

Emissions from California Poultry Production

ARB Livestock Emissions Symposium
January 26, 2005



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Collaborative Effort

Study Planning Committee:

- Patrick Gaffney, Michael FitzGibbon
 - California Air Resources Board
- Matt Summers
 - California Department of Food and Agriculture
- Bill Mattos
 - California Poultry Federation
- Dave Duke, Jim Marnatti, Dr. Sun Kim and Doug Stabelfeld
 - Foster Farms
- Kevin Clutter
 - Pacific Egg and Poultry Association
- Dr. Ralf Ernst
 - University of California, Davis
- Daby Humbert
 - Zacky Farms

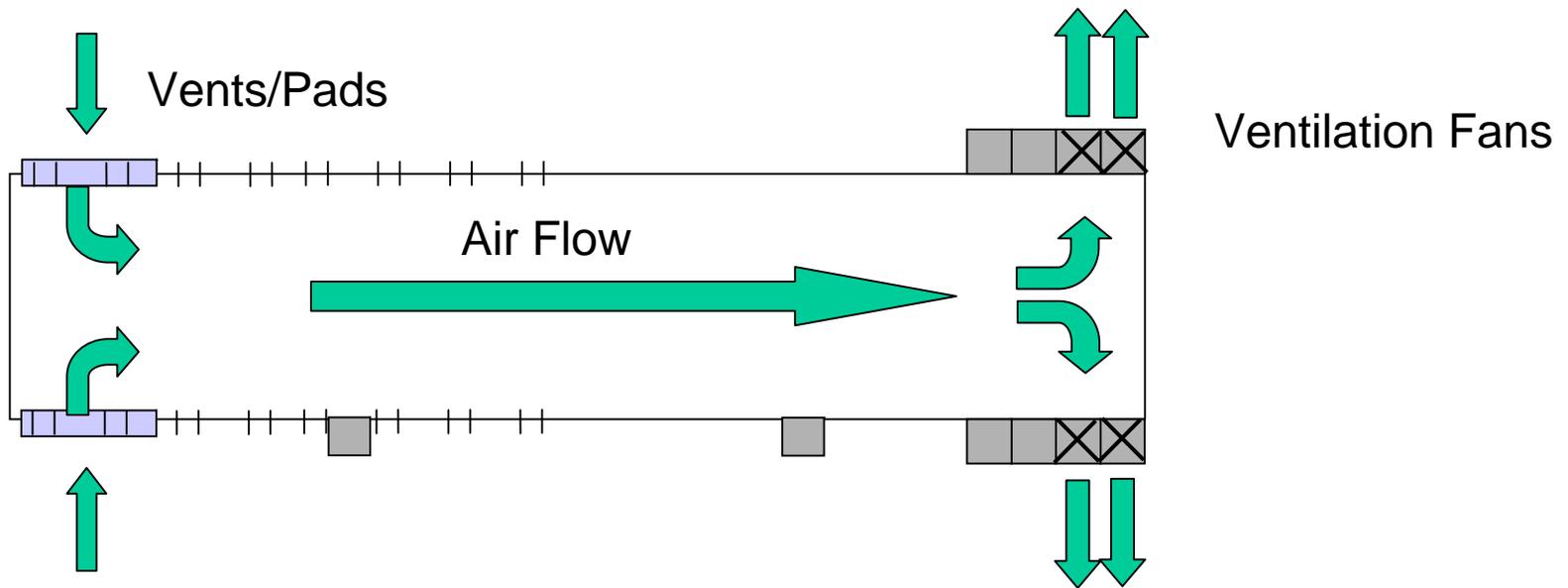


Poultry Air Emissions Study

Goals:

- Measure poultry house emissions during complete broiler cycle (TOG, ROG, Ammonia, PM)
- Use standard source test methods in public domain
- Use data to generate emissions factors for California

Typical Mechanically Ventillated Brioler House for California



- Size: 48' x 320'
- Number of birds: ~21,000
- Growth cycle: 45 days, 10 days before next flock
- Bedding material: rice hulls,
- Litter removal: 1/3 + conditioning each cycle
Full removal at 3 cycles





