TETRA TECH

Regulatory Compliance and Your Landfill Gas-to-Energy Project

Keith A. Johnson, P.E.

LFG Well Monitoring

- LFG wells must be routinely monitored and adjusted so that the composition of the LFG is maintained within regulatory parameters.
- LFG monitoring and adjustment is performed in order to optimize the extraction of LFG.
- Monitoring and adjustments may be separate tasks.

Regulations

- Air Regulations
  - NSPS/EG – New Source Performance Standards / Emission Guidelines
  - Surface Emissions Monitoring
  - LFG Well Operating Criteria
- Solid Waste Regulations
  - 40 CFR 258 – Solid Waste Disposal Criteria
  - 258.23 – Explosive Gas Control

Site Conditions Affecting LFG

- Landfill Cover Type
- Moisture
- Temperature
- Barometric Pressure
- Waste Age
- Waste Compaction

Energy Project Needs

- LFG with a relatively high BTU content
- Relatively low oxygen and nitrogen content
- Sufficient flow to maximize energy production
- Appropriately sized equipment
- Objective: Keep plant running

TETRA TECH

Landfill Owners' Compliance Needs

- Vacuum on all collection wells
- Sufficient flow from perimeter wells to prevent offsite migration
- Sufficient flow from interior wells to prevent surface emissions
- Objective: Keep landfill in compliance

Landfill Gas Technicians' Responsibilities

- Keep the energy project supplied with high BTU content fuel
- Keep the landfill in regulatory compliance
- Keep the LFG wells within specified operating ranges
- Coordinate with both the LF owner and plant operator
- **Objective: Keep both the energy project operator and the landfill owner happy**

Well Field Monitoring Frequency

- Site dependent
- Can vary from once per month to once per week
- For arid landfills – tuning twice per month
- Once per month minimum

TETRA TECH

Monitoring Wells & Making Adjustments

- Option 1 – Collect the data, go back to the office, analyze the data, and return to make adjustments
- Option 2 – Collect the data and make adjustments on-site (adjust on the fly)
- Required adjustments to wells not in compliance with NSPS parameters should be made on-site
- Tuning should be conducted during “normal” atmospheric conditions

Surface Emissions

- Increase LFG flow from nearby wells
- Avoid significant adjustments
- How many wells need adjustment?
- Look at previous well monitoring data
- Should the LF owner add another well?

TETRA TECH

Well Field Data Management

- Store well readings in GEM or Envision
- Technician typically downloads data to laptop at the end of the day
- Technician transmits comma-separated values (csv) file to the office (wireless card) or visits the office at the end of the day
- CSV file is imported into a spreadsheet and/or uploaded to database
- Excel spreadsheet can be “programmed” to generate **suggested** well adjustments

