Methane Emissions Management at TransCanada PipeLines

by Hasan Imran

Methane Emissions Management at TransCanada PipeLines

AGENDA

• TransCanada PipeLines Ltd.
  • Introduction & Background
• TransCanada Climate Change Strategy
• Greenhouse Gas Emissions
• Emissions Management Strategy
• TransCanada’s Experience
  • Control Methodologies
  • Research & Development
• Conclusion
Methane Emissions Management at TransCanada PipeLines

TransCanada PipeLines at a Glance
Corporate GHG Emitters

Methane Emissions Management at TransCanada PipeLines
Climate Change Policy

• Climate Change issue is not going away.
• Greenhouse Gas Emissions is potential liability for TransCanada.
• We have a plan in place to manage climate change.
• TransCanada believes in promoting global solutions to this global challenge.
• TransCanada believes prudent action is required.
• TransCanada believes in a strong commitment to technological innovation.
Climate Change Strategy

Participation in National Processes

Upstream Oil and Gas Working Group

Issue Table Process

Fugitive Emissions Management

Blowdown Emissions Management

Direct Emissions Reduction

Technology Development

Emissions Offsets

Dry Gas Seals

Methane Biofiltration

Combustion processes

Landfill Gas Reuse

CDM/JI

Business Opportunities

CO2 service?
Methane Emissions Management at TransCanada PipeLines

Source of Greenhouse Gas in TransCanada

Direct

CO₂
CH₄
N₂O

Indirect

Electricity

Utility Consumption

Pipelines (include Valves, Compressor and Meter Stations)

Power Plants

Cancarb - Carbon black facility

Company Vehicle
- Rental Vehicle
- Employee Vehicle
Methane Emissions Management at TransCanada PipeLines

2002 vs 2003
GHG Emissions by Type

<table>
<thead>
<tr>
<th>Type</th>
<th>2002 (kilotones CO2E)</th>
<th>2003 (kilotones CO2E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>8000</td>
<td>6000</td>
</tr>
<tr>
<td>Power</td>
<td>1000</td>
<td>1500</td>
</tr>
<tr>
<td>Indirect</td>
<td>500</td>
<td>700</td>
</tr>
</tbody>
</table>
Greenhouse Gas Emissions from Pipeline Operations

Methane Emissions Management at TransCanada PipeLines

Graph showing greenhouse gas emissions from pipeline operations from 1990 to 2003. The graph includes emissions for Carbon Dioxide, Methane, Nitrous Oxide, and Indirect emissions. The emissions are measured in kilotons (kt) of CO2e. The graph indicates a decrease in emissions over the years.
Methane Emissions Management at TransCanada PipeLines

Methane Emissions Distribution

- Methane Emissions: 13%
- Combustion Emissions: 87%
- Greenhouse Gas Emissions
- Fugitive Emissions: 70%
- Blowdown Emissions: 30%
Methane Emissions Management at TransCanada PipeLines

**Fugitive Emissions Management**
*(LDAR vs Measurement)*

- **High Flow Sampler Measurement**
  - **Accuracy:** ± 25%
  - Identification of most “cost effective fixes”

- **Bacharach HFS - NEW**
Methane Emissions Management at TransCanada PipeLines

2003 Methane Emissions from system by Facility Type

- CST: 62%
- CSR: 22%
- CSE: 3%
- MSR: 2%
- MSW: 3%
- BMS: 4%
- MD: 1%
- BV: 3%

2003 Methane Emissions from system by Facility Type
Methane Emissions Management at TransCanada PipeLines


Total Leaking Components measured = 19457

number of leaks

0 500 1000 1500 2000 2500 3000 3500

1999 2000 2001 2002 2003

CS MS BV
Methane Emissions Management at TransCanada PipeLines

Sample Field Measurement Data Analysis

Cumulative Fraction of Leaking Components

Cumulative Fraction of Total Leak Rate
Methane Emissions Management at TransCanada PipeLines

**Benefit - Cost Effective Repairs**

Number of leaking Components by Category at CS, MS & BV in 2003

60% of total
Methane Emissions Management at TransCanada PipeLines

**LDAR Program Achievements**

- **2002**
  - $2.6M
  - 0.454 Bcf

- **2003**
  - $3.4M
  - 0.528 Bcf

- **2002**
  - 191 kilo tonne CO₂E

- **2003**
  - 223 kilo tonne CO₂E

- **$ Value of gas saved**
- **Natural gas volume saved**
- **Emissions saved**
TransCanada’s Contribution to Environment