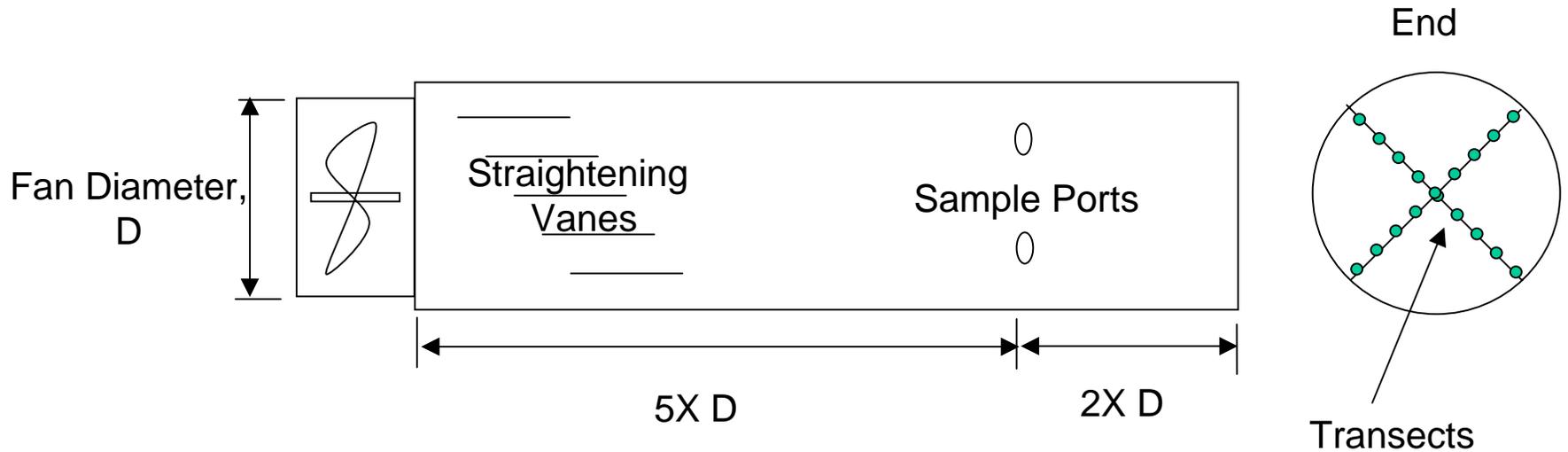
Measurement Methodology

- For emissions estimate we need compound concentration and house airflow
- Standard methods call for a stack to provide smooth, well mixed airflow
- House cannot be changing ventilation rate during collection cycle (up to 120 min)
- Need ambient air concentration to determine “enrichment” from house