Well Field Data Interpretation/Validation

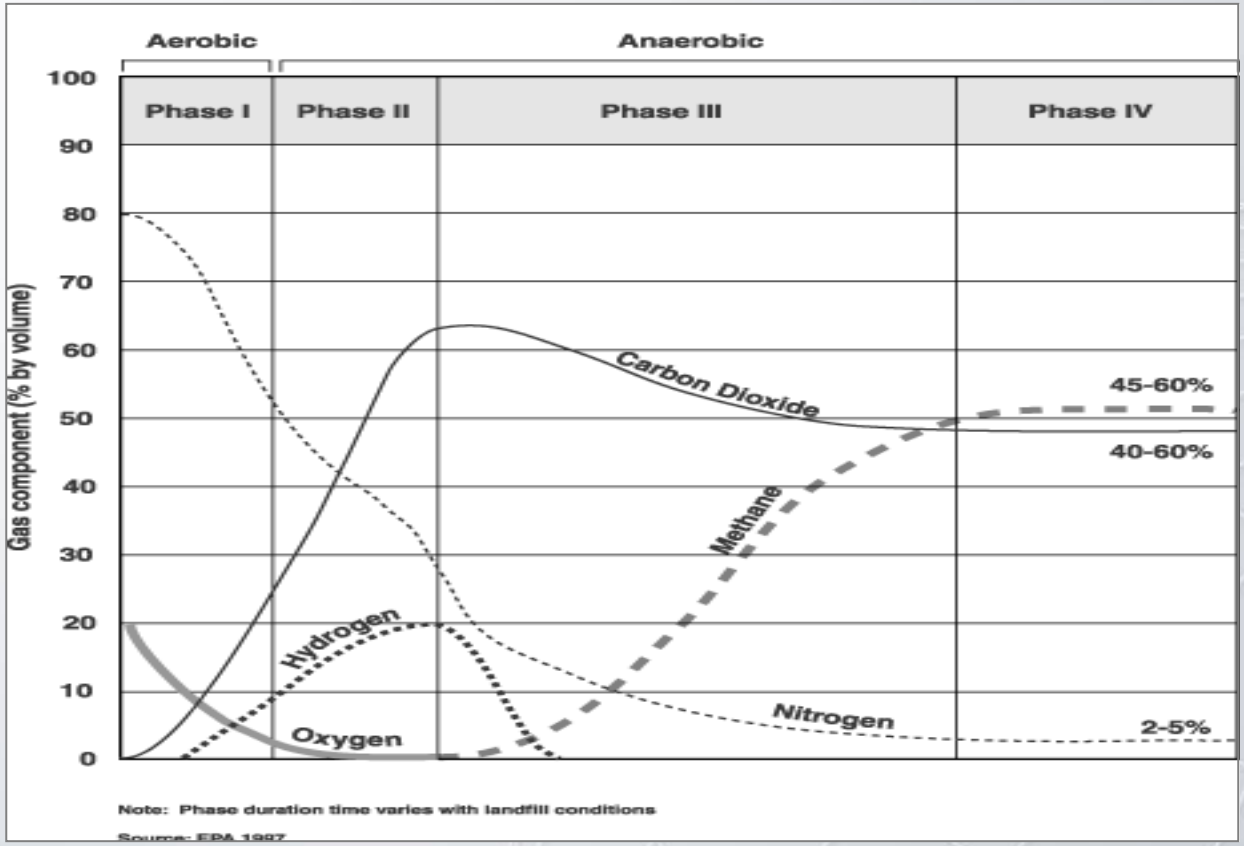
- Validate the data
  - Within expected parameters (i.e. CH_4 less than 55%)
  - Within NSPS parameters, particularly temperature
  - Note times readings were taken
  - Note barometric pressure changes during the monitoring event
  - Compare current data with past data, trending
  - Outliers need to be verified by technician
  - Weather – rain events

Well Adjustment Guidelines

- Required Adjustments – NSPS Parameters
  - Temperature less than 55 deg C (131 deg F) and
  - Either nitrogen less than 20% or oxygen less than 5%
  - Well under negative pressure
- Methane Target (GC Environmental, 1998)
  - Set reasonable methane target
- Focusing on only a few parameters can lead to misinterpretation of the data
- Energy projects require closer well field control
- Objective is to achieve stable composition and flow
- LFG flow vs. vacuum or valve position

