



**TARGET**  
**EMISSION SERVICES**

IMPROVING SAFETY  
MAXIMIZING PROFITS  
REDUCING EMISSIONS  
MAINTAINING COMPLIANCE

***METHANE TO MARKETS***

***Oil & Gas Systems Technology Transfer***

**FUGITIVE EMISSION MANAGEMENT**

Terence Trefiak, P.Eng.

**Sept. 15, 2009**

# OVERVIEW

- BACKGROUND
- DETECTION & MEASUREMENT TECHNOLOGY
- FUGITIVE EMISSION MANAGEMENT PROGRAM (FEMP) COMPONENTS
- FEMP CONSIDERATIONS
- CURRENT AND FUTURE 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...



[www.targetemission.com](http://www.targetemission.com)





**THREADED CONNECTION**  
**0.45 ft<sup>3</sup>/min.**



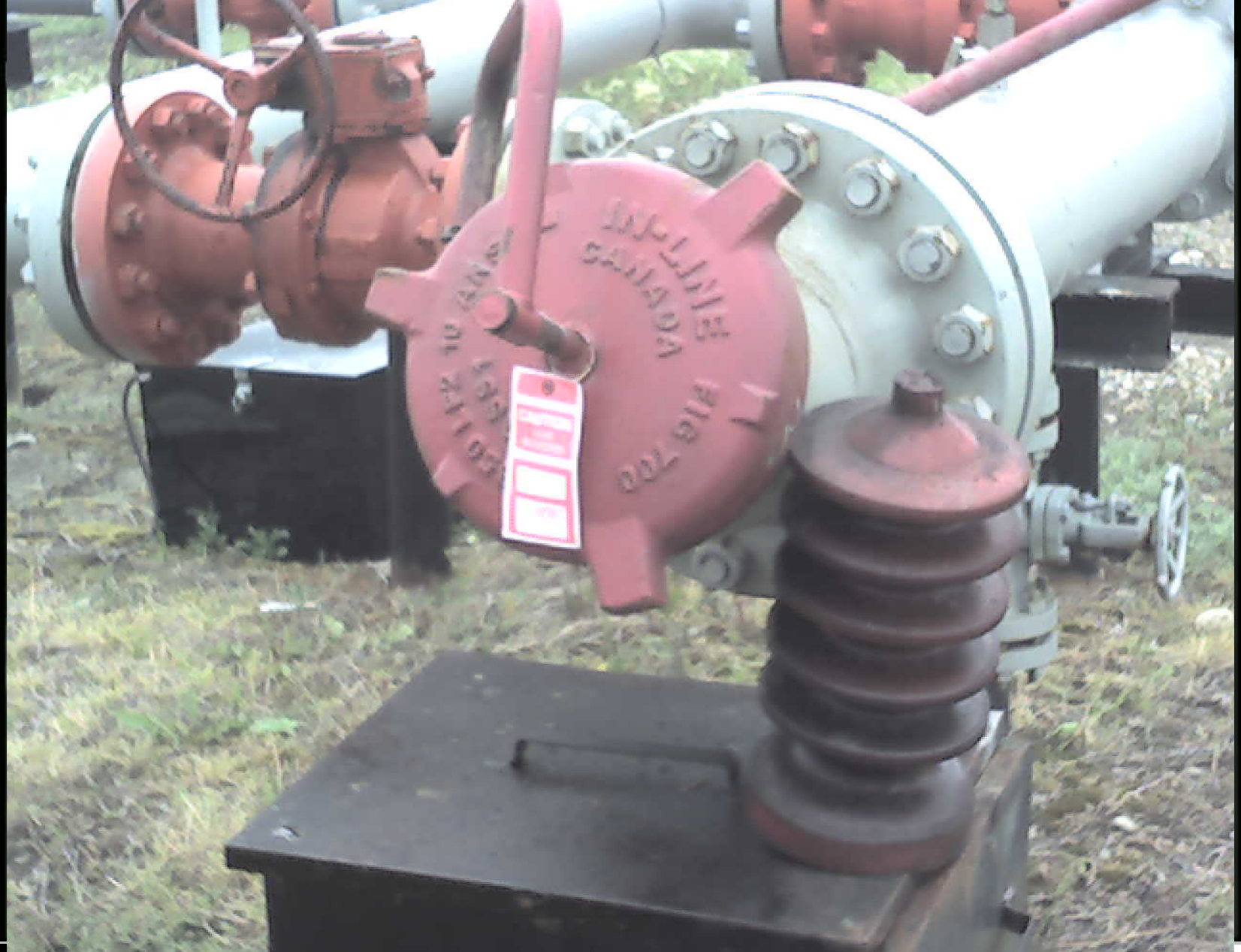
**TARGET**  
**EMISSION SERVICES**



**VALVE STEM**  
**0.65 ft<sup>3</sup>/min.**



**TARGET**  
**EMISSION SERVICES**



**Pig Trap Cap**  
**3.50 ft<sup>3</sup>/min.**



**TARGET**  
**EMISSION SERVICES**

FLIR™ HI