>> Simple, low cost methods that can be implemented by source test company



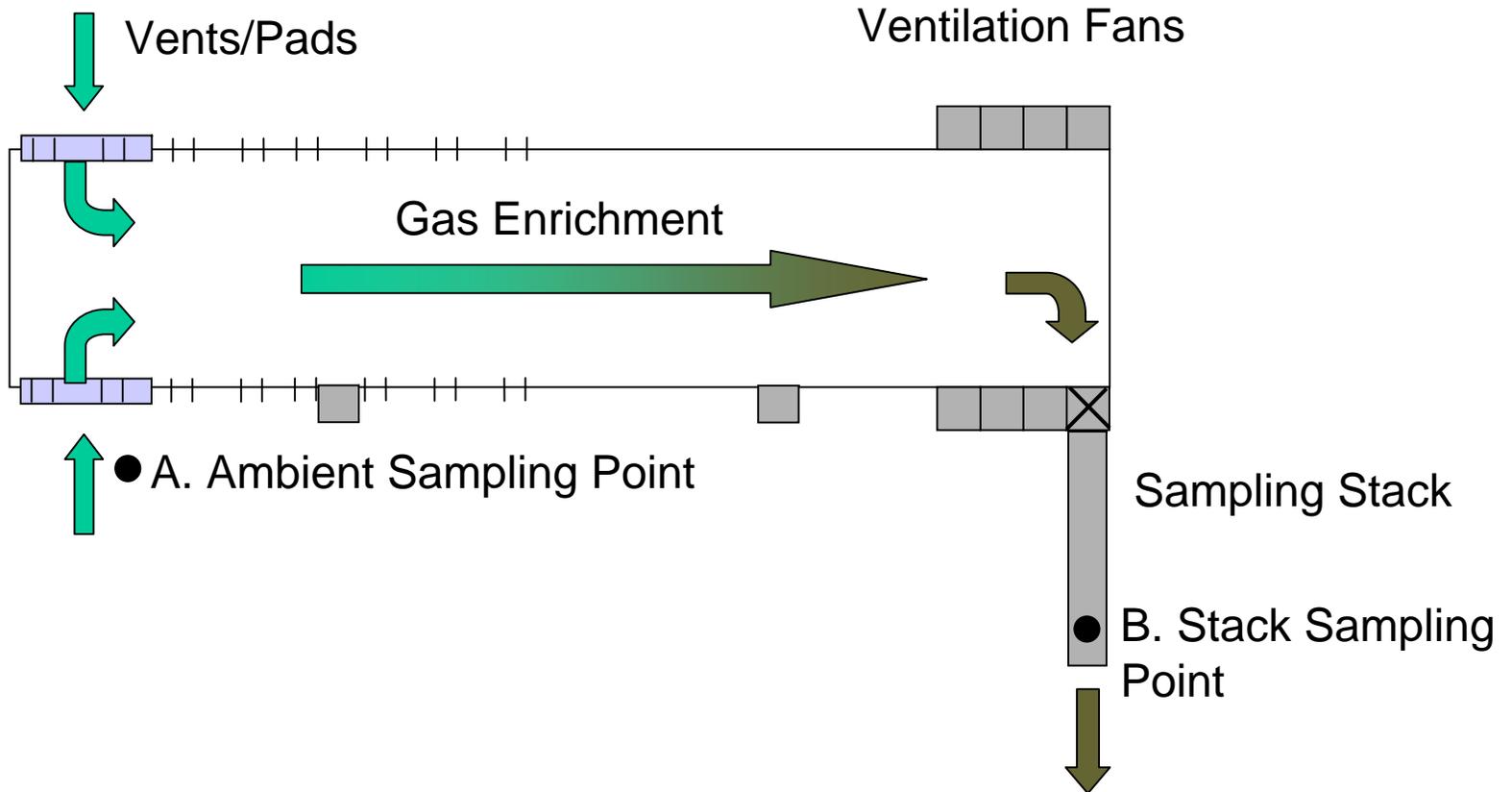
Sampling "Stack"





