IMPROVING SAFETY
MAXIMIZING PROFITS
REDUCING EMISSIONS
MAINTAINING COMPLIANCE

TARGET
EMISSION SERVICES

Natural Gas STAR's
2009 Annual Implementation Workshop

Fugitive Emission Management

in the Transmission Sector

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OVERVIEW

- BACKGROUND
- DETECTION & MEASUREMENT TECHNOLOGY
- FUGITIVE EMISSION MANAGEMENT PROGRAM (FEMP) COMPONENTS
- FEMP CONSIDERATIONS
- REGULATIONS
- CASE STUDY DATA

UNDERSTANDING THE ISSUE

Fugitive Emissions

- intentional
  - intended/designed venting (i.e. venting from tanks, controllers, compressor seals, stacks, etc.)
- unintentional
  - leaks due to normal wear and tear, improper or incomplete assembly of components, inadequate material specification, manufacturing defects, damage during installation or use, corrosion, fouling and environmental effects
- potentially cost industry hundreds of millions to billions of dollars in lost product and can pose safety risks to workers and the public
- account for a significant amount of the total inventory of greenhouse gases emitted by industry

DRIVERS

Improving Health & Safety

- Identify and eliminate hazards (Fire & Explosions and Exposure)
- Reduce LEL (lower explosive limit) levels within facilities

Maximizing Profits

- Recover lost product
- Increase production
- Reduce costs

Reducing Emissions

- Reduce GHG (methane) emissions
- Reduce BTEX and other VOC emissions
- Solve offsite odor problems

Maintaining Regulatory Compliance

- Meet or exceed requirements
- Arm company with new technologies used by regulators

CONVENTIONAL LEAK DETECTION

Gas Sniffer

- US EPA Method 21 using a hydrocarbon detection sensor to obtains ppm, or LEL.
- Ranging from a personal safety monitors to TVA VOC analyzer
- Each connection must be assessed separately

Bubble Test

- Using soap solution on a connection to detect leak

Ultrasonic Testing

- Detects frequency of turbulent flow from leaks

DETECTION TECHNOLOGIES

Primary:

Optical Infrared Detection

ThermaCAM® GasFindIR

- New leading FE technology
- Proven and reliable technology
- Significant increase in ability to find emissions
- Significant decrease in the time/money needed to assess facilities
- IR scanning now approved by EPA as alternative to conventional methods

Secondary:

Gas Detector (EC, PID/FID, IR, etc.)

- Provides ppm level detection of gas leaks
- Building entry, hazardous gas detection, etc.
- Supplementary confirmation of emission type, source, and size

DETECTION TECHNOLOGIES

Auxiliary / Specialized:

- **Laser Methane Gas Detector**
  - Long range & Remote detection
  - High sensitivity for Methane (100-10,000 ppm*m)
  - Ultra fast response
  - Use with mobile survey (pipeline)

- **Ultrasonic Internal Valve Leak Detection**
  - detects through-valve leakage based on ultrasonic frequency
  - Quantitative estimation of leak volume

MEASUREMENT TECHNOLOGIES

Primary:

- **Hi flow Sampler**
  - very high accuracy and efficiency
  - allows an objective cost-benefit analysis
  - always have at least one backup unit

Secondary:

- **Vane Anemometer**
- **Calibrated volume bag**
- **Flow Meters**

Let us help you “see” what you are missing!

What you see…

What we see…

THREADED CONNECTION

0.45 ft^3/min.

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VALVE STEM

0.65 ft^3/min.

