory & liability exposure

What Is the Payback?

Financial Analysis for VRU Projects

Peak Capacity (Mcf/d)	Installation & Capital Costs ¹ (\$)	O&M Costs (\$/year)	Value of Gas ² (\$/year)	Payback ³	Return on Investment ⁴ (%)
25	26,470	5,250	25,869	1 yrs, 4 mos	73
50	34,125	6,000	51,738	9 mos	132
100	41,125	7,200	103,477	7 mos	234
200	55,125	8,400	206,955	3 mos	360
500	77,000	12,000	465,648	2 mos	589

¹ Unit cost plus estimated installation cost of 75% of unit cost.

² \$5.67 per Mcf x 1/2 capacity x 365. Assumed price includes value of Btu-enriched gas (1,285 Btu/scf).

³ Based on 10% discount rate for future savings. Excludes value of recovered gas liquids.

⁴ Calculated for 5 years.

Source: Natural Gas Star Partners

Thermal Imaging

Infrared Camera

**Process unit with 10,000
Components subject to monitoring**



ThermaCAM® *GasFindIR*

- Hand held, Battery operated IR Camera
 - Cooled, 320x240 InSb
 - Midwave Cold Filter (~3.25 μm)
- Passive System
- Optimized for detecting VOC's
- Let's you "SEE" a gas leak



Detection Technology with GasfindIR®

- Optical emission technology
- Infrared video camera with hydrocarbon/VOC filter
- Provides visible images of a HC gas emissions in real-time

Benefits:

- Rapid, accurate and safe detection
- Scan hard-to-reach components from a distance
- Assessments performed without interruption of operations
- Inspection times are minimal, which can keep costs down
- With exact leak source info, repairs are less time consuming and less expensive
- Cost effectively scan hundreds of components simultaneously

Approx. Cost: \$75,000 USD

How does it work?

IR Theory

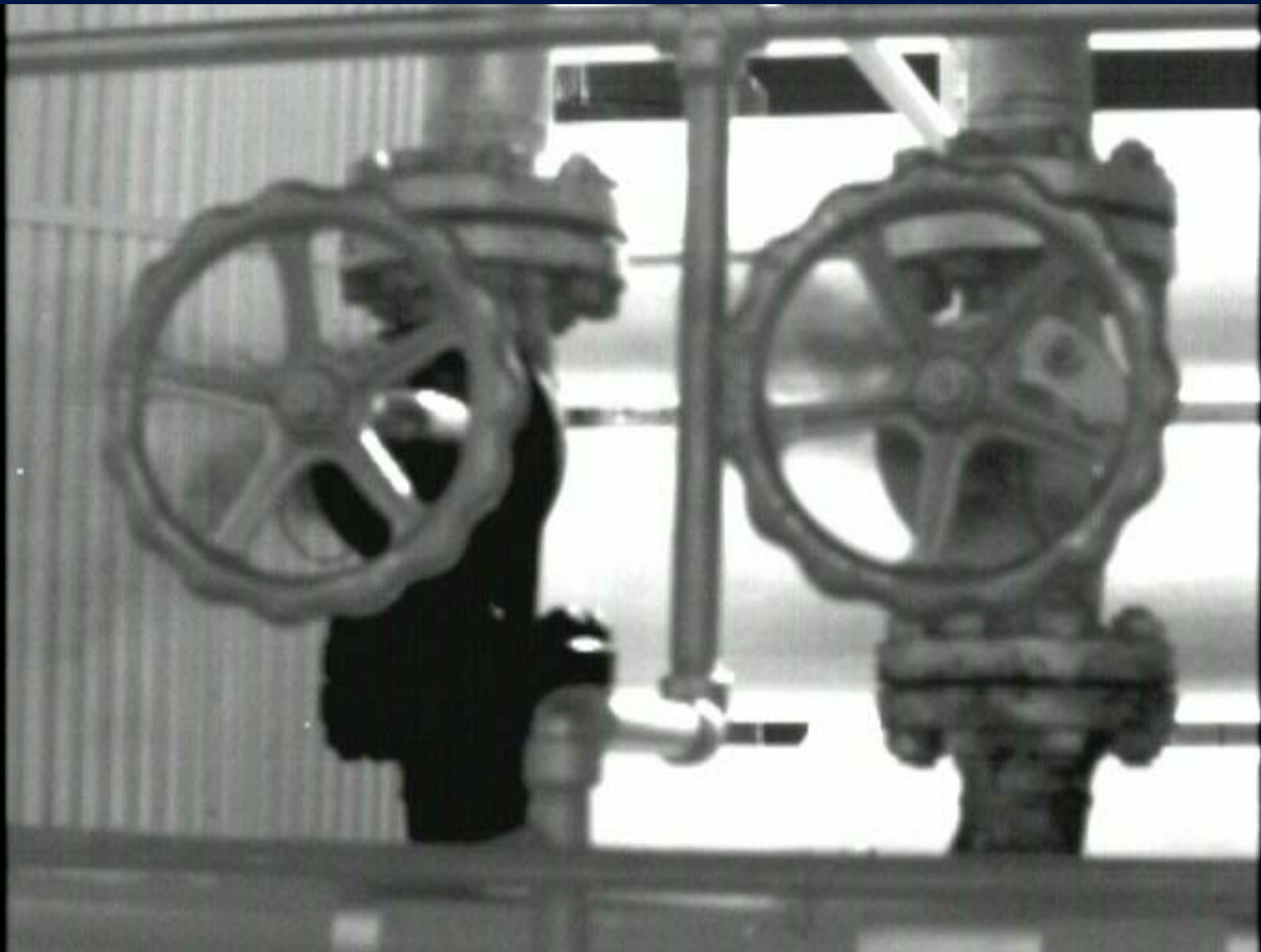
Infrared Radiation...