AUTO

HIST WH



5/ 1/06 10.03.37AM



**CONDENSATE TANK VENT EMISSIONS**  
**10.5 ft<sup>3</sup>/min.**



**TARGET**  
**EMISSION SERVICES**



**CONDENSATE TANK VENT EMISSIONS**  
**12.0 ft<sup>3</sup>/min.**



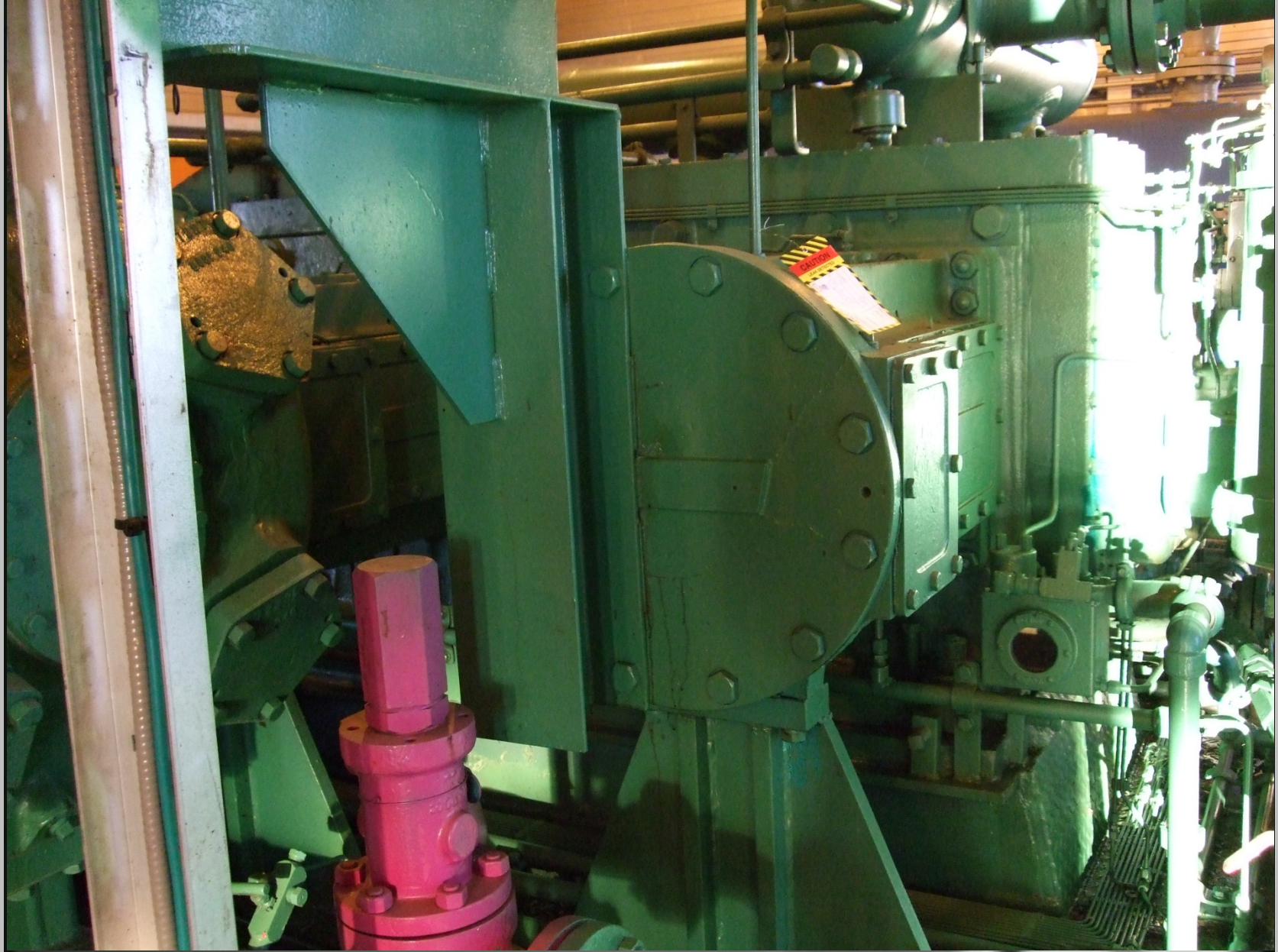
**TARGET**  
**EMISSION SERVICES**



**DUMP VALVE LEAK (VENT STACK)  
OVER 60.0 ft<sup>3</sup>/min.**



**TARGET**  
EMISSION SERVICES



**HOLE IN BLOCK FLANGE**  
**1.20 ft<sup>3</sup>/min.**



**TARGET**  
**EMISSION SERVICES**





**COOLER PIPING LEAK**  
**20.00 ft<sup>3</sup>/min.**



**TARGET**  
**EMISSION SERVICES**

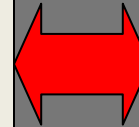
# FEMP

## 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**



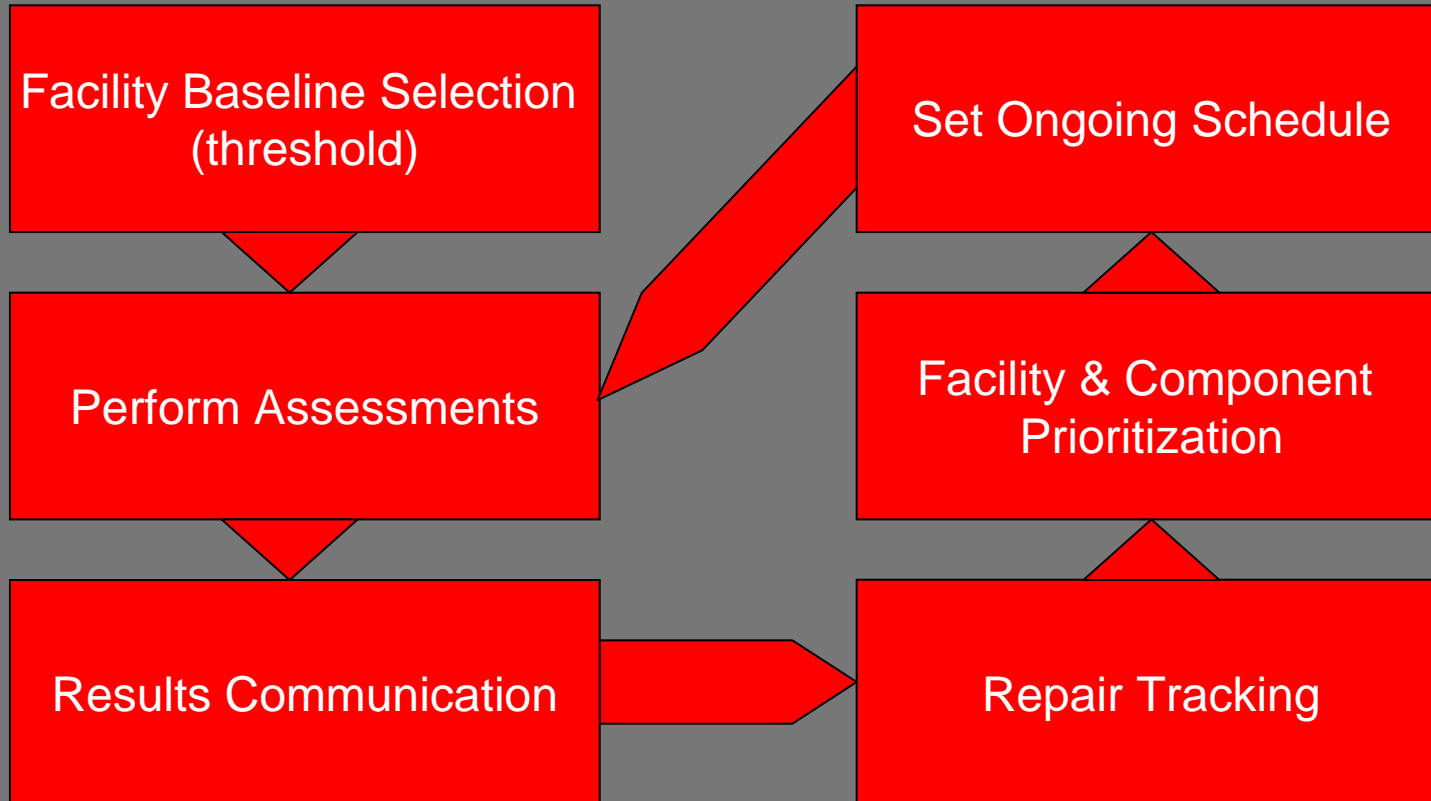
Roles and Responsibilities

Communication System

