Eni Case Study

Fugitive Emissions Monitoring
in Eni upstream Oil/Gas treatment Plants

Maria Mantini
Eni HSE Department

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Methane Emissions by sources in Gas Processing

In gas processing plants fugitive equipment leaks are the dominant source of CH₄ emissions.

Source: “Directed Inspection and Maintenance (DI&M) at Gas Processing Plants”
EPA Presentation, Gas Star Workshop, July 2006
Methane Fugitive Reporting needs

- Improve the Eni fugitive environmental reporting method for the upstream sector

- Provide data with more accuracy in order to respond to the Regulations and Communications requirements (attention on diffuse sources: IPPC, PRTR*)

- Define fugitive monitoring plan for Air Quality Management and Leak Detection and Repair (LDAR)

*IPPC Integrated Pollution Prevention and Control; E-PRTR European Pollutant Releases and Transfers Register
Fugitive Calculation Approaches

Eni adopts its own “GHG Accounting & Reporting Protocol*” which provides three approaches for estimating Fugitive Emissions

<table>
<thead>
<tr>
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<th>FACILITY LEVEL</th>
<th>Calculation based on facility production data and standard emission factors (for each facility type)</th>
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<tbody>
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<td>A</td>
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<tr>
<td>B</td>
<td>EQUIPMENT LEVEL</td>
<td>Calculation based on equipment number and standard emission factors (for each equipment type).</td>
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<td></td>
<td></td>
<td>This method requires equipment counts</td>
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<tr>
<td>C</td>
<td>COMPONENT LEVEL</td>
<td>Calculation based on connections number and emission factors. The emission factors for each component can be derived from literature or measures.</td>
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</tbody>
</table>

* Based on “The API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry”, American Petroleum Institute (API)
9 Monitoring Campaigns carried out by using standard detector in accordance with “US EPA Method 21”, on:

- n.2 Oil/Gas processing plants
- n.4 Gas processing plants
- n.3 Offshore gas compression platforms

Time: 2005-2006

...moreover gas wellheads measures are carried out and the emissions resulted much lower than the estimated ones.
Eni Monitoring Activities

Monitoring Campaigns
Activity phases

1. Plant components counting and classification from P&ID
2. Statistical component sample definition
3. In-situ measurements by FID (Flame Ionization Detector*)
4. Experimental data elaboration using empirical correlation (software FRIEDA**) 

Corporate Guideline on fugitive monitoring and accounting methodology was performed

** Calculation tool developed by Eni Research Centre of Monterotondo
Eni Monitoring Activities

Monitoring Campaigns

Critical points:

- High cost and time
- Dangerous operations required (i.e.: offshore installation and piping)

...from a more technical point of view...

- Agreement between P&ID components mapping and their relative positioning on the installation
- Uniform components’ classification
- Monitored points labeling and leaking points communication
Measurements demonstrate that well maintained plants emit much less than what is usually calculated.
Eni Monitoring Activities
Remote Sensing

Detection and quantification of leaks have demonstrated a very effective gas reduction opportunity.

A research and development initiative is ongoing in order to make monitoring activities cheaper and faster.

Remote Sensing Technology testing on upstream operations.
Eni Monitoring Activities

Field Testing
Infrared Gas Imaging and Quantification Camera

- Monitoring of a representative components sample in a Eni Oil/Gas Treatment Plant with the Videocamera Sherlock®

- This Technology was developed and patented by Pacific Advanced Technology for the US Defense Department

- Comparison with the simultaneous FID measures

Test performed by Eni R&D Centre of Monterotondo,
Results presented at the “Air and Waste Management Conference”, New Orleans, June 2006
Eni Monitoring Activities

Field Testing
Infrared Gas Imaging and Quantification Camera

Sherlock’s Capabilities:

- Leak Detection (also high distance and unattainable position)
- Quantification (within 2-5 m) over 10,000 ppm
- The methane is the most difficult substance to detect due to water interference in the atmosphere with IR
- Man portable (9.5 kg) and user friendly application
Opportunities

- Video-imaging can be applied as an alternative or in combination with standard measurement methods (40 CFR Part 60, Proposed Rule)

- Participate/promote in Joint Industrial Project for R&D video-imaging Tools development

- Validate fugitive estimation method and assure the data “quality” for the upstream sector
... furthermore...

experimental data

are an important step to support

Methane Emission Reductions
Thanks for Your Attention

Eni Referents:
- P. Buttini Patrizia.Buttini@eni.it
- C. Piatti Cesare.Piatti@eni.it
- L. Gelpi Leonardo.Gelpi@eni.it
- M. Mantini Maria.Mantini@eni.it

www.eni.it