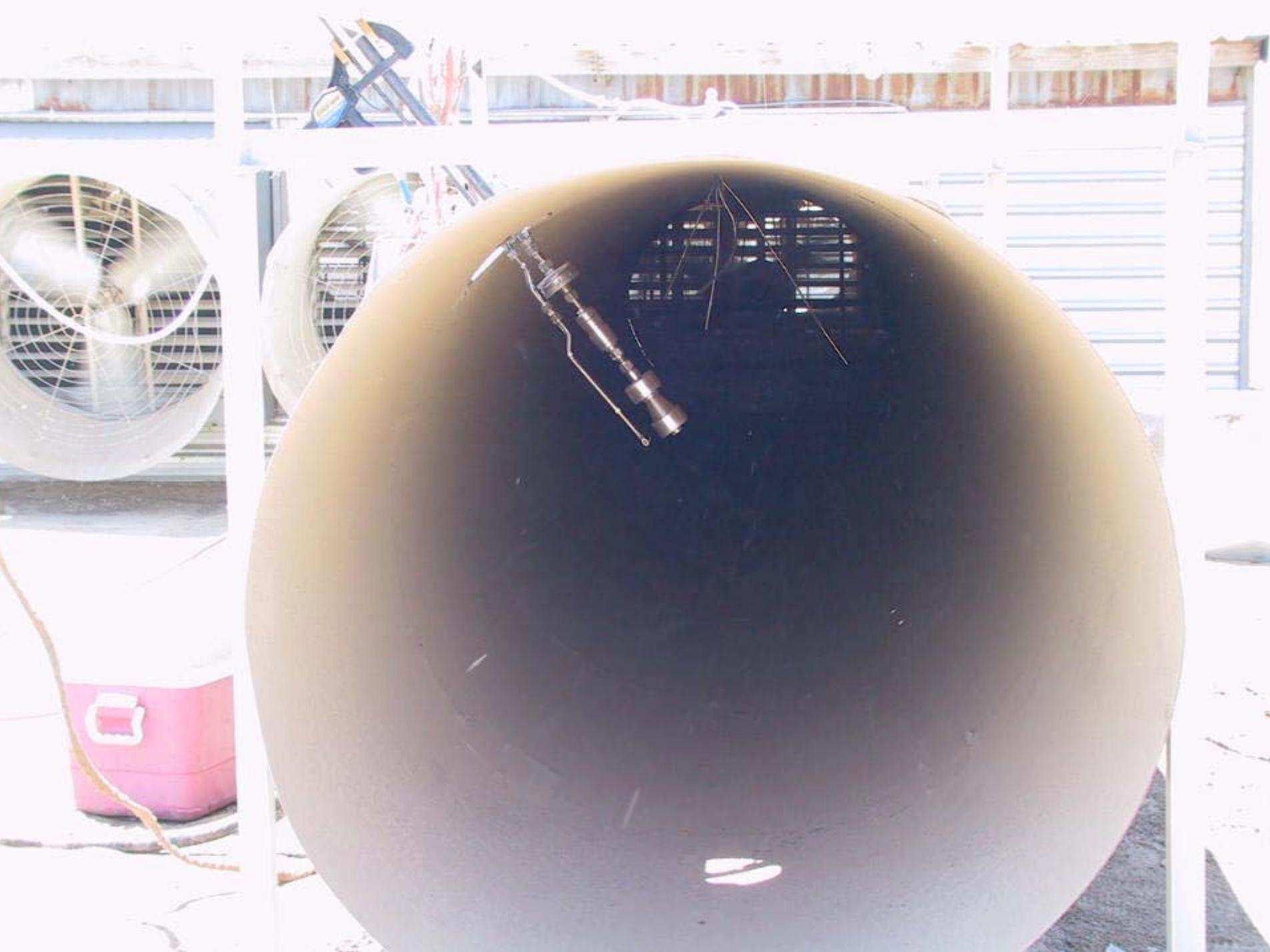


Measurement Approach



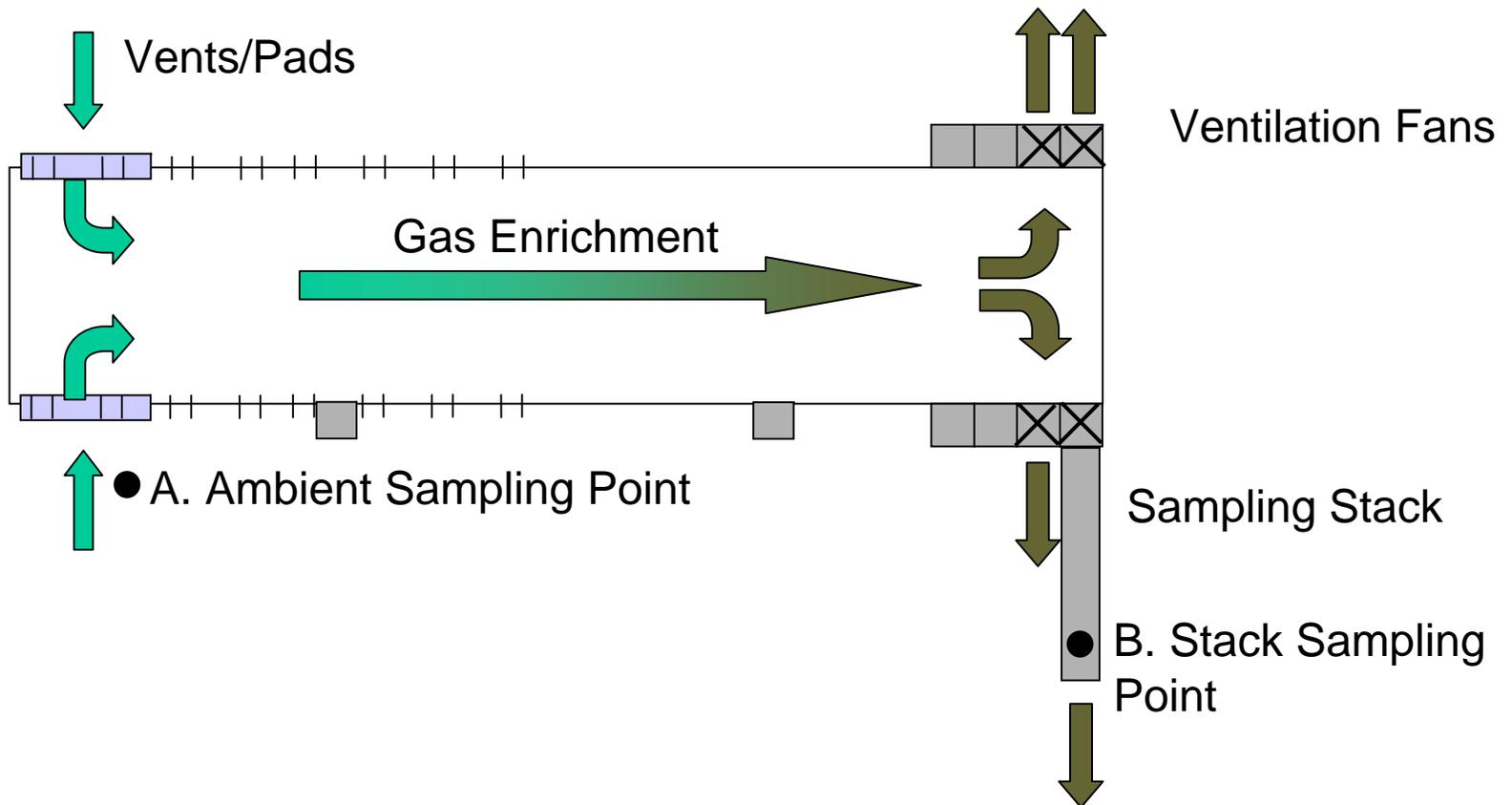
$$\text{Emmissions} = (C_B - C_A) \times \text{Flow}_B$$







Measurement Approach



$$\text{Emmissions} = (C_B - C_A) \times (\text{Flow}_B \times \text{VLF})$$

Ventilation Level Factor

- All fans are calibrated relative to test fan at beginning of cycle
- 8 points per fan with two anemometers (vane type and wire type)
- Two static pressures (high, low)
- Fans generally about 10% higher flow than stack fan
- Ventilation levels during sampling are recorded by computer for determination of total house flow





Test Methods

- Ammonia method
 - BAAQMD ST-1B (HCl impinger train)
- Hydrocarbon methods
 - EPA 25A (Direct FID)
 - EPA 18 (GC-FID, C1–C6+ compounds, Tedlar bag collection)
- Organic gas method
 - EPA TO-15 (GC-MS, 69 polar/non-polar target compounds with non-specific library search for other compounds reported relative to internal standard, summa canister collection)
- PM method
 - EPA 201A (Total Particulate, PM-10, PM-2.5, cyclone/impinger sampling train)