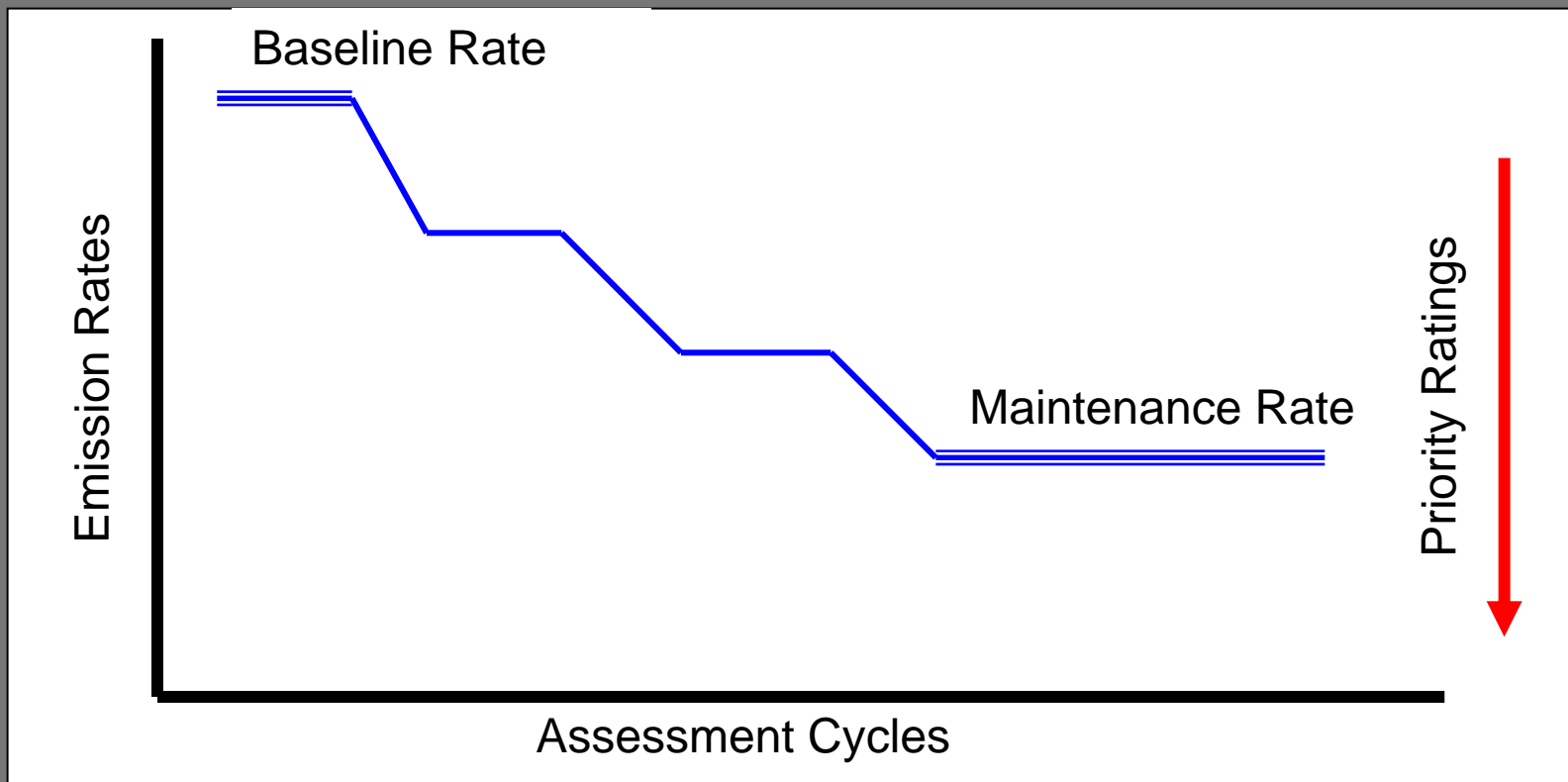
Data Collection Management

QA/QC

# 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, but average level is approx. 250 hp
- some starting at larger/older facilities only
- some companies doing wide cross section (wellsite, oil battery, comp. stn, GP)

## 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 CO<sub>2</sub>e 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 **CH<sub>4</sub> and CO<sub>2</sub>**
- 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	#	% OF FACILITY COUNT	% OF TOTAL EMISSIONS
COMPRESSOR STATIONS	265	60.6%	52.2%
MULTIWELL OIL BATTERY	91	20.8%	14.6%
GAS PLANTS	62	14.2%	30.9%
SINGLE WELL OIL BATTERY	12	2.7%	0.6%
WELLSITE	5	1.1%	0.4%
SAGD (Oil Sands)	2	0.5%	1.4%
<b>TOTAL</b>	<b>437</b>	<b>100%</b>	<b>100%</b>

