PROCESS ECOLOGY

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2016 CPANS Annual Conference and General Meeting

AN INTEGRATED METHODOLOGY FOR MANAGING GREENHOUSE GAS (GHG) FROM FLARING & VENTING IN THE OIL & GAS SECTOR

May 3, 2016

OUTLINE

- Who we are
- Importance of Venting and Flaring Emissions Estimation
- Methodology
- FlareAdvisor™ Calculation Modules
- Case Study

PROCESS ECOLOGY

- Founded 2003, Calgary, AB
- Software Products:
  - **Benzene Emissions Advisor**
    - Directive 39 Reporting Software and Service
    - Over 2000 Dehydration units (AB, BC, SK)
  - **FlareAdvisor™**
    - Track and manage flared & vented volumes
- Key Competencies:
  - Engineering Consulting, Process Simulation
  - Process Engineering & Optimization
  - Air Emissions estimation and Management
  - Software Development

ACCURATE VENTING & FLARING EMISSION ESTIMATION

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Issues:

- Accurately estimate flaring and venting emissions as required by current regulations:
  - AB Directive 60
  - BC Flaring and Venting Reduction Guideline

    (eliminate routine flaring by 2016)
  - SK Directive S-10 (Increased focus on Reduction)
- Effectively track and managed venting & flaring emissions (particularly non-metered and non-routine emissions)

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ACCURATE VENTING & FLARING EMISSION ESTIMATION

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Issues:

- Reduce emissions
  - Reduce methane emissions by 45% from 2014 levels by 2025.
  - Canada Federal GHG Reduction (30% below 2005 levels by 2030)
  - US (GHG emissions reductions of 26% by 2025)
  - World Bank Sponsored Global Gas Flaring Reduction (Zero Routine Flaring by 2030)
  - UNEP – Oil & Gas CCAC Initiative (Methane emissions reductions)
- Establish the methane baseline

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CALCULATION MODULES

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Built-in Calculation Modules	
Equipment Blowdown	✓
Pipeline Pigging	✓
Compressor Start	✓
Dehydrator Emissions	✓
Tank Emissions	✓
PSV Relief Emissions	✓
PVRV Relief Emissions	✓
Flare Maintenance Gas	✓
Liquid Loading Emissions	✓
Fugitive Emissions Totals	✓
Combustion GHG Totals	✓
Compressor Packing Vents	✓

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RIGOROUS ENGINEERING CALCULATIONS

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- Backed up by Validation documentation
- First Principles Thermodynamics calculations – Most accurate method available
- Head-to-head comparison vs. current tools

