Climate Action Reserve
September 21, 2010
Nitric Acid Workshop
Agenda

- About ClimeCo, Nitric Acid Services
- First Step - Technology Selection
- First CAR Nitric Acid Project – Overview
- ERRATA 1
- Critical USEPA Part 75 Requirements
- Questions and Answers
About ClimeCo
Nitric Acid Sector
ClimeCo’s Role in the CAR Protocol

ClimeCo selected to participate in the CAR N₂O Protocol development process. Workshop members included:

ClimeCo
The Fertilizer Institute
Orica Canada Inc
Terra Industries Inc.
California Air Resources Board
U.S. EPA
DNV
Blue Source, LLC
N. Serve Environmental Services
Technology Selection
Technology Selection – Protocol accepts secondary and tertiary

- Critical to understand the plant design
- Some nitric acid plants (NAPs) are best suited for secondary while some NAPs are best suited for tertiary.
- Secondary – Understand basket retrofit requirements and system pressure drop.
- Tertiary – Understand total installed cost (TIC) of project. Preliminary engineering is essential.
First CAR Listed Nitric Acid Project
El Dorado Nitrogen Project – Baytown Texas

- Dual Pressure Plant
- Secondary Abatement
- BASF Catalyst Selection
- Typical Campaign Length: 6-9 months
- Historical Campaigns: 4/28/06 to 2/17/09
- Baseline Campaign: 11/01/09 to 6/27/10
- Project Campaign Started: 7/1/10
- Project Verifier – Ruby Canyon Engineering
El Dorado Nitrogen Project Schedule

- **Project Schedule**
  - September 2009: ClimeCo engaged to evaluate FTIR CEM and perform N\textsubscript{2}O RATA. RA exceeded Part 75 Requirements
  - November 1, 2009: Baseline campaign starts
  - December 2, 2009: CAR Protocol v1 issued
  - May 27, 2010: CLcap threshold met
  - June 10, 2010: Baseline verification (on-site) begins
  - June 27, 2010: Baseline campaign ends
  - June 29-30, 2010: Installation of BASF catalyst
  - August 25, 2010: Verification of baseline complete
  - October 2010: mid campaign verification
Installation (June 29 and June 30th)
• **Historical Campaign Data**
  
  - Hourly process data required for oxidation temperature, pressure, ammonia to air ratio, and HNO$_3$ production
  - Removed all data for non-operating conditions (OH < 1)
  - Removed upper and lower 2.5% (95 percentile)
  - Established historical operating limits (upper and lower)
  - Calculated CLcap – average annual production from the 5 consecutive campaigns during the last 5-years. [applied to EFbl]
  - Calculated HNO$_3$max – historical maximum annual average total output (100% nitric) (HNO$_3$/hr) [applied to HNO$_3$max,scaled]
Important Concepts in Protocol

• **Baseline Emission Factor**
  - Manually calculated Bias Adjustment Factor (BAF) and applied
  - Removed all data with OH < 1
  - Added function to summarize accumulated HNO₃ production and capped data fields to the point when CLcap was met
  - Calculated 95% confidence levels NCSG and VSG [N₂O concentration (mg/m³) and air volumetric flow rate (m³/hr)]
  - Removed all data outside of historical operating ranges
  - Approximate data loss after “hair cuts” – 12%
  - Calculated EFbi = (BEBC) tN₂O/tHNO₃BC
• **Project Emission Factor / Project ERs**

- Follow same process as done for Emission Factor Baseline except do not apply $CL_{cap}$.

- Project emission factor ($EF_p$) = $PE_n/HNO_{3n}$

- $ERs = (EF_{BL} - EF_p) \times HNO_{3ER} \times GWP_{N2O}$
  - $HNO_{3ER} = $ quantify of $HNO_3$ corresponding to NCSG and VSG values used to calculate total $N_2O$ or
  - $HNO3_{max, scaled} = HNO3_{max} \times OH$ for project campaign, whichever is less.
Project commenced prior to Protocol Publication, resulting in two variance requests:

- Variance 1 – Quarterly Linearity Check
- Variance 2 – Flow Meter (7-day drift, daily calibration, daily flow interference)
Key ERRATA / Clarifications

• ERRATA
  - Execution of Attestation of Title
  - New term – HNO3max,scaled
  - Equation 5.4 – Variables modified to include project campaign “n”
  - Linearity Check / Cylinder Gas Audits

• Clarifications
  - Calculation and application of HNO3max
  - Calculation of Ammonia to Air Ratio
  - Statistical analysis of historical operating data
  - Statistical comparison of permitted and baseline operating conditions
  - System installation and certification requirements (existing CEMs)
  - Frequency of test (existing CEMs)
• Clarifications
  - Quarterly leak checks for mass flow meters
  - Quarterly flow to load comparisons
Critical USEPA Part 75 Requirements
**N₂O Analyzer Types**

- **Non Dispersive Infrared (NDIR)**
  - Less versatile
    - ✓ CH₄, C₃H₈, CO, CO₂, N₂O, NOₓ, SO₂
  - Less expensive
- **Fourier Transform Infrared (FTIR)**
  - More versatile
    - ✓ All molecules except O₂, N₂ and H₂
  - More expensive
    - ✓ More expensive calibration audits
Mass Flow Meters

• Mass flow meters

75 percent of the flow meters installed in industry are not performing satisfactorily…

- Designed to USEPA RM 2
- Location is critical – turbulent vs. laminar flow
- Orifice and hotwire applications
CAR Protocol requires more stringent CEMS audit specifications and additional certification tasks

- Quarterly and annual certification procedures are similar, but audit criteria are more stringent
  - Quarterly linearity criteria reduced from 15% to 5% of audit value (Part 75, Appendix A, Section 3.2)
  - RATA criteria from 20% to 10%/7.5% for a bi-annual cert./annual cert. (Part 75, Appendix A, Section 3.3)
• New certification activities are also required:

   DAHS verification test
   Cycle time test
   Bias test
   Linearity check
   7 day CEMS drift check

• Daily CEMS out-of-control calibration criteria tightened - 5% versus 10% for single N₂O daily calibration (Part 75, Appendix A, Section 2.1)

• Volumetric flow meter certification now required:
Upgrades to existing CEMS DAHS required

- CEMS DAHS must incorporate missing emission data substitution routines for every hour of missing data (Part 75, Subpart D)
  - Substituted data are determined based on CEMS data availability. The more data missing, the higher the missing emission data default

- DAHS must apply conservative bias adjustment factors (BAF) to mass emission rate data where applicable (Part 75, Appendix A, Section 7.6)
  - If absolute difference between reference method and facility CEMS exceeds confidence coefficient (cc) then bias test is failed and BAF required to be applied
Questions and Answers
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