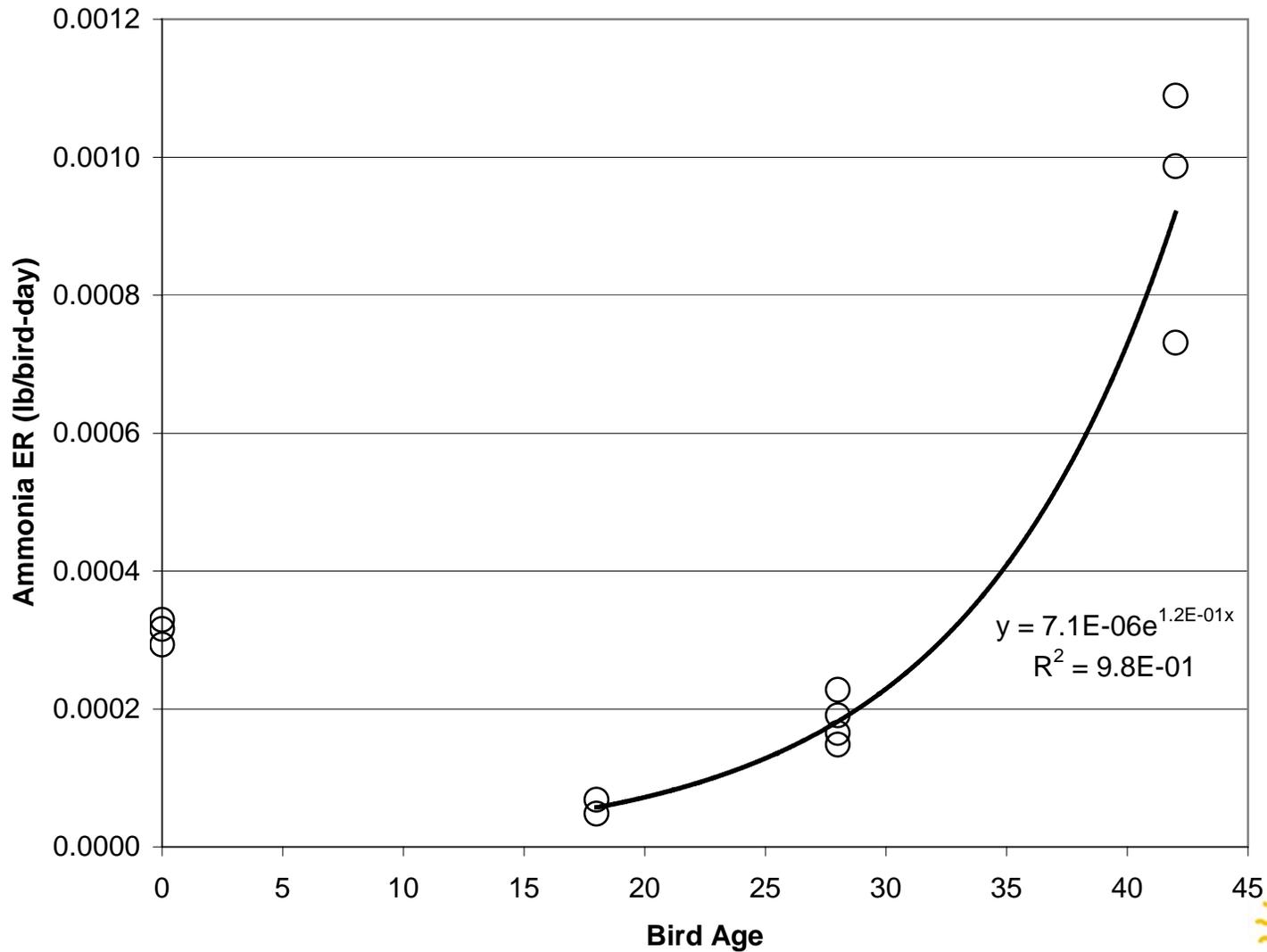
Quality Assurance Checks

- Plan was reviewed by ARB technical staff and Central California Ozone Study Technical Committee
- All sample collection performed by district approved source testing firm, AirX Testing
- Audit on field collection and laboratory methods (GC-MS) provided by California Air Resources Board, Monitoring and Laboratory Division

