Practical Considerations of LFG Analysis, Measurement, and Data Management to Receive CDM Credits

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Topics

• Evaluation of site
• Gas management
• Monitoring to collect CDM credits
• CDM Case Study
Evaluation of site

- Gas composition and flow measurements
- Gas migration measurements
- Information to be added to models

Estimation of the potential emission reduction
Gas Management

- Aim is to extract as much gas with fewest problems
- Improve System Reliability
- Reduce Well-field aging factor
- Improve Collection Efficiency
- Reduce Operation and Maintenance Costs
- Applicable to both CDM and non CDM projects
Gas Management

• Improvements due to:
  • Routine maintenance
  • Well-field tuning
  • Data Analysis and Management – trend analysis
  • Recommended surface improvements that: Reduce leakage – low flow of LFG and Reduce air infiltration – poor quality of LFG
Gas Management

- Improvements due to:
  - Proactive adjustment of system parameters results in fewer failures of equipment
  - Early detection of potential problems
    - High Condensate level
    - Low Flow
    - Sudden increase in O2
Gas Management

- Analysers designed for Landfill gas measurement
- Easy to use
- Operators trained on usage and replacement of filters
- Manufacturers instructions on maintenance and calibration followed.
• This methodology is applicable to landfill gas capture project activities
• Gives the approved consolidated baseline and monitoring methodology
• Main measurements are flow, methane content, temperature and pressure
• Continuous monitoring with reporting an average in time intervals not greater than an hour
Figure 1: Monitoring Plan

Measurements:
CH₄ = Fraction of CH₄
T = Temperature
P = Pressure
F = Flow of LFG (m³)

PE_{flare} = Project emissions from flaring of the residual gas stream
• Additional flow measurements if gas is split to Flare, Power Plant, Boiler or Pipe
• If using flare need to measure emissions from the flare
CDM Credits

• Strong QA/QC procedure for the calibration of equipment is needed.
• Prove measurements taken are accurate and tamper proof.
• ISO17025
CDM Credits

• Training of on site staff
• Routine maintenance
• Additional measurements
• Routine review of data
Case Study

- General Project Information
- Registration Process
- Methodology Selected & Implemented
  - Recent changes
- Monitoring Equipment Implemented
  - Equipment for current methodology
- Quality Assurance and Quality Control
- Reporting and Analysis of Data
- Current Project Status and Results
• Joint Venture between S.A. Paulista & EcoSecurities
  - Brazilian Civil Engineering & Construction firm
  - Environmental finance company – GHG

• CDM Project 0008
  - Brazil and Netherlands
  - First registered CDM landfill project
  - Large scale project – >15 Megawatt output/reduction
    >15 Kilotonne reduction in anthropogenic emissions
  - Consist of two sites; Adrianopolis & Marambaia
  - Flaring Landfill Gas and generating electricity
  - First phase is complete and operating successfully
Adrianopolis Landfill

- NW Rio de Janeiro, Brazil
  - Close to suburb of ~800,000
  - Transmission lines

- Active Site
  - Feb 2003
  - 1,000 T/day
  - Active collection
  - ~80 wells
  - ~46% CH₄
    - 1,300m³/h
  - Max 9,000m³/h
Marambaia

- Adjacent to Adrianopolis

- Closed Site
  - 1986 - Feb 2003
  - \(~700,000\) to \(2,000,000\) Tons
  - Active collection
  - \(~35\) wells
  - \(~25\%\) \(\text{CH}_4\)
    - \(300\text{m}^3/\text{h}\)
Registration Process

• Develop
  – Project Design Document (PDD)
    • Project activities
    • Baseline Study
    • Duration & credit period of project
    • Monitoring Plan (MP) & Calculations

• Review / Certification
  – Designated Operating Entity (DOE)
    • Validate request for registration
    • Verify emission reductions
  – CDM Executive Board

• Respond / Revise
  – Corrective Action Request (CAR)
  – New Information Request (NIR)
Project Milestones

• 2001 S.A. Paulista granted 20 year concession
  – Decommissioning and rehabilitation of Marambaia

• Project Design Document & Monitoring plans
  – Prepared September 2002
  – Stakeholder interviews February 2003
  – Validated August 2004
  – Registration November 18, 2004
  – Credit period July 1st 2004

• March 15th 2007 Adrianopolis operational
• May 17th 2007 Marambaia operational
• February 17th to 19th 2008 site verification
• June 20th 2008 emission reductions verified
Methodology

- AM0003 ver. 1 – Simplified financial analysis for landfill gas capture projects
  - Methane fraction in landfill gas
  - Flow of landfill gas to flare
  - Flare temperature
  - Flare efficiency
  - Flare run time
  - Gross electricity produced (future)
  - Generator heat rate (future)
  - 20% reduction at Marambaia
  - Adjustments for emissions due to project
Current Methodology

• Current AM0003 version 4
  – Retains monitoring from NovaGerar project
  – Adds monitoring of flare in accordance with Annex 13
    “Tool to determine project emissions from flaring gases containing methane”
  – Continual monitoring of methane emissions from flare stack
  – Exhaust flow
  – Methane in and out for actual continuous efficiency
Monitoring Equipment

- Automated Extraction Monitoring System (AEMS)
- CH₄ – Field Analytical Unit (FAU)
- Flow – Thermal Mass
- Temperature “K” Thermocouple
- Flare Efficiency – Semi annual stack test
- Flare Run time – Logic and Fire eye
- Propane used for ignition – Logic and number of ignitions
- Electric meter and invoice from electric provider
Monitoring Equipment Version 4

• Flare Exhaust Monitor
  – Measures CH\textsubscript{4} in flare exhaust 0 – 500 ppm
  – Measures O\textsubscript{2} in flare exhaust 0 - 25%

• Integral portion of the Automated Extraction Monitoring System (AEMS)
  – Enables calculations of flare flow and efficiency

Without measurement default value is 90%
Quality Control/Quality Assurance

- **Daily QA/QC**
  - Review of Envirocomp LFG Pro data; Calibration records, LFG composition, flare temperature, flow and run time.

- **Weekly QA/QC**
  - Review operation processes and procedures
  - Review gross emission reductions, discount for LP used to ignite flare

- **Monthly QA/QC**
  - Custom LFG Pro reports
  - Discount emission reductions for electricity used – generate net emission reductions
27 Documents
- Project documents PDD, MP
- Calibration certifications
- Calculations
- Operational & Maintenance

Envrirocomp LFG Pro
- Data at two minute interval
- FAU Calibration data
- Flare ignitions
- Gross emission reductions
Results of Monitoring & Reporting

• Totals Reported
  – 11,344,724.65 m³ LFG Flared
    ~ 10,000,000 from Adrianopolis
  – 29,099.80 kWh Electricity used
    ~ 20,000 from Adrianopolis
  – 3.932 m³ LPG used ~ equal split between sites

• Emission Reductions Claimed
  – 67,303 tCO2e

• Percentage Certified/Verified
  – 100%
CDM case study and other case studies can be downloaded from

www.geotech.co.uk

Thank you for your attention