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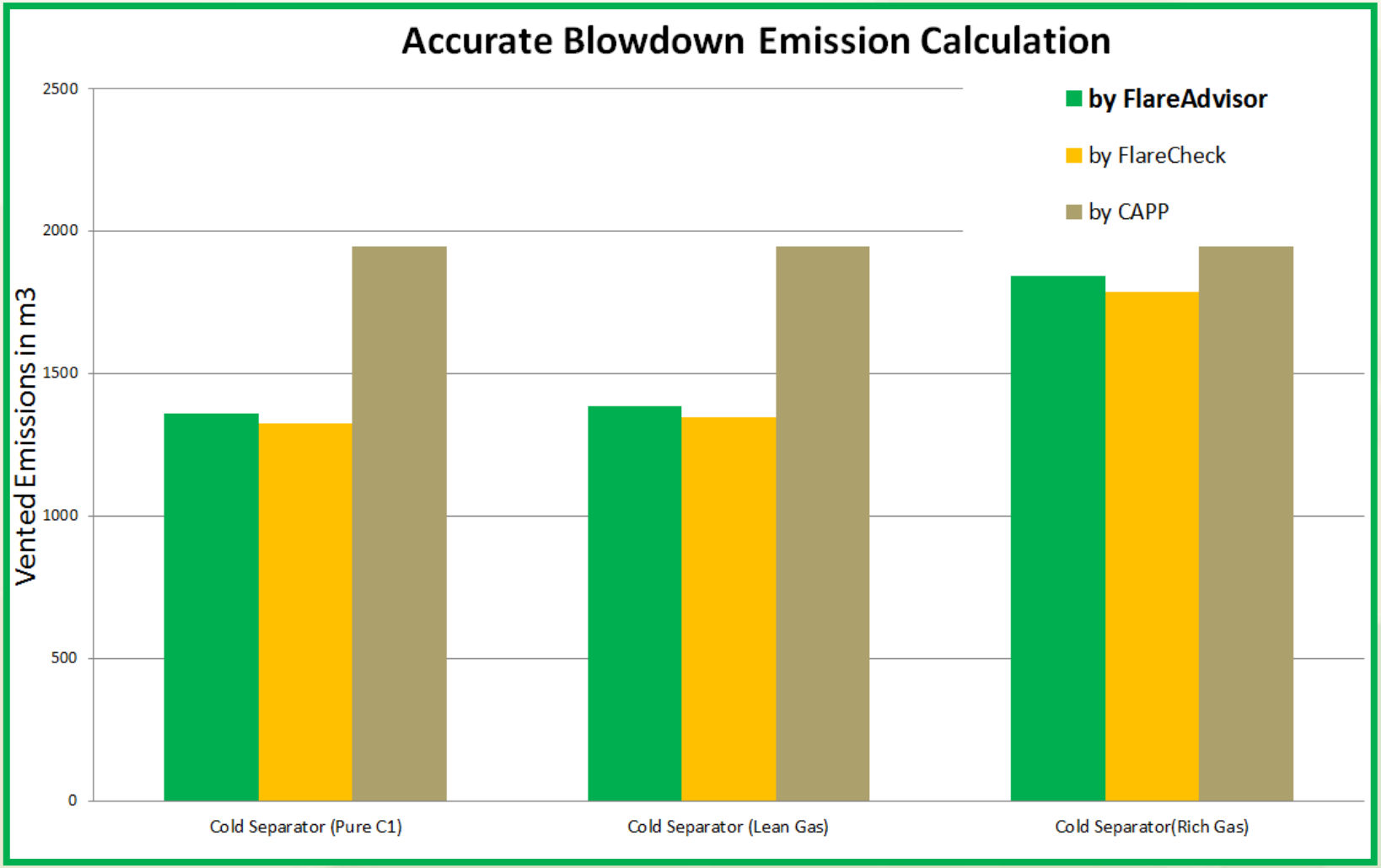
NON-ROUTINE EVENT (VESSEL BLOWDOWN EMISSIONS)

- Vessel orientation
- Vessel dimensional information (internal diameter, height/length)
- Liquid height in the vessel
- Operating conditions