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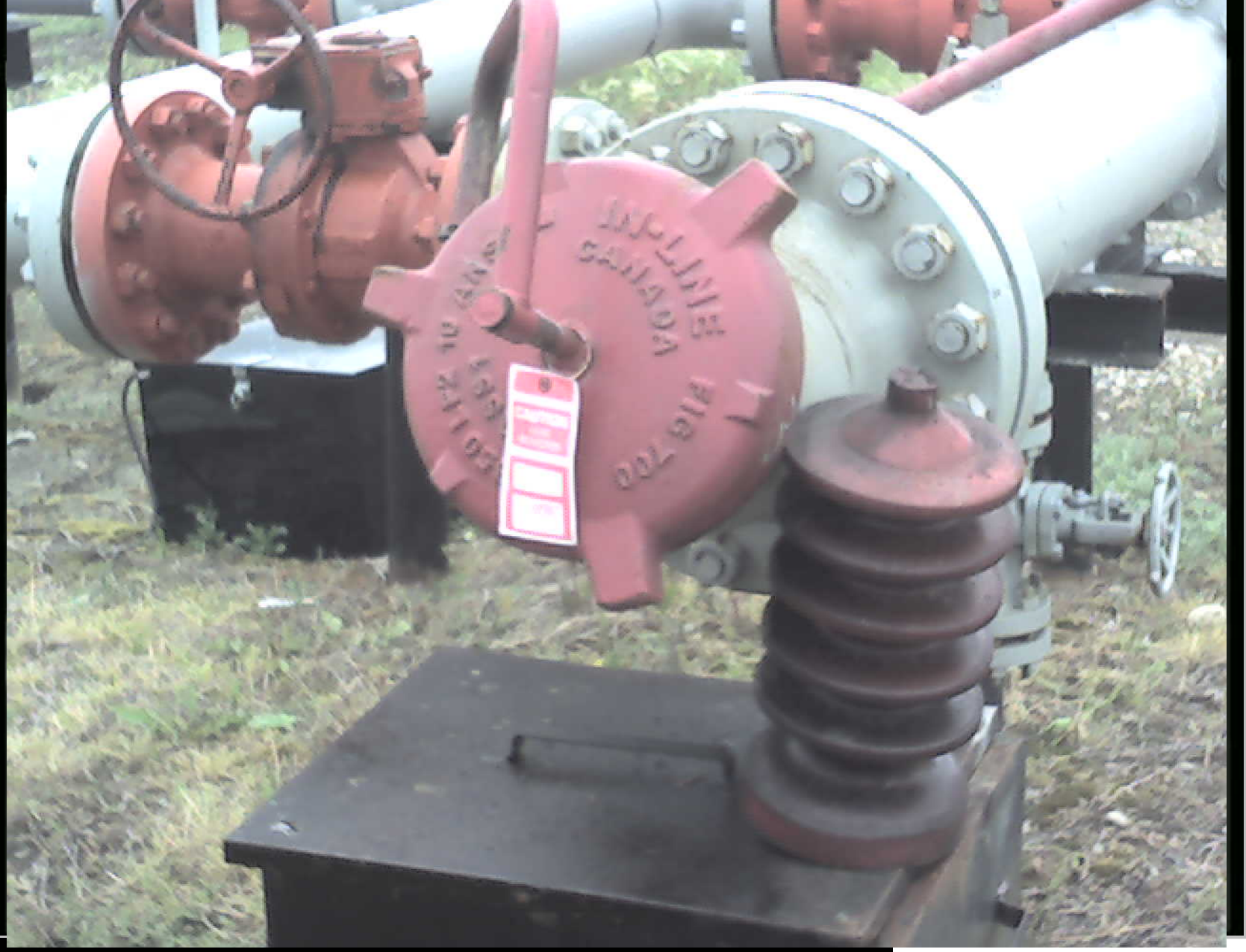

Pig Trap Cap

3.50 ft^3/min.

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DUMP VALVE LEAK (VENT STACK)

0VER 60.0 ft^3/min.

