Energy Efficiency and Fugitive Emission Management Program

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OVERVIEW

- Energy Efficiency
- Fugitive Emission Pilot Study Findings
  - Source Data
  - Facility Comparison
  - Economics
- PATH FORWARD
Energy Efficiency

- Energy Efficiency and Product Recovery Team
  - Steering Committee
  - Planning and Implementation

- Areas of focus
  - Identify opportunities for improved Energy Efficiency
  - Pilot projects
  - Developing Programs (fugitives emissions)
Fugitive Emission Management Pilot Study
(ConocoPhillips Canada)
FUGITIVE EMISSIONS

Losses (leaks) of HC product
(methane, propane, VOC’s)

UNINTENTIONAL FUGITIVES

- normal wear and tear / damage
- improper or incomplete assembly of components
- inadequate material specification
- manufacturing defects

INTENTIONAL FUGITIVES

- venting (tanks, controllers, comp. seals, stacks, etc.)
On average natural gas processing plants lose between 0.05 to 0.5% of their total production to fugitive emissions.

Based on ConocoPhillips Canada production, fugitive gas loses 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.

What is the Problem?...

“Gas leaks are *invisible* and *go unnoticed*”
PILOT STUDY OBJECTIVE
(ConocoPhillips Canada)

Evaluate new leak detection and measurement technologies and determine actual facility fugitive emission rates

Drivers

- Increase production & reduce costs by recovering lost gas
- New regulations in Canada
- Increase operations Health & Safety
- Reduce GHG emissions
- Part of ConocoPhillips Canada goals and programs - E/E, Gas Star Program, and BIC Initiative
DETECTION TECHNOLOGY

GasfindIR®

- optical emission technology
- infrared video camera with hydrocarbon/VOC filter
- provides visible images of a HC gas emissions in real-time

Suggested 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
Hi Flow® Sampler

- volumetric leak measurement
- vacuum flow rate detection uses dual-element hydrocarbon (methane) detector
- measures hydrocarbon concentrations in the captured air stream and determines the leak flow rate (+/- 10%)

Suggested Benefits:

- offers a much higher accuracy of measurement (compared to conventional methods)
- allows an objective cost-benefit analysis of each repair opportunity
Pilot Study Scope

- Evaluate 22 facilities (9 gas plants and 13 comp. stns.) from various asset areas
- Obtain fugitive emission data
- Complete repair cost/benefit analysis
- Create recommendations for applying a Canada-wide program (Canadian Association of Petroleum Producers “CAPP” Best Management Practice)
## Pilot Study Results

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<tr>
<td><strong>Average Payback (years)</strong></td>
<td>0.37</td>
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<tr>
<td><strong>NPV (US$)</strong></td>
<td>~$2 million</td>
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<tr>
<td><strong>CO₂e Emission Rate (tonnes/ year)</strong></td>
<td>21,000</td>
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* Using for Illustration Purposes $5.50 USD/mmbtu and $25.00 USD/tonne CO₂e
Pilot Study SOURCE INFO

**# of Sources**
- 77% leaking components (111)
- 23% other fugitive emission sources (33)
- 92% economical to repair (133)

**Composition**
- 75% Process gas (108)
- 21% Fuel gas (30)
- 4% Propane (6)

**Location**
- 72% Compressor Buildings
- 20% Process Buildings
- 4% Outside piping
- 4% Tanks
Pilot Study SOURCE TYPES

- Flanges: 15% of Total # of Sources, 7% of Total Volume of Sources
- Vents: 77% of Total # of Sources
- Treaded Connections: 27% of Total # of Sources, 5% of Total Volume of Sources
- Valves: 35% of Total # of Sources, 11% of Total Volume of Sources
GAS PLANT THROUGHPUT COMPARISON

Potential Savings (USD/year)

Facility

Throughput (mcmcf/year)

$10,000.00

$20,000.00

$30,000.00

$40,000.00

$50,000.00

$60,000.00

GP #5 GP #9 GP #8 GP #1 GP #2 GP #7 GP #3 GP #6 GP #4
<table>
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<tr>
<th>Economic Projection: ConocoPhillips Canada</th>
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<tr>
<td><strong>Average Total Cost/Facility (US$/year)</strong></td>
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<tr>
<td>(assessment and repairs)</td>
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<tr>
<td><strong>Total Est. NPV (US$/year)</strong></td>
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<td><strong>CO2e/year Reduction (tonnes)</strong></td>
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PATH FORWARD

• **Fugitive Emission Management Program**
  - Field assessments started in September 2007
  - 2 year testing cycle
  - 2 outsourced vendors
  - Individual report/results for each facility or area
  - Imbed into Operations and Facility Design
  - Develop repair tracking system and refine data management system

• **Evaluate pipeline & wellsite opportunities within Energy Efficiency and Product Recovery Team**

• **Education / Knowledge Sharing**

• **Energy Efficiency and Product Recovery Team identify other opportunities for ConocoPhillips Canada**
QUESTIONS?

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