1. GreenPath OGI & MOBILE SENSOR Equipped field trucks
2. GreenPath SurveySource Inventory & Online Data Management & Compliance System
3. GreenPath Measurement (Direct, In-Direct & Engineered Solutions)
4. GreenPath Response & Reporting
WHO & WHY – Determines What you Care About & Solution

**Regulation**
- Directive 60
- Directive 17
- Manual 15
- Manual 16

**Measure**
- Inventory of equipment and emission sources
- LDAR
- Point Source quantification

**Reporting**
- Methane
  - MMR
  - MRRCP
  - GHG Reporting
  - LDAR Reporting
- Production Accounting
  - Emission Management Systems
  - GHG Accounting

**Assessment**
- Do you have a problem?

**Field Projects**
- Design & implement emission solutions
- Brownfield retrofit
- Greenfield design
- External Financing
- Capital Funding
- Impact on Operations
- Engineering Standards
Data Analytics, Information & Reporting Challenges – Current Regulation

**Overall Vent Gas Site Limit:**
Vents classed as **Non-Routine + DVG** with limits of:
- $15.0 \times 10^3$ m$^3$ / month
- $9.0 \times 10^3$ kg / month

**DVG Limit**
Vents classed as **Routine** with limits of:
- $3.0 \times 10^3$ m$^3$ / month
- $1.8 \times 10^3$ kg / month
Overall Vent Gas Site Limit:
Vents classed as Non-Routine + DVG with limits of:
15.0 x 10^3 m^3 / month
9.0 x 10^3 kg / month

DVG Limit
Vents classed as Routine with limits of:
3.0 x 10^3 m^3 / month
1.8 x 10^3 kg / month
Data Analytics, Information & Reporting Challenges – 2023 Regulation

Overall Vent Gas Site Limit:
Vents classed as Non-Routine + DVG with limits of:
15.0 x 10^3 m^3 / month
9.0 x 10^3 kg / month

DVG Limit
Vents classed as Routine with limits of:
3.0 x 10^3 m^3 / month
1.8 x 10^3 kg / month
“It’s like chasing a fart in a tornado”

GreenPath Client

- FFV Configuration & calculation
- Metering schematic reviews and site walkdowns
- Actual tank details driving software / AP-42
- Maintaining & updating records
- Operational input and data automation
- good in = good out
MEASUREMENT- VOLUME or Mass?

Manual 15 provides a tool to quantify vent gas volumes and methane mass emissions. There is an important distinction:

<table>
<thead>
<tr>
<th>Method</th>
<th>Example – Tank Vent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regardless of which Equation you use, the gas composition becomes very important.</td>
<td>Volume of Raw Gas</td>
</tr>
<tr>
<td>The emissions limits are:</td>
<td>OR</td>
</tr>
<tr>
<td>Volume of Raw Gas</td>
<td>Mass of Methane</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>Choose the measure that suits you best</td>
<td></td>
</tr>
<tr>
<td>• Choose the measure that suits you best</td>
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</tr>
</tbody>
</table>

### Equation 1

\[ M = V \times \phi_{CH4} \times \rho_{CH4} \]

### Equation 2

\[ M = V \times \omega_{CH4} \times \rho_{gas} \]

Example – Tank Vent

- V = 10 e³ m³ of raw gas in a month
- \( \phi_{CH4} = 0.0808 \) (Molar Fraction)
- \( \rho_{CH4} = 0.6785 \) kg/m³
- M = 548 kg

The DVG volume limit of 3 e³ m³/mth is exceeded, but not the mass limit of 1.8 e³ kg/mth

**CONCLUSION: USE the GAS ANALYSIS**
MEASUREMENT - STATIC vs. DYNAMIC

Ex) Facility Site Design & Regulatory Compliance

Ex) Upstream Separator Dump Valve Passing
MEASUREMENT- STATIC vs. DYNAMIC

• Who & what & when
  • Data explicitly & standard?
  • Need to have vs. nice have data?
  • Now problem vs. Future problem?

• What is the cost of measurement & management that your company is willing to pay beyond the bare minimum of being “compliant”
  • Social Sustainability commitments?
  • External revenue?

• Cost of automation & communication
  • Corporate & operation field time
  • Minimize data handling and developing a data MVP designed for problem being solved.