**AVERAGE THROUGHPUT**

75 e<sup>3</sup>m<sup>3</sup>/day



# CASE STUDY DATA

Natural Gas (US\$/mcf)	TYPE	TOTAL # OF SOURCES	ANNUAL GAS VALUE	CO2e CREDIT VALUE (\$15/tonne)	EST. COST OF REPAIRS	NET PRESENT VALUE	ASSESSMENT TIME (days)
\$5.00							
<b>TOTAL</b>	<b>LEAKS</b>	2330	\$2,016,181	\$787,699	\$198,080	\$3,894,242	<b>157</b>
	<b>VENTS</b>	2513	\$6,170,307	\$2,494,379	\$10,102,080	\$14,834,995	
	<b>TOTAL</b>	4843	\$7,876,988	\$3,282,078	\$10,300,160	\$18,051,432	
<b>AVERAGE / FACILITY</b>	<b>LEAKS</b>	5	\$4,614	\$1,803	\$453	\$8,911	<b>0.36</b>
	<b>VENTS</b>	6	\$14,119	\$5,708	\$23,117	\$33,947	
	<b>TOTAL</b>	11	\$18,733	\$7,511	\$23,570	\$42,858	
<b>AVERAGE / DAY</b>	<b>LEAKS</b>	15	\$12,842	\$5,018	\$1,262	\$24,805	<b>1</b>
	<b>VENTS</b>	16	\$39,302	\$15,887	\$64,345	\$94,490	
	<b>TOTAL</b>	31	\$52,143	\$20,905	\$65,607	\$119,295	