New Waste Vs. Old Waste

- Temperature
- Carbon Dioxide

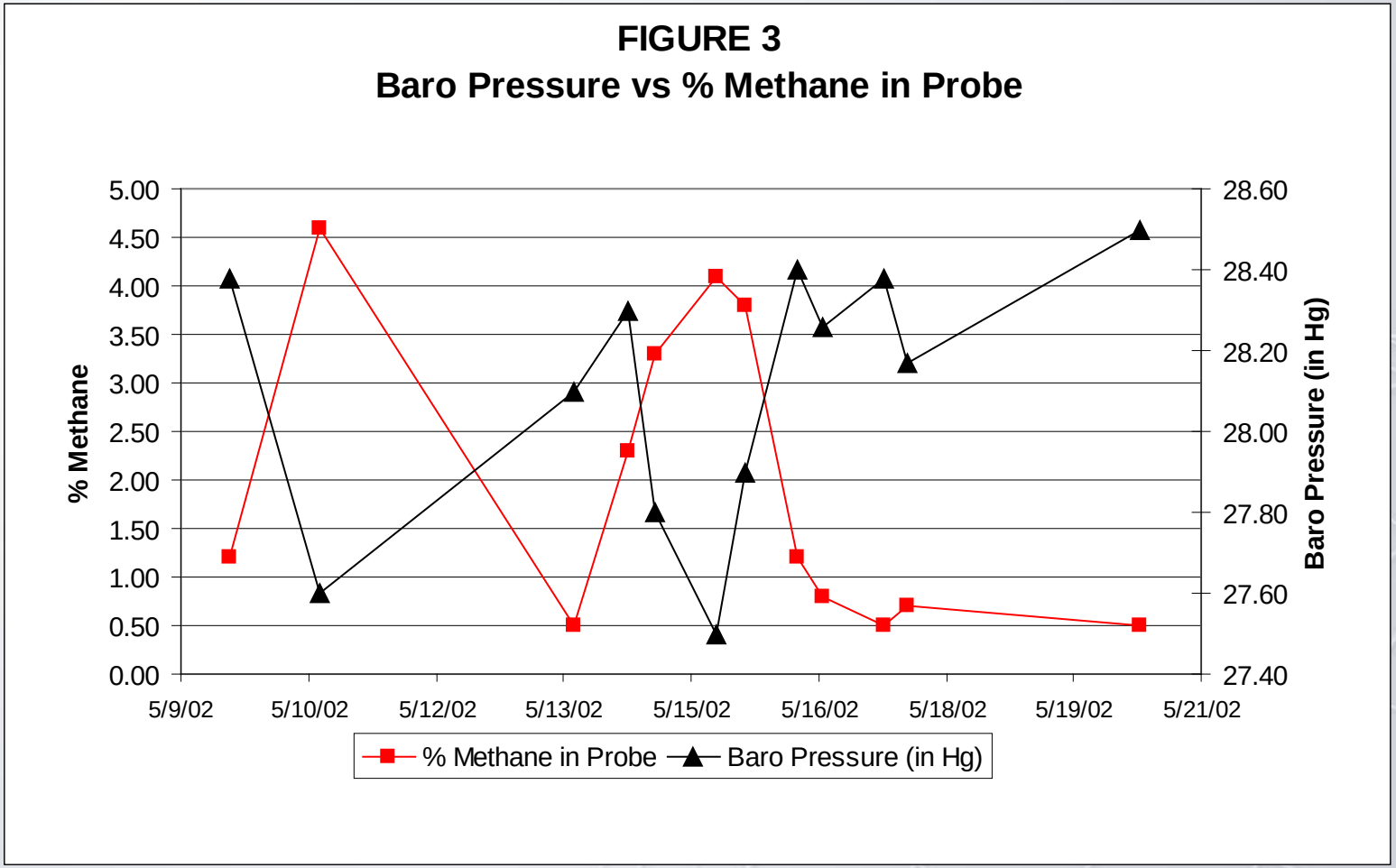


TETRA TECH

Arid Climate Landfills

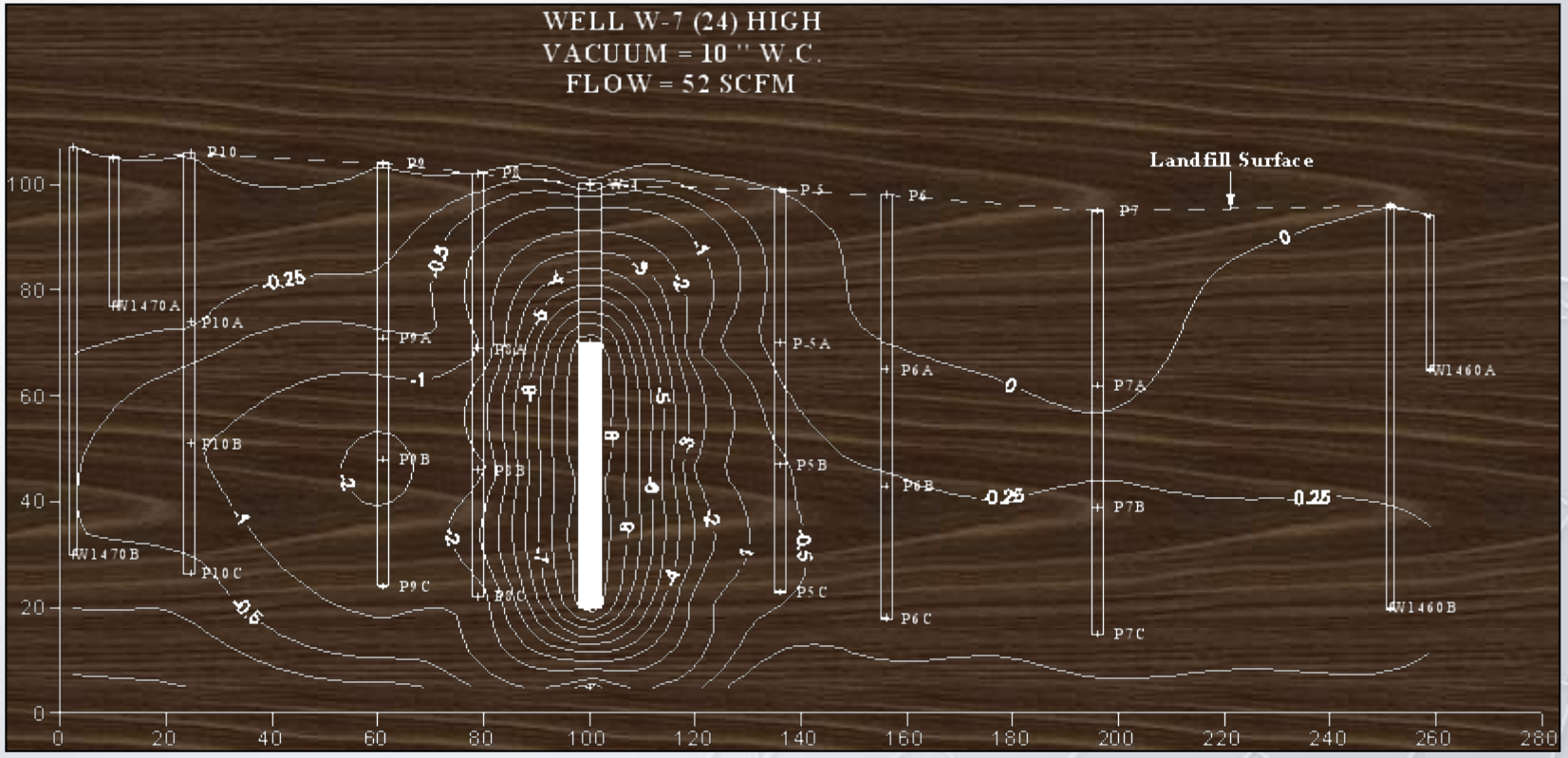
- Ambient air intrusion
- Significantly affected by barometric pressure
- An increase in the barometric pressure can cause an increase in the landfill's internal pressure
- Barometric pressure fluctuations will affect LFG flow in collection wells (not limited to 10' BSG)

Barometric Pressure Effects



TETRA TECH

Theoretical Subsurface Pressure Contours



TETRA TECH

“The Bubble Effect”

- Initial methane concentrations and flow rates encountered immediately after system start-up may be unusually high
- LFG stored + LFG generated
- LFG generated

Carbon Filters

- Hexane, pentane, octane, propane, or other non-methane hydrocarbons are present in LFG
- The presence of these gases can affect the CH_4 channel (IR in Landtec), causing artificially high readings
- Difference can be 3%

Signs of Overpulling the Field

- Elevated nitrogen (balance gas)
- Decrease in CH_4 over time
- Oxygen and temperature increase

Contrary Wells

- Subjective part of well adjustment
- Cannot use just a simple formula
- Graph LFG composition of contrary wells
- Hydrate well seal
- Extending ROI can tap into uncollected LFG

TETRA TECH