- ❑ IR is emitted by all objects
- ❑ IR radiation increases with temperature
- ❑ IR radiation is minimal at Low temperatures
- ❑ IR is generated by the vibration of electrically charged particles
- ❑ IR travels through space at the speed of light
- ❑ The difference between light and IR is wavelength



What can GasFindIR do?

Let's take a look....



AUTO HIST WHITE

FLIR™

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AUTO

HIST

WHITE

FLIR™

8/ 8/05 5.50.06PM



AUTO

HIST

BLACK

FLIR

8/ 8/05 4:49:40PM





FLIR™ HI

MANUAL

WH



1/18/06 2:42:47PM

FLIR™ HI AUTO HIST WH



11/29/06 11.38.42AM

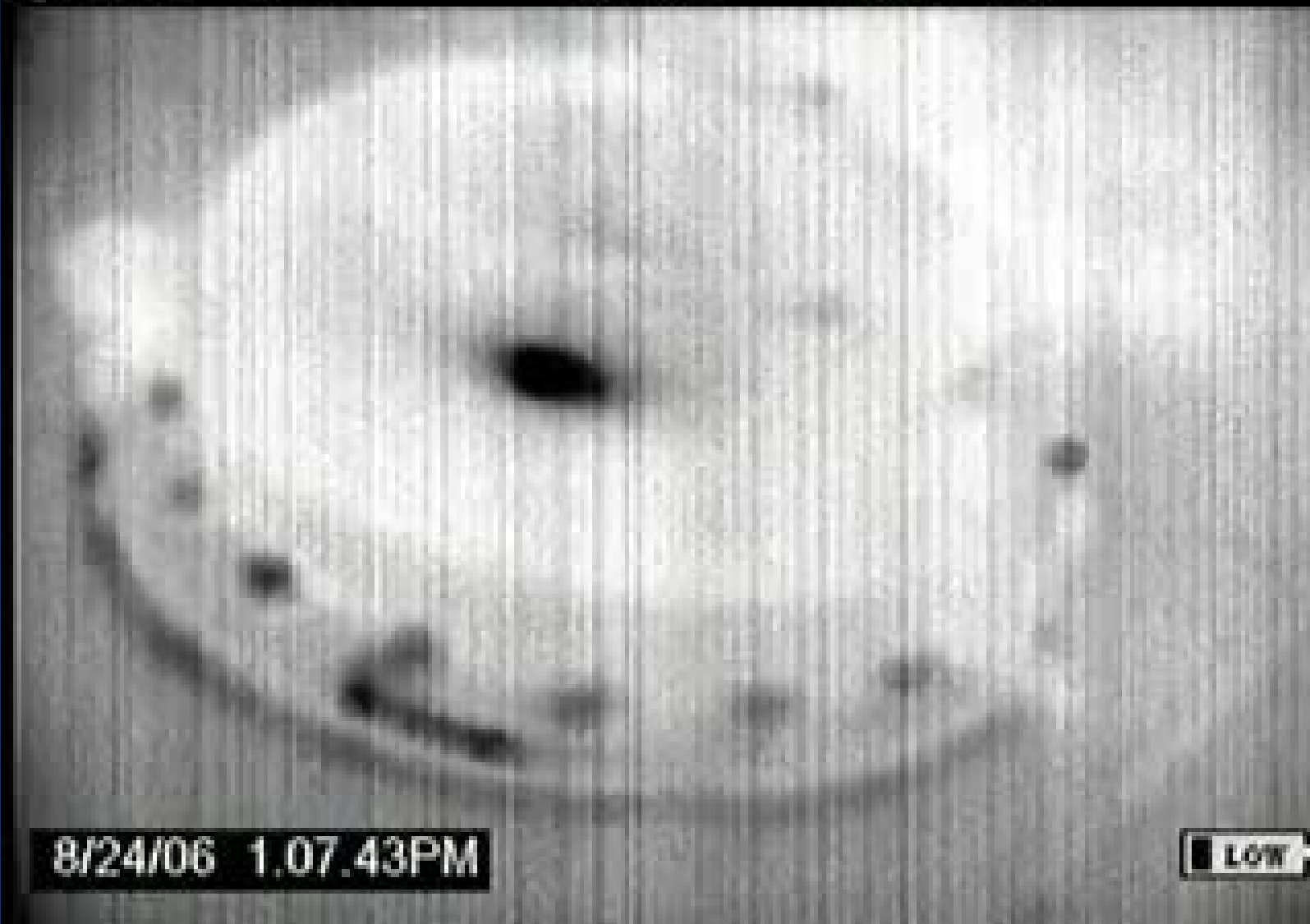