# 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





**TARGET**  
**EMISSION SERVICES**

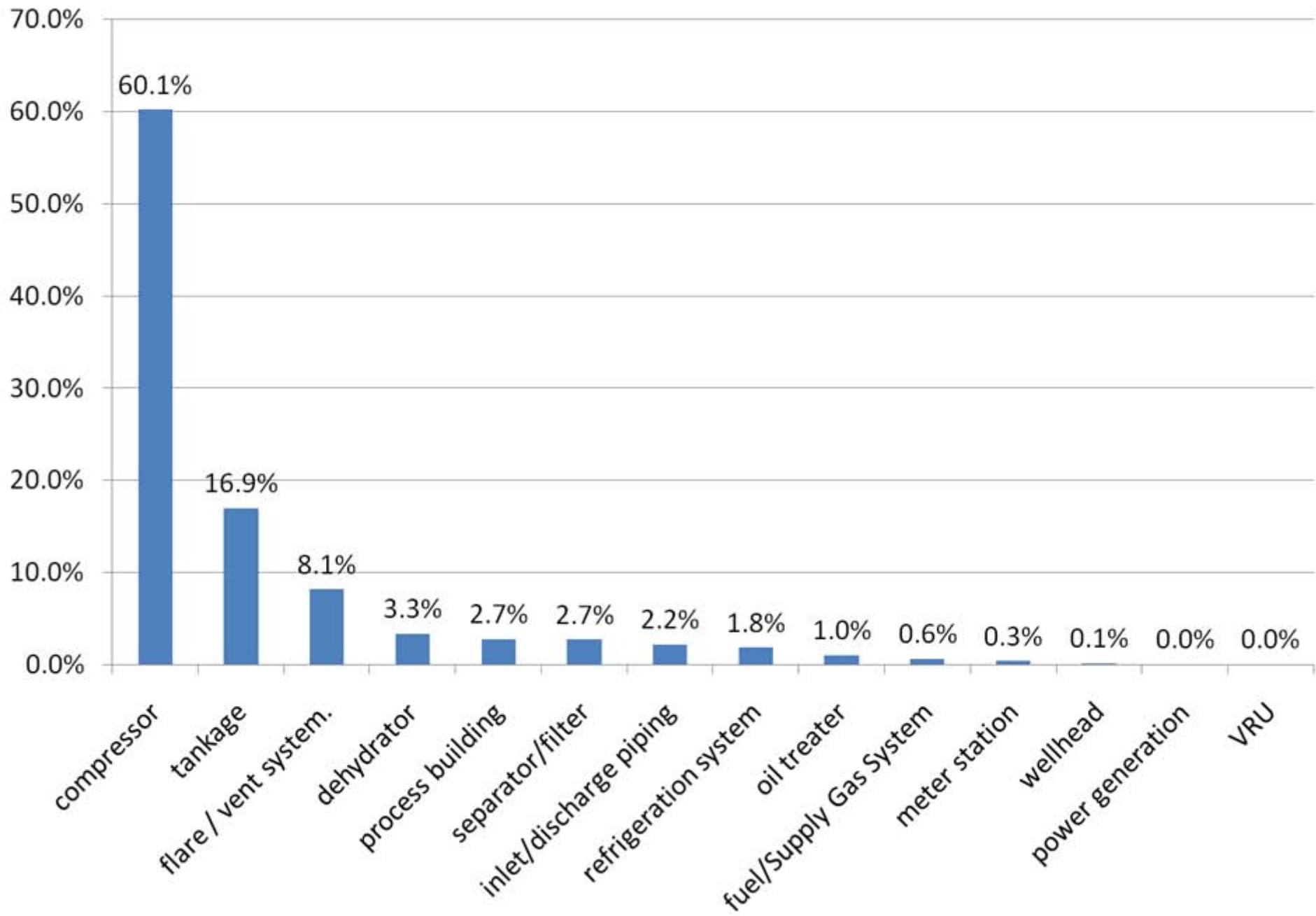