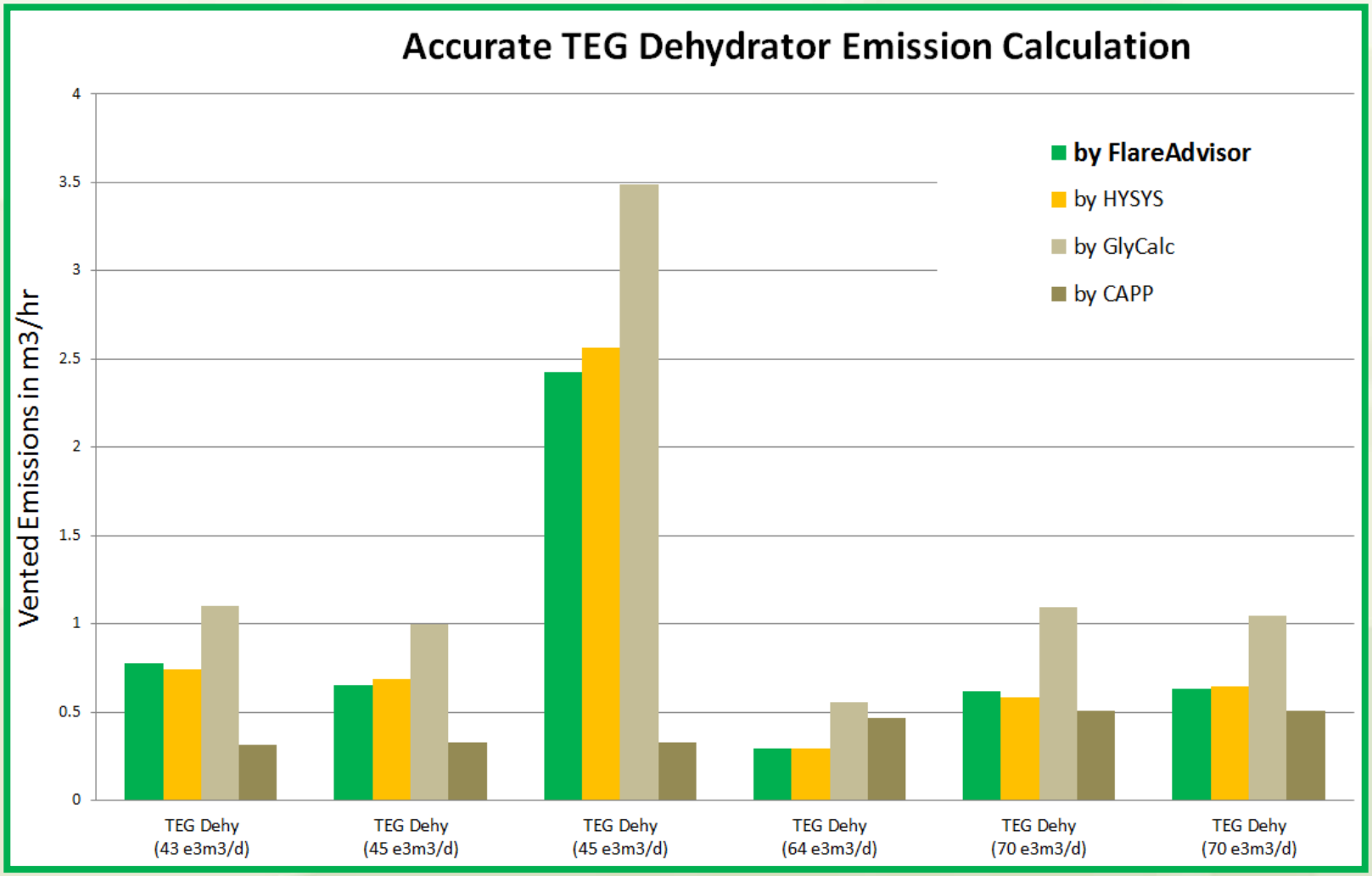
VESSEL BLOWDOWN EMISSIONS



CONTINUOUS SOURCE (TEG DEHYDRATOR)

- CAPP document:
  - $V = Q(K_{SC} + K_{SG} + K_{GP})$
- GlyCalc:
  - Peng-Robinson EOS
- HYSYS Simulation:
  - Peng-Robinson EOS
  - Tuned Binary Interaction Parameters
- FlareAdvisor:
  - Statistical analysis
  - HYSYS Simulation Results
  - Over 2000 Dehydration units (AB, BC, SK)