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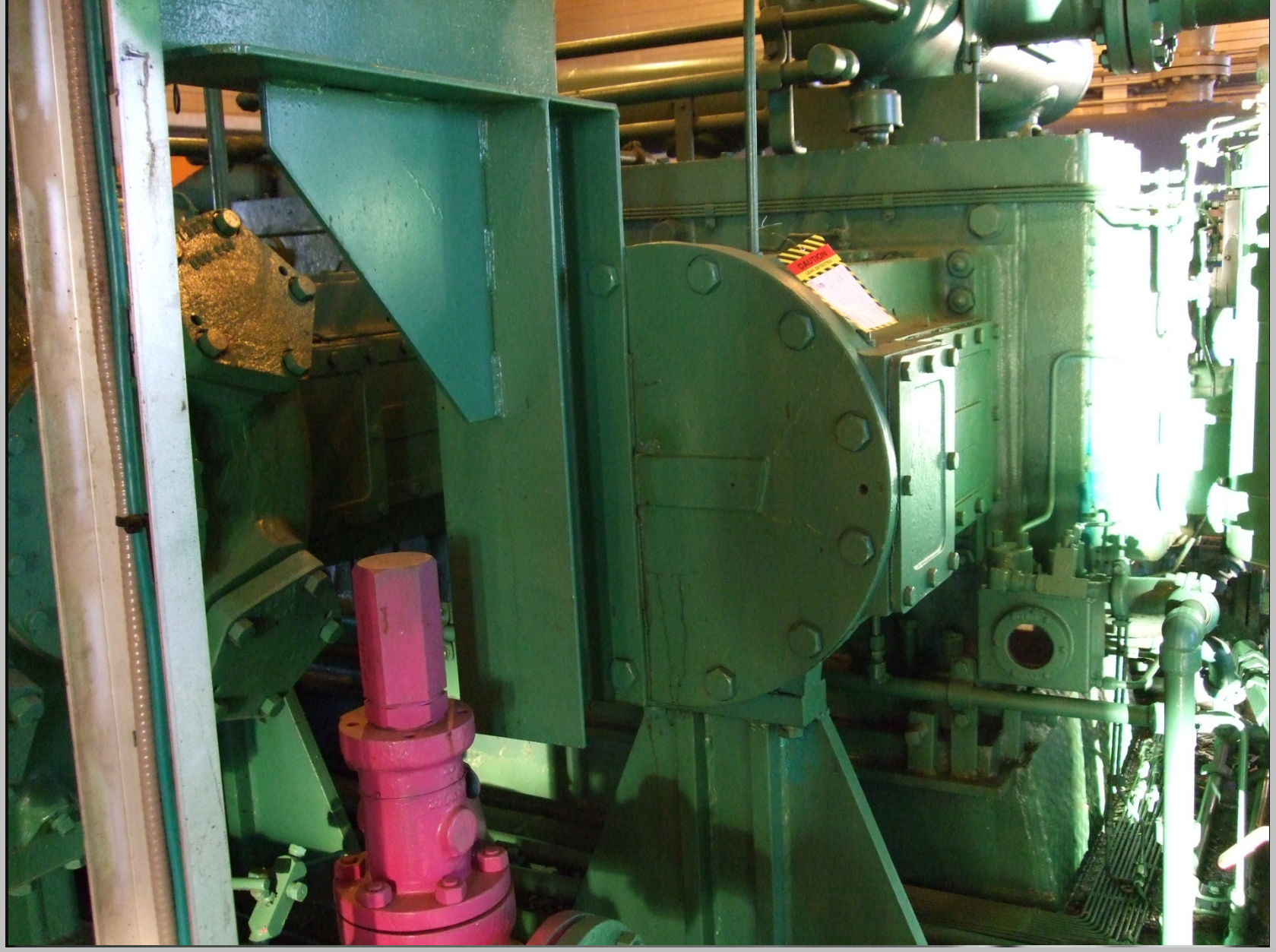

HOLE IN BLOCK FLANGE

1.20 ft^3/min.

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COOLER PIPING LEAK

20.00 ft^3/min.