**CONTACT INFO**

**PHONE: (403) 225-8755**

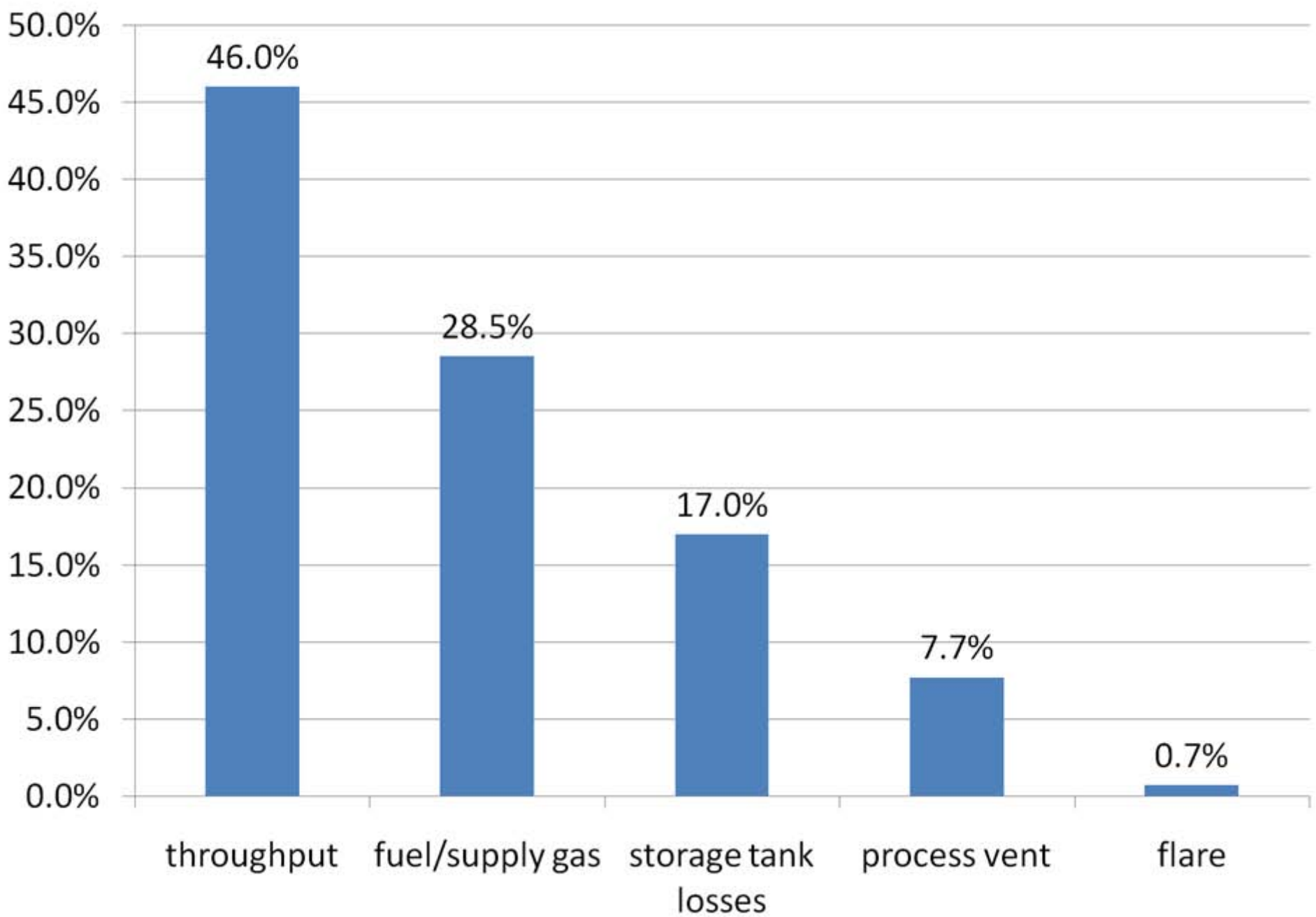
**EMAIL: [target@envirotecheng.com](mailto:target@envirotecheng.com)**