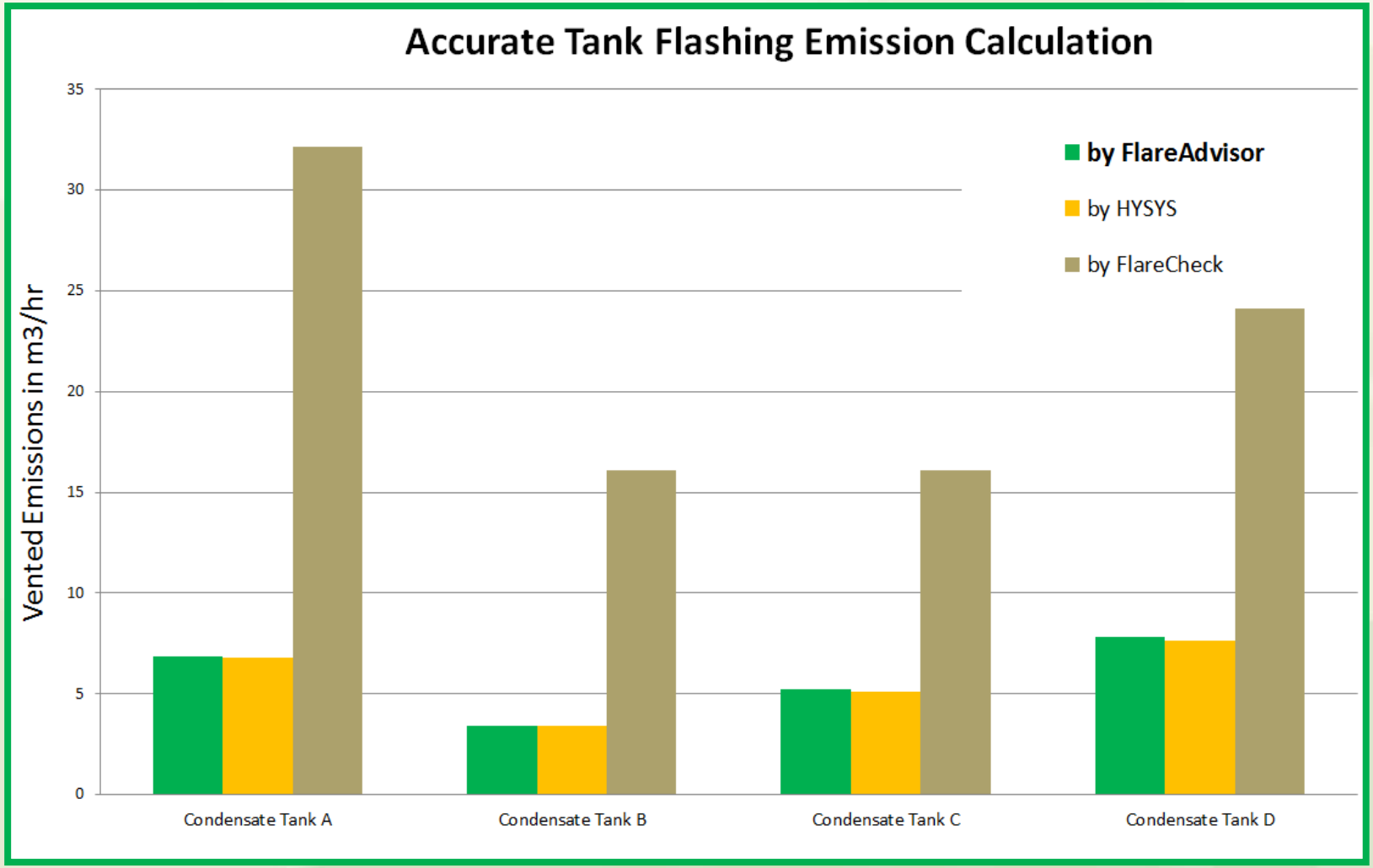
TEG DEHYDRATOR EMISSIONS



CONTINUOUS SOURCE (TANK FLASHING LOSSES)

- Flarecheck:
  - EUB rule-of-thumb (Solution Gas Factor)
  - $V = 0.0257 \,.V_{oil}.\Delta P$
- HYSYS:
  - Peng-Robinson EOS (flash calculation)
  - License Required
- FlareAdvisor:
  - Peng-Robinson
  - Built-in flash calculation

TANK FLASHING EMISSIONS



MAIN ELEMENTS

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- Corporate and Facility Data Storage
- Non-Routine Flaring & Venting
- Continuous Flare/vent Sources
- GHG Emissions
- Reporting
- Administrator and Operator Views

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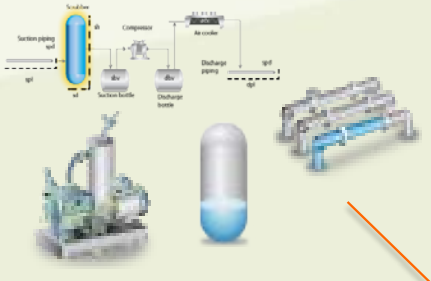
FlareAdvisor™ Elements

CONTINUOUS SOURCES

FACILITIES

NON_ROUTINE EVENTS



EQUIPMENT

FACILITIES

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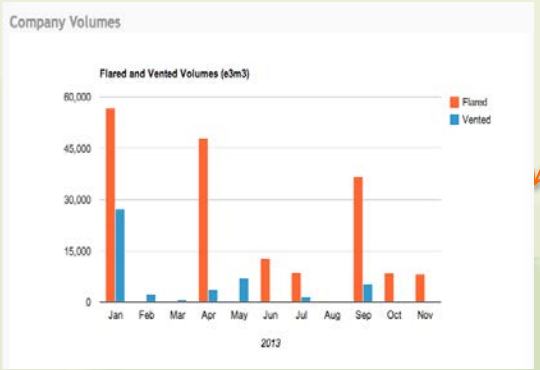