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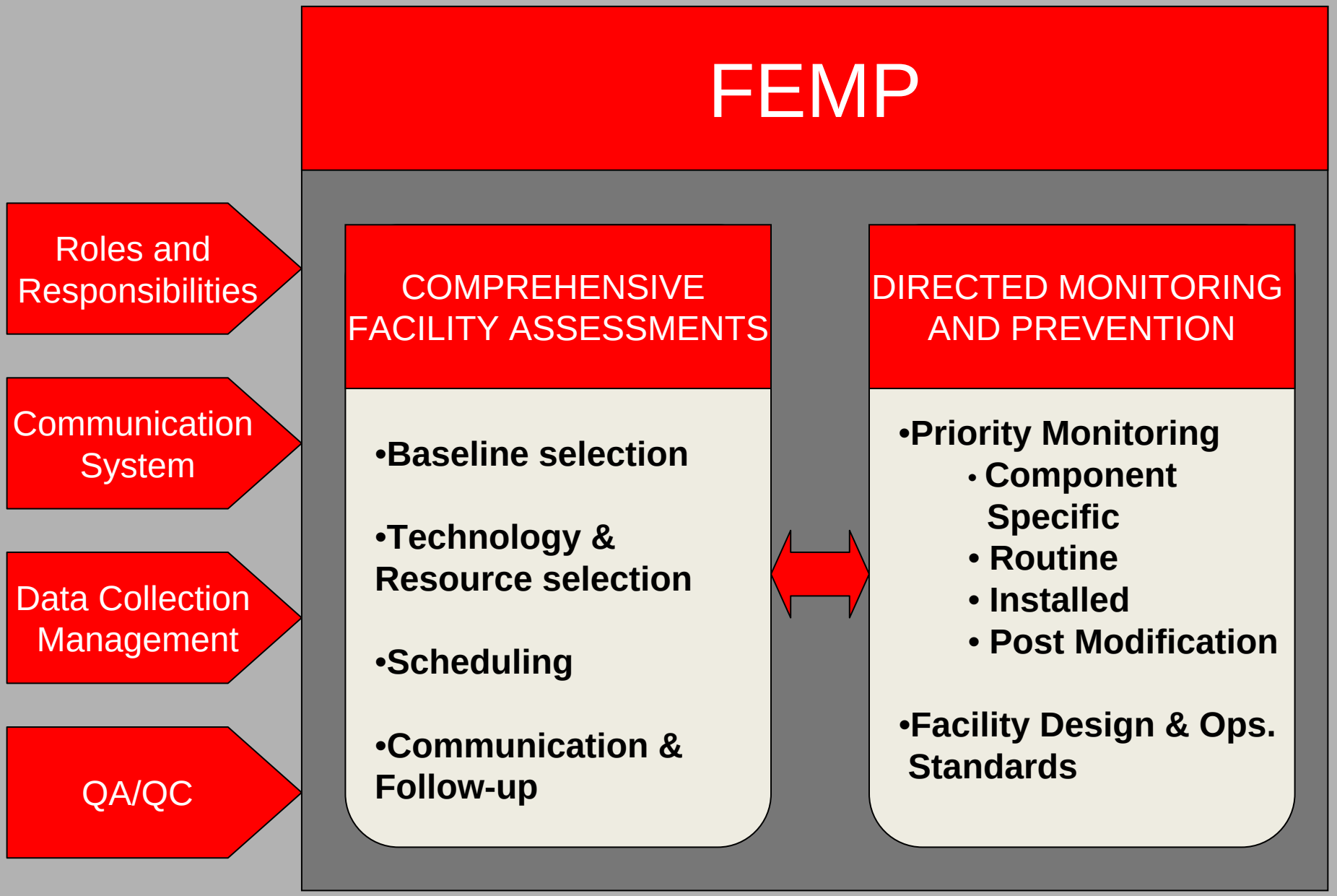