LOW

FLIR™ ME

AUTO

HIST

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FLIR™ HI AUTO HIST BL



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LOW



Compliance Assurance

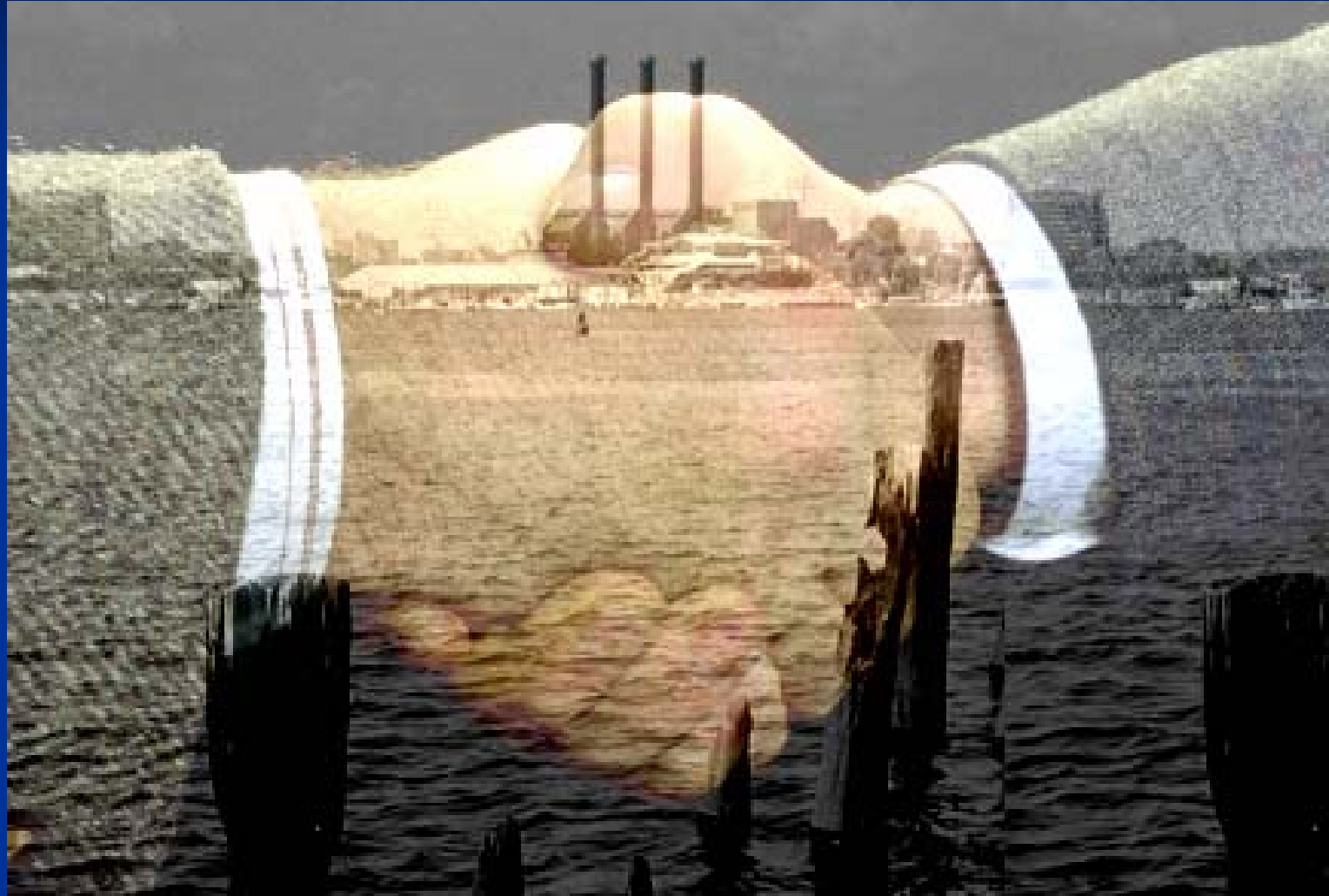
- 40 CFR Part 63 Subpart HH
- 40 CFR Part 63 Subpart HHH
- 40 CFR Part 60 Subpart KKK

Inspection to Area of Concern Ratio	
Oil and Natural Gas Facilities	90%
All Other Types of Facilities	75%

Estimated VOC Emissions from Oil and Condensate Wellhead and Gathering Site Storage Tanks

Non-Attain. area	Oil (bbl/Year)	Condensate (bbl/Year)	Estimated VOC (TPD)
BPA	2,419,201	3,065,105	145
DFW	102,558	816,724	38
HGB	9,875,858	5,858,404	289
E.TX Attain. Counties	49,939,437	16,171,858	846
E. TX Region Total	62,337,054	25,912,091	1,317

Partnerships



Sources of information:

U.S. EPA Natural Gas STAR Program

Roger Fernandez 202-343-9386 fernandez.roger@epa.gov

<http://www.epa.gov/gasstar/>

FLIR Systems

Craig R. O'Neill 866-837-3241 craig.oneill@flir.com

<http://www.flirthermography.com/>

Hy-Bon Engineering Company, Inc.

Larry S. Richards 432-697-2292

<http://www.hy-bon.com>

U.S. EPA Region 6 – ONG Coordinators

Tony Robledo 214-665-8182 robledo.tony@epa.gov

Himanshu Vyas 214-665-2709 vyas.himanshu@epa.gov

The End