**WEBSITE: [www.targetemission.com](http://www.targetemission.com)**

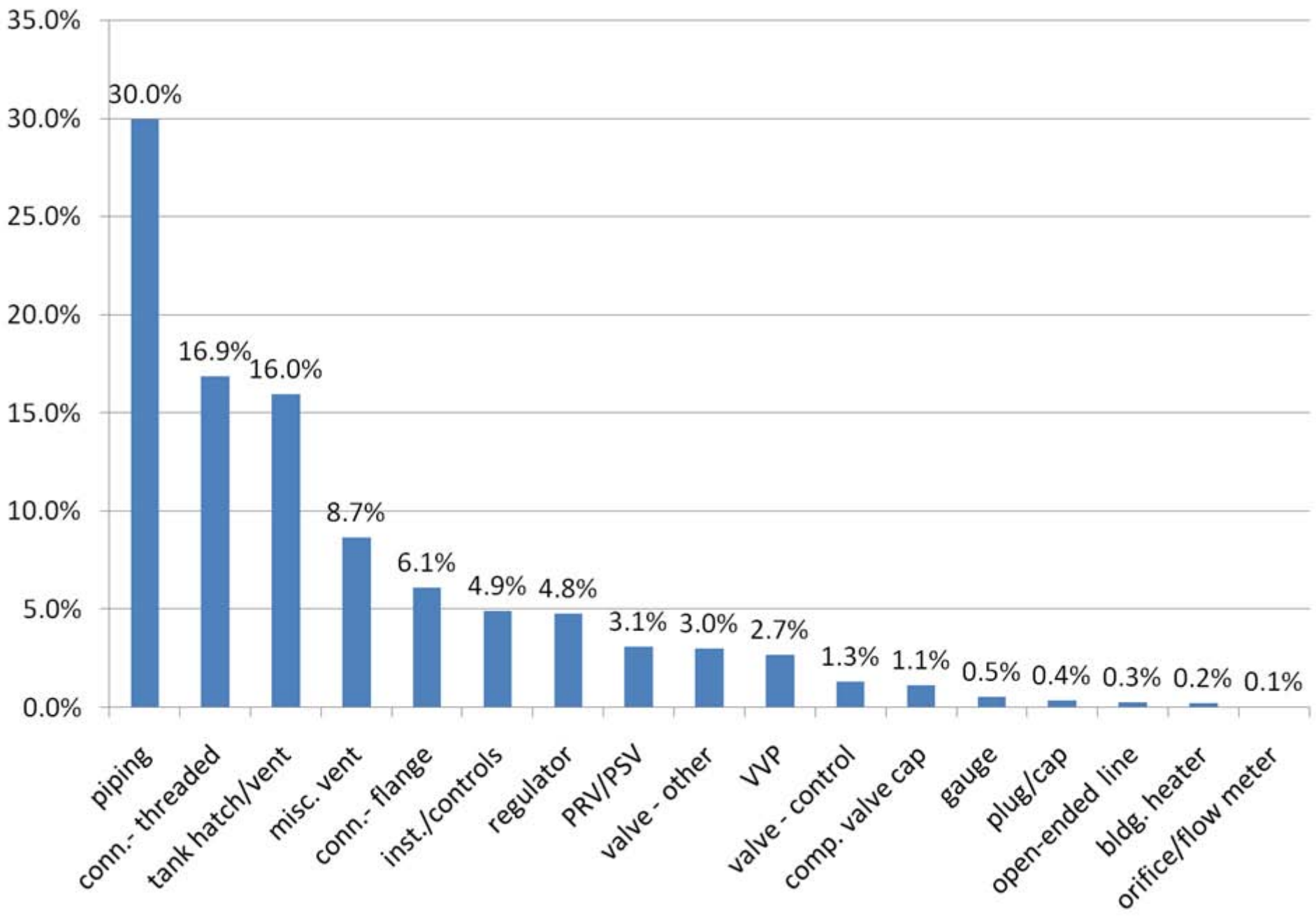
## LEAK PROCESS BLOCK %



# LEAK GAS STREAM %