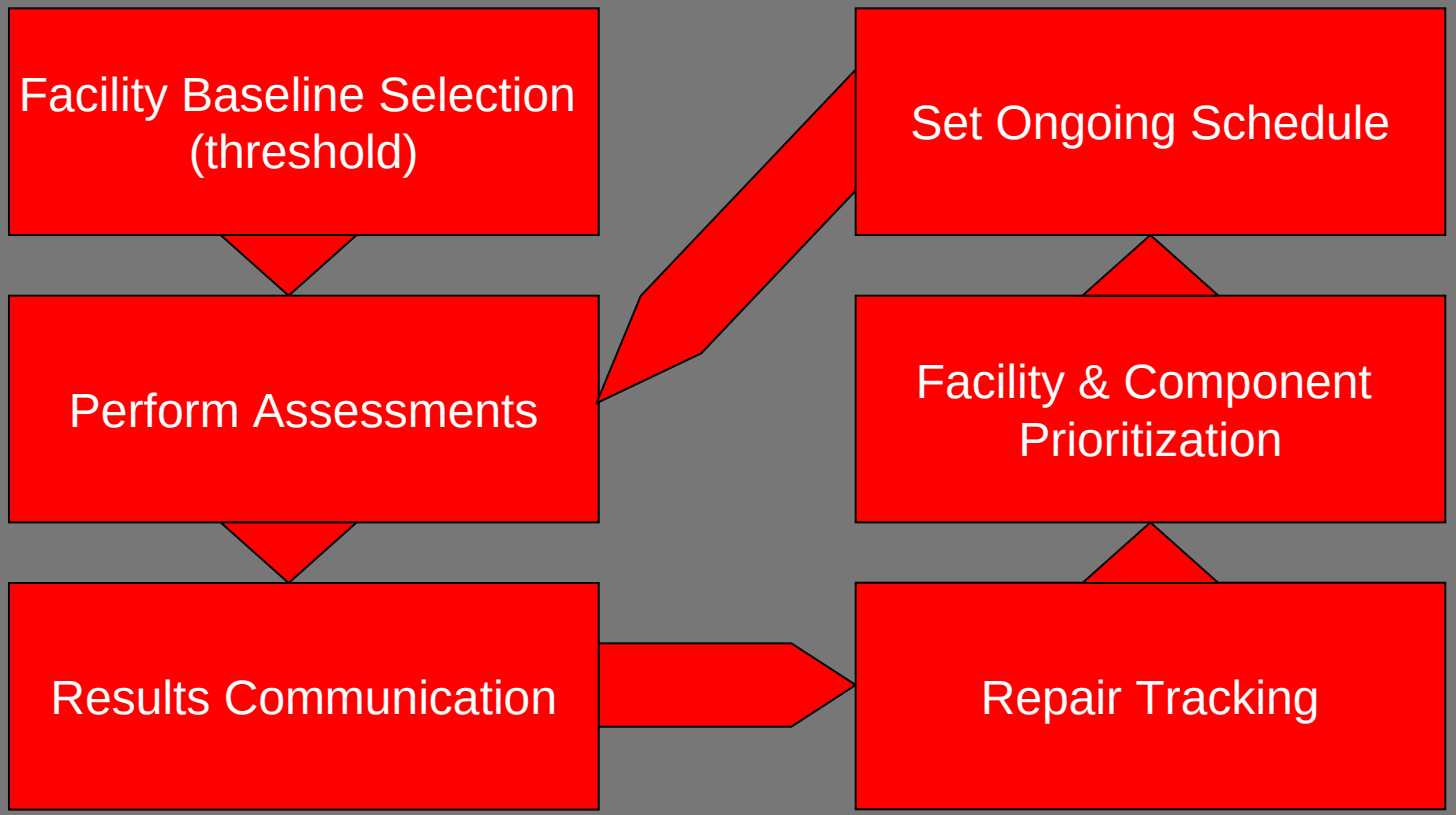
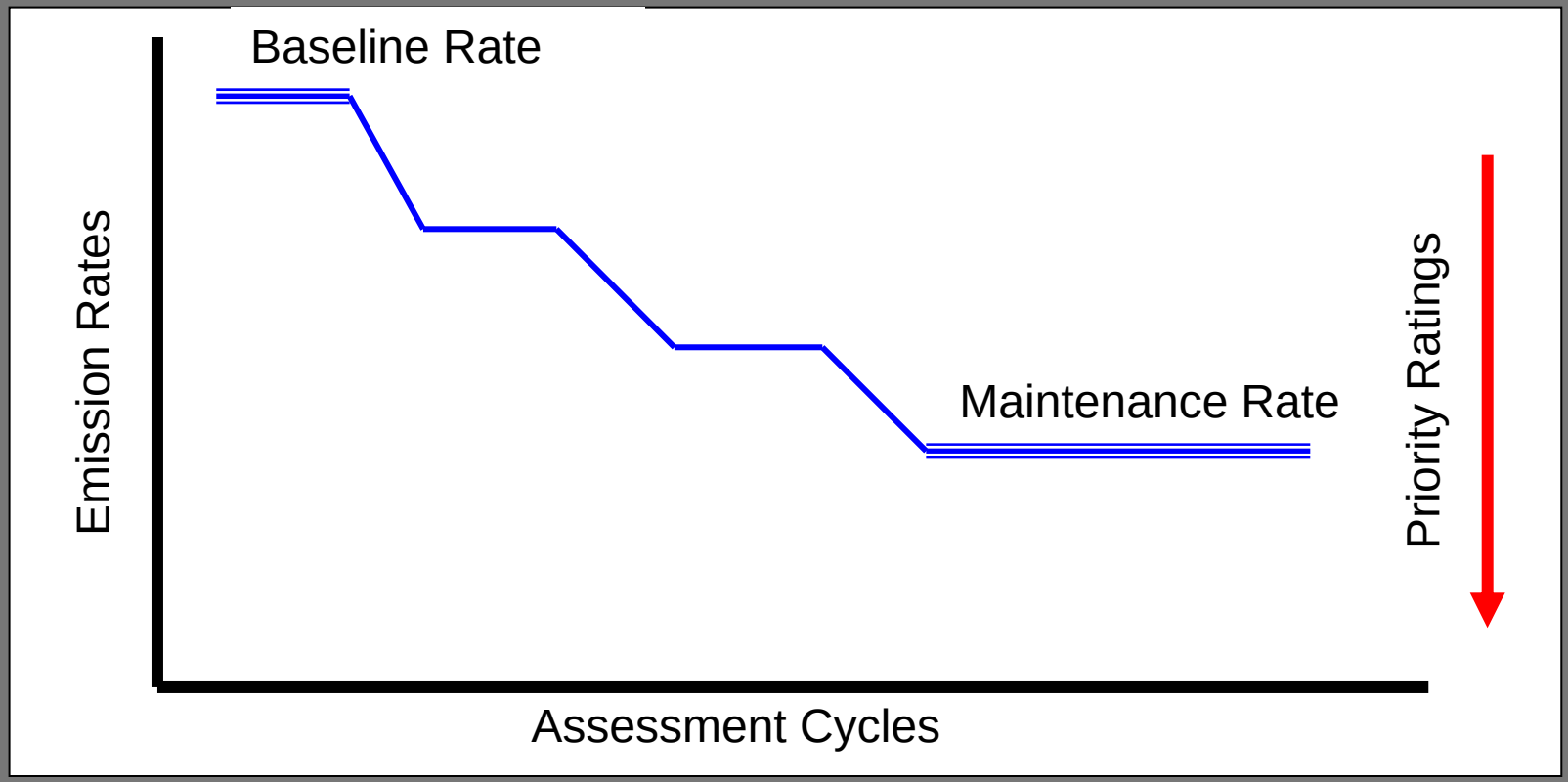