Emissions saved in no. of Tree Equivalents

- Total Equivalent Cars taken off the road = 42,330
- Total Equivalent Homes which can be heated for one year = 3,427

<table>
<thead>
<tr>
<th>Year</th>
<th>Tree Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>232,000</td>
</tr>
<tr>
<td>2003</td>
<td>270,630</td>
</tr>
</tbody>
</table>
Methane Emissions Management at TransCanada PipeLines

**Blowdown Emissions Management**
*(Control Methods and Technologies Used)*

- Scheduling Practices
- Operational Adjustments
- Transfer (Pull-down) Compressors
- Buttered Stubs
- Hot Tapping
- Sleeves
- Stopples
- Hot line lowering
Methane Emissions Management at TransCanada Pipelines

Reducing Emissions by using Transfer Compressor
### 2003 Summary of Savings from Methane Emission Reduction Programs

<table>
<thead>
<tr>
<th>Activity</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimizing Blowdown Emissions</td>
<td>1,132 tonnes of CO2E</td>
</tr>
<tr>
<td>Transfer Compression</td>
<td>626,966</td>
</tr>
<tr>
<td>Valve Sealing</td>
<td>61,678</td>
</tr>
<tr>
<td>Buttering &amp; Hot Tapping</td>
<td>154,632</td>
</tr>
<tr>
<td>Repair Sleeves</td>
<td>164,949</td>
</tr>
<tr>
<td>Reducing Fugitive Emissions</td>
<td>223,270</td>
</tr>
</tbody>
</table>
**Savings Outcome**

**Methane Emissions and Savings**

(million tonnes of carbon dioxide equivalent - Mt CO2E)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane Emissions</td>
<td>3.29</td>
<td>2.82</td>
<td>2.55</td>
<td>2.45</td>
<td>2.37</td>
<td>2.15</td>
<td>1.06</td>
<td>0.82</td>
<td>0.81</td>
</tr>
<tr>
<td>Savings</td>
<td>0.15</td>
<td>0.23</td>
<td>1.74</td>
<td>1.26</td>
<td>1.20</td>
<td>2.10</td>
<td>1.59</td>
<td>1.24</td>
<td>1.13</td>
</tr>
</tbody>
</table>
Research & Development

- Incineration of Blowdown Gas using new Technology
- Biofilter for Meter station methane emissions oxidation
- Dry Gas Seal Emissions capture technology
- Incineration Methane emissions by the use of CH4Reactor
- Fuel Cells
Technology R&D at TCPL
(incinerator for blowdowns)

- Incineration of blowdown gas instead of venting (after transfer compression)
- At Caron Compressor Station, Moose Jaw, November 2002

GHG Emission Comparison with & without Incineration after Transfer Compression

Emission savings of 1,100 t CO2E
Biofilter Pilot Plant for Methane Emissions Reduction

Research at University of Calgary
Methane Emissions Management at TransCanada PipeLines

Biofilter Pilot Plant for Methane Emissions Reduction

![Image of biofilter pilot plant]

![Graph showing % oxidation over time]

![Graph showing % oxidation over months]

- Predicted
- Observed
Compressor Dry Gas Seal Emissions Mitigation Research Project

- Use of gas-gas ejector to recompress seal gas emissions
- Re-injecting to high pressure system
- Application to TransCanada Compressors would save
  - 538 MMSCF/yr. of natural gas
  - 227,000 tCO2E/yr. of greenhouse gas emissions
- Negligible operating cost
Methane Emissions Management at TransCanada PipeLines

Compressor Dry Gas Seal Emissions Mitigation Research Project
Methane Emissions Management at TransCanada PipeLines

Compressor Dry Gas Seal Emissions Mitigation Research Project

653 t CO₂ E/yr.

1 seal

227 kt CO₂ E/yr.

(538 MMCF/yr)

348 seals

Emissions Value = $ 0.68 M

Market value of gas = $ 3.70M

@ $6.84/1000 ft³
Methane Emissions Management at TransCanada Pipelines

CONCLUSION - Cost Curve

Methane Management Programs in place

GHG Emissions Reductions Required (million tonnes CO2e)
Methane Emissions Management at TransCanada PipeLines

Thank you!