REPORTS

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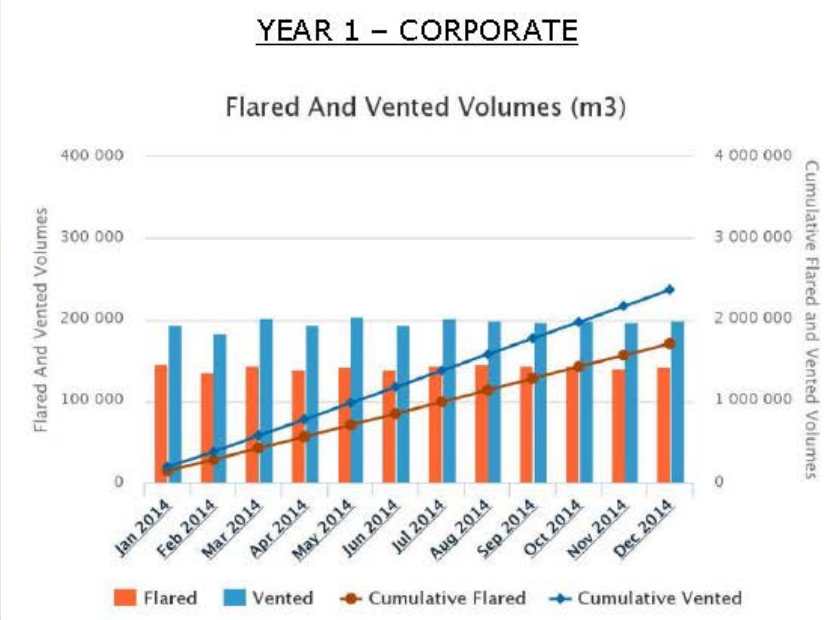
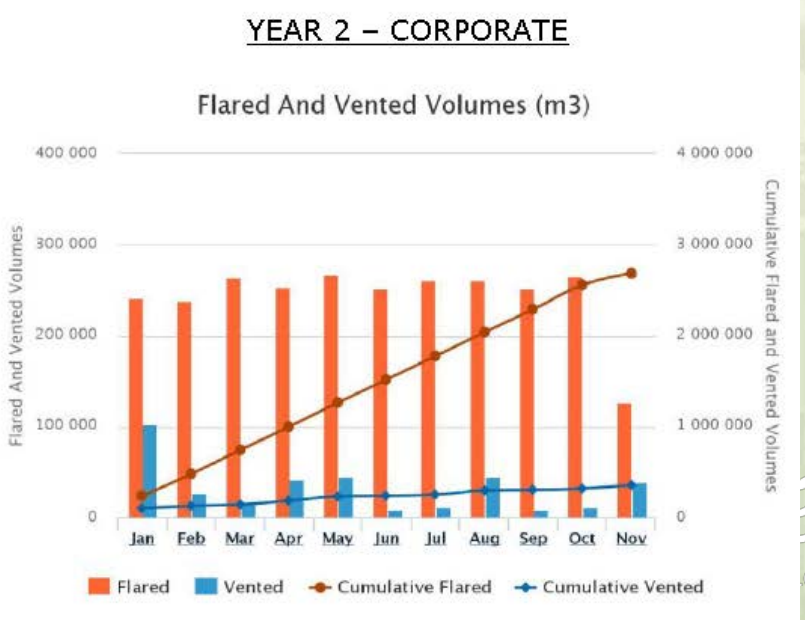
CASE STUDY

- 5 typical oil & gas facilities (2 compressor stations, 2 oil batteries, 50 MMSCFD gas plant)

Year	Venting Volume	Flaring Volume	GHG Emissions
1st Year	2,367 E3m3/yr	1,707 E3m3/yr	43,646 tonnes CO2E/yr
2nd Year	357 E3m3/yr	2,684 E3m3/yr	14,852 tonnes CO2E/yr





CASE STUDY (EMISSIONS REDUCTION)

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- SAVINGS: $576k in one year
- Recording all Non-Routine Events
- Accurately calculating Continuous Sources of emissions
- Focused capital and operating spending to reduce emissions where it makes the most sense.

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SAVE, COMPLY, REDUCE

- If you don't estimate, measure and track it – you can't reduce it!
- SAVE $$ - Identify and fix:
  - Problem venting areas, problem repeat flaring
  - Reduce excess gas for flares by comparison with Best Practices
- COMPLY - Ease of Use
  - Stay on top of logs and reporting
  - Keep Regulators Happy
- REDUCE -Social License and Sustainability
  - Reduce Flaring and Venting
  - Reduce GHG Emissions
  - Establish a Methane baseline

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- Reduce Flaring, Venting and GHG Emissions
- Simplify Flaring and Venting Event Logging
- Ensure Compliance for Air Emissions
- Establish a Proper Baseline for Methane Emissions

MORE INFORMATION

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- Thanks to IRAP for Sponsoring this Research

- Want more Information?
- Contact laura@processecology.com

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