FEMP
Roles and Responsibilities
Communication System
Data Collection Management
QA/QC
COMPREHENSIVE FACILITY ASSESSMENTS
•Baseline selection
•Technology & Resource selection
•Scheduling
•Communication & Follow-up
DIRECTED MONITORING AND PREVENTION
•Priority Monitoring
• Component Specific
• Routine
• Installed
• Post Modification
•Facility Design & Ops. Standards

COMPREHENSIVE FACILITY ASSESSMENTS



FEMP TIMELINE



IMPORTANT CONSIDERATIONS

QA/QC - protocols for procedures, equipment maintenance, data collection and storage, and training

COMMUNICATION – effective reporting system to transfer data to individuals responsible for action

DATA CONSISTENCY - ensure that all source data is captured and consistently recorded

AUDITABILITY –consistent and repeatable results

VERIFIABLE - eligible to apply for GHG credits and/or offsets via independent verification (ISO 14064-1, 2, & 3)

EXPERIENCE –trained (certified), experienced and tested in the use of fugitive equipment and processes

HEALTH & SAFETY –work presents a set of hazards that must be controlled

IMPORTANT CONSIDERATIONS

RESOURCES

- external vs. internal (LODI)
- expertise in emission management
- a good tool is not a program

CORPORATE COMMITMENT

- bottom down approach will help ensure buy-in and follow through of implementation
- the program approach has large impact on success
- Imbed into corporate, facility and individual goal setting