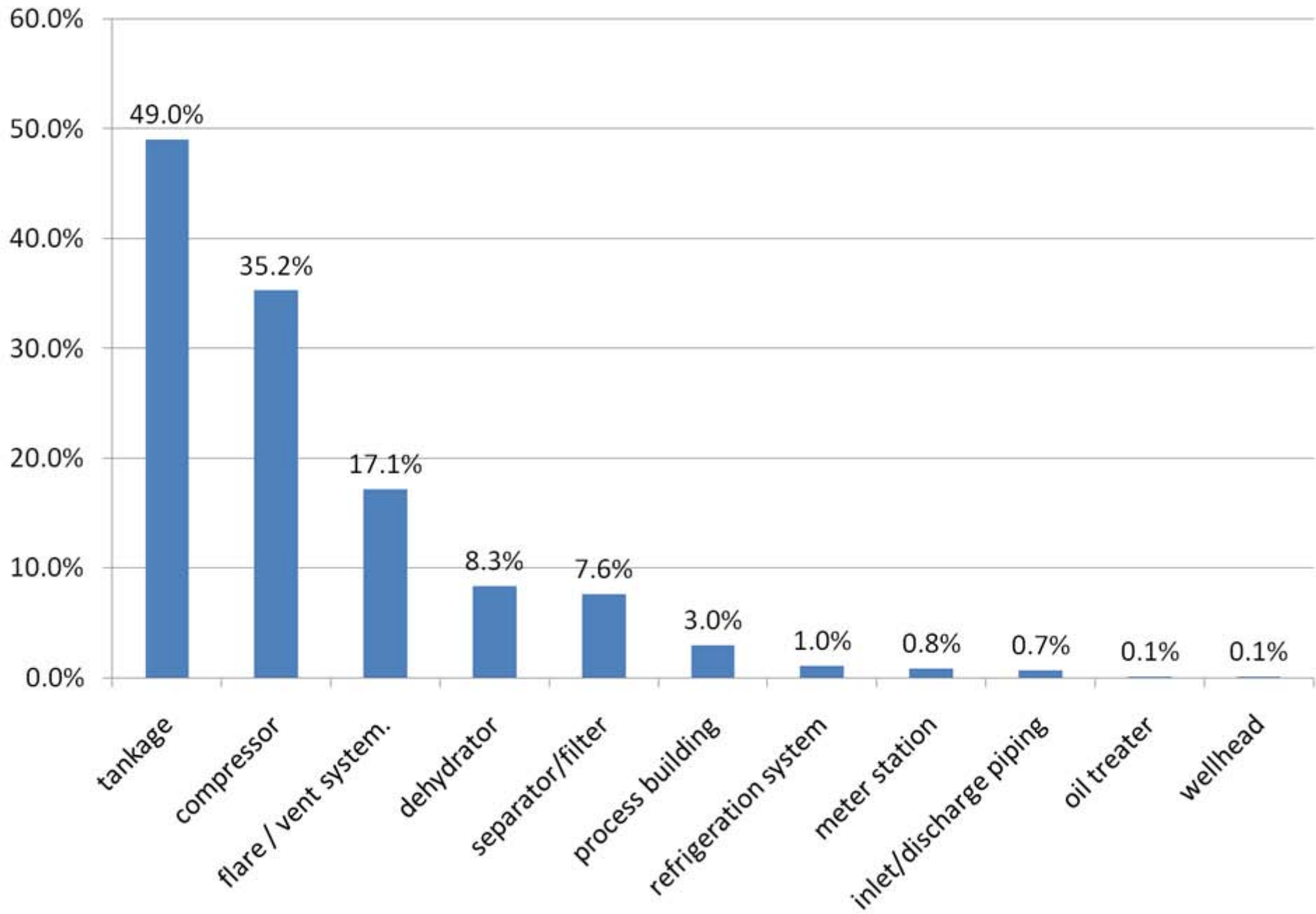


# LEAK COMPONENT %

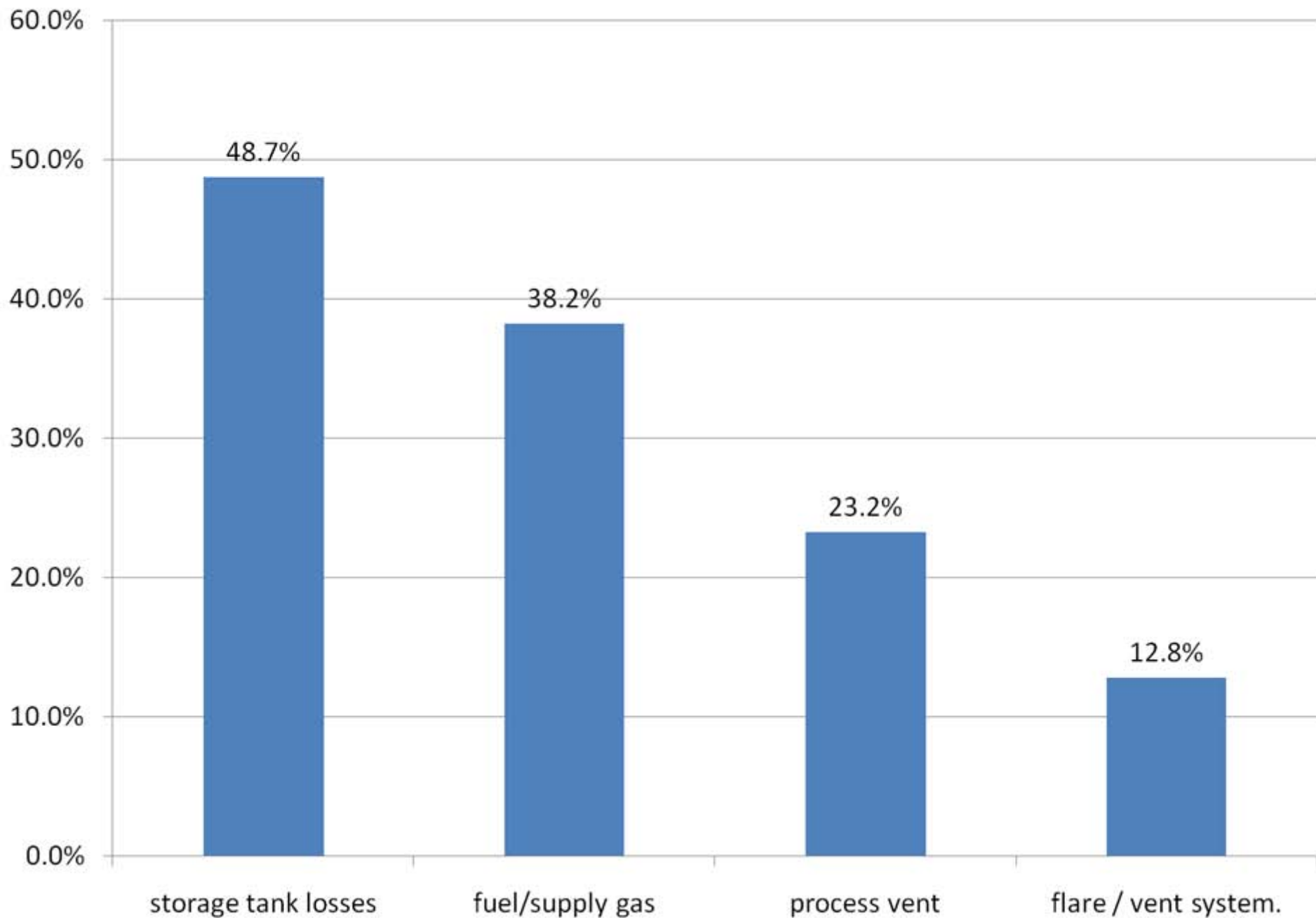




## VENT PROCESS BLOCK %



## VENT GAS STREAM %



## VENT COMPONENT %

