California's Reactivity Program

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California Environmental Protection Agency

Air Resources Board

California's Reactivity Program

- Regulation
- Research
- Internal Reactivity Team
- External Assistance

VOC Regulation

- California has an effective system of mass based VOC controls.
- The SIP relies on with mass-based VOC reductions
- Important that any reactivity regulation provides ozone reductions equivalent to these mass-based controls.

Reactivity and VOC Regulation

- Mass-based controls alone may not be sufficient for attainment.
- Reactivity may provide a cost effective control strategy.
- Reactivity may provide flexibility to industry.

California's Current Use of Reactivity in Regulation

- Needed a way to compare alternatively fueled vehicle's emissions.
- Use of reactivity of vehicle exhaust for comparisons.
- Adopted LEV/CF regulations in late 1990 with Reactivity Adjustment Factors, RAF
- $$RAF = \frac{\text{Exhaust Reactivity AFV}}{\text{Exhaust Reactivity CFV}}$$

Questions Encountered

- Which Reactivity Scale?
  - MIR
    - Dual control program in CA
    - MIR scale complements NOx controls
- What about uncertainty?
  - Alternative fuels program (LEV/CF)
    - MIRs ~30 - 70%
    - RAFs ~5 - 15%

Development of Aerosol Coatings Regulation

- California Low Emissions and Reactivity Regulation for Aerosol Coatings (CLEAR)
- Voluntary alternative to mass based regulation
  - Product MIR = Σ Wt% X MIR
- Current Schedule
  - Public Workshops: late Fall 1999, Winter 2000
  - Public Hearing: Spring 2000

Regulatory Challenges

- Regulation Development
  - Equivalent ozone benefits
  - Enforceable
  - Flexibility
  - Simple
  - Cost Effective

Technical Challenges

- Uncertainty
  - Alternative Fuels Program
    - Relative reactivities reduce uncertainty
  - Consumer Products
    - Majority of inventory are well studied VOCs
    - Adjust MIRs for higher uncert.
- Speciation Profiles
  - Ongoing efforts to improve chemical speciation data

Previous Research

- Our regulations have a significant body of previous research to draw on:
  - Atmospheric Chemistry
  - Mechanism Development
  - Uncertainty Analysis
  - Reactivity Values
  - Speciation Profiles

Current CARB Reactivity Research

- Atmospheric Chemistry of Mineral Spirits
- Development of Improved Reactivity Measurement Methods
- Uncertainty Analysis of Chamber Data
- Peer Review of SAPRC99

Reactivity Research
(continued)

- Reactivity of Stationary Source VOCs
- Improved Aerosol Speciation Profiles
- Investigation of Low Reactivity Solvents for Use in Consumer Products
- Reactivity Values Using Airshed Models

Internal Reactivity Assessment Team

- Review effectiveness of CARB's current uses of reactivity
- Examine the technical basis for quantifying reactivity
- Provide recommendations on how to include reactivity in a coordinated regulatory program

7th International Conference Air Pollution 99

- Papers presented:
  - Assessment of the organic compound reactivity concept for regulatory applications in California
  - Photochemical reactivity of organic compounds in central California: A grid-based modeling study
- Contact: Ajith Kaduwela akaduwel@arb.ca.gov

External Assistance

- Reactivity Scientific Advisory Committee (RSAC)
  - RSAC meeting October 8, 1999
- Reactivity Research Advisory Committee (RRAC)

In Summary:

- Properly designed reactivity-based regulations can add flexibility to control strategies.
- Reactivity regulations must provide equivalent ozone reductions as the mass-based controls.
- Will continue to fund research to improve our understanding of reactivity