REPAIR TRACKING

- develop a workable tracking system before program implementation
- incorporate existing data management systems
- effective feed-back system for repair tracking

FEMP APPROACHES

BASELINE

- threshold levels vary
- some starting at larger/older facilities only
- some companies doing wide cross section

FREQUENCY

- most companies are following a facility priority system, while other facility plans range from bi-annual to every 3 years

REPAIR TRACKING

- split between existing work order system and external tracking system

RESOURCES

- most companies are using third party, a few have started internal programs
- Operator involvement is low

US CONSIDERATIONS

EPA Proposed Mandatory Greenhouse Gas Reporting Rule (March 10, 2009)

(http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)

W. Oil and Natural Gas Systems

- facilities with emissions **greater than 25,000** metric tons CO2e per year be subject to reporting (**annual leak assessments**)
- identifies relevant facilities and outlines methods and procedures for calculating and reporting fugitive emissions
- fugitive emissions defined as unintentional equipment emissions and intentional or designed releases of **CH4 and CO2**
- propose that facilities would be required to **detect and then quantify** emissions
- Emission Source, Monitoring Method Type, Emissions Quantification Methods

US CONSIDERATIONS

Proposed Mandatory Greenhouse Gas Reporting Rule (cont.)

- lists advantages/disadvantages of specific technologies (**cost-effective detection technologies such as infrared fugitive emissions detection** instruments in conjunction with direct measurement methodologies)
- direct measurement using Method 21 was not found suitable for fugitive emissions measurement under this reporting rule
- engineering estimates only used of variable or unsafe to monitor sources
- the mass balance is often not recommended because of the uncertainties surrounding meter readings and the large volumes of throughput relative to fugitive emissions.
- emissions detected and measured would be assumed to continue throughout the reporting year, unless no emissions detection is recorded at an earlier and/or later point in the reporting period.

CASE STUDY DATA

FACILITY TYPE	#	Avg. Cumulative HP	Avg. Assessment Time
COMPRESSOR STATIONS	100	5000	8 hours (0.65 day)

Natural Gas (US$/mmbtu)
$5.00

CASE STUDY DATA

	EMISSION TYPE	TOTAL # OF SOURCES	TOTAL ANNUAL RATE (mcf/yr)	TOTAL ANNUAL GAS VALUE ($)	TOTAL NET PRESENT VALUE OF LEAK REPAIRS	ANNUAL CO2E RATE (tonnes/yr)
TOTAL	Leaks	1300	180,000	$950,000	$2,200,000	66,000
	Vents	2500	630,000	$3,370,000	$7,350,000	234,000
	TOTAL	**3800**	**810,000**	**$4,320,000**	**$9,550,000**	**300,000**

	EMISSION TYPE	TOTAL # OF SOURCES	TOTAL ANNUAL RATE (mcf/yr)	TOTAL ANNUAL GAS VALUE ($)	TOTAL NET PRESENT VALUE OF LEAK REPAIRS	ANNUAL CO2E RATE (tonnes/yr)
AVERAGE / FACILITY	Leaks	13	1,800	$9,500	$22,000	660
	Vents	25	6,300	$33,700	$73,500	2,340
	TOTAL	**38**	**8,100**	**$43,200**	**$95,500**	**3,000**

	EMISSION TYPE	TOTAL # OF SOURCES	TOTAL ANNUAL RATE (mcf/yr)	TOTAL ANNUAL GAS VALUE ($)	TOTAL NET PRESENT VALUE OF LEAK REPAIRS	ANNUAL CO2E RATE (tonnes/yr)
AVERAGE / DAY	Leaks	20	2,800	$14,600	$33,800	1,000
	Vents	38	9,700	$51,800	$113,000	3,600
	TOTAL	**58**	**12,500**	**$66,400**	**$146,800**	**4,600**

STATISTICS

- % Economical Leaks (POP <1.5 years) = 92%
- % Economical Vents (POP <1.5 years) = 70%
- % of emissions that are Safety Concern = 4%
- Top 10% of leaks makes up 73% total volume
- Top 10% of vents makes up 62% total volume

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