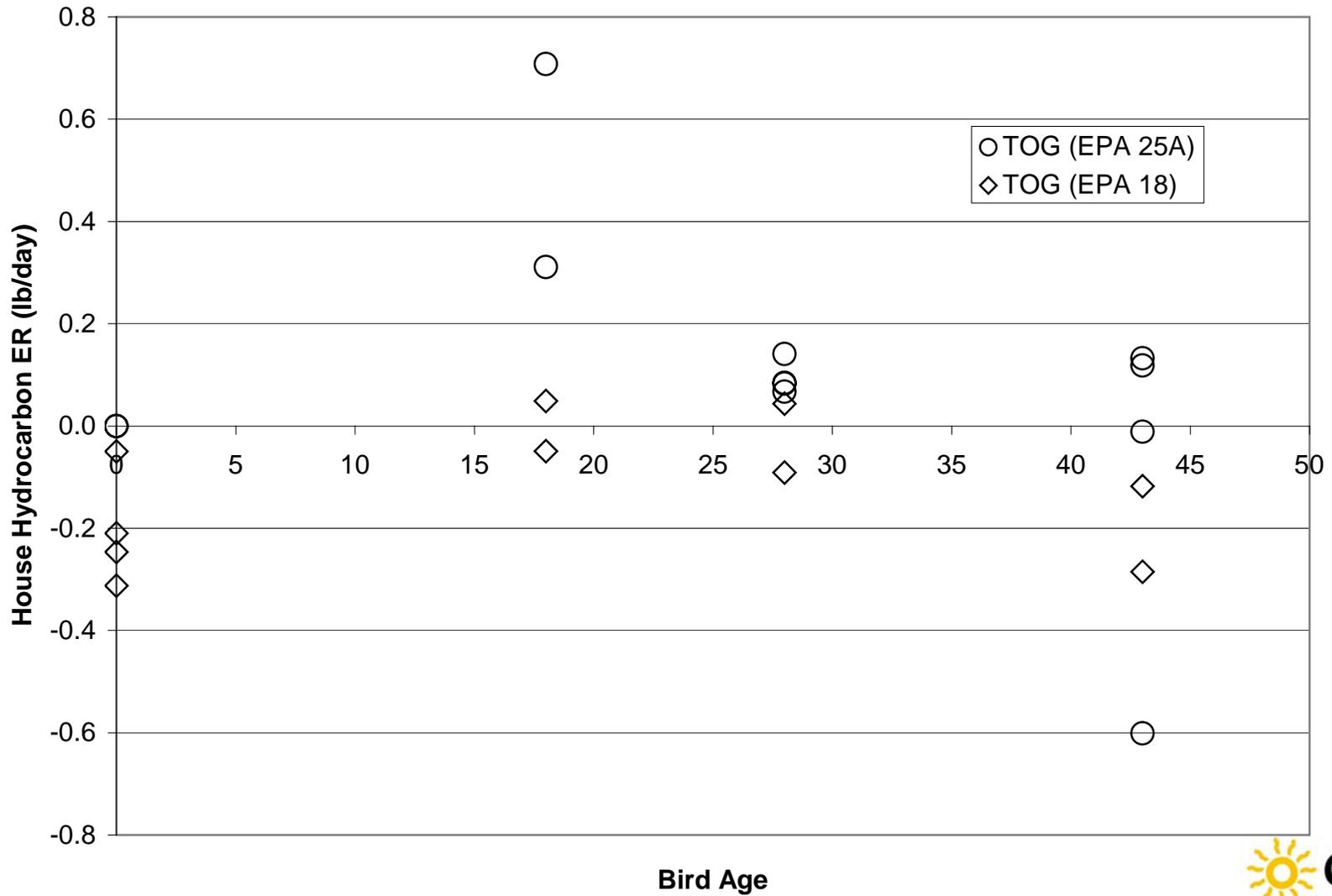
Results: Particulate matter

- No results to report
- Method did not collect enough sample for proper quantification
- Much longer sampling cycle needed to pull enough air through sampling train
- Because of cost and complexity it was decided to defer to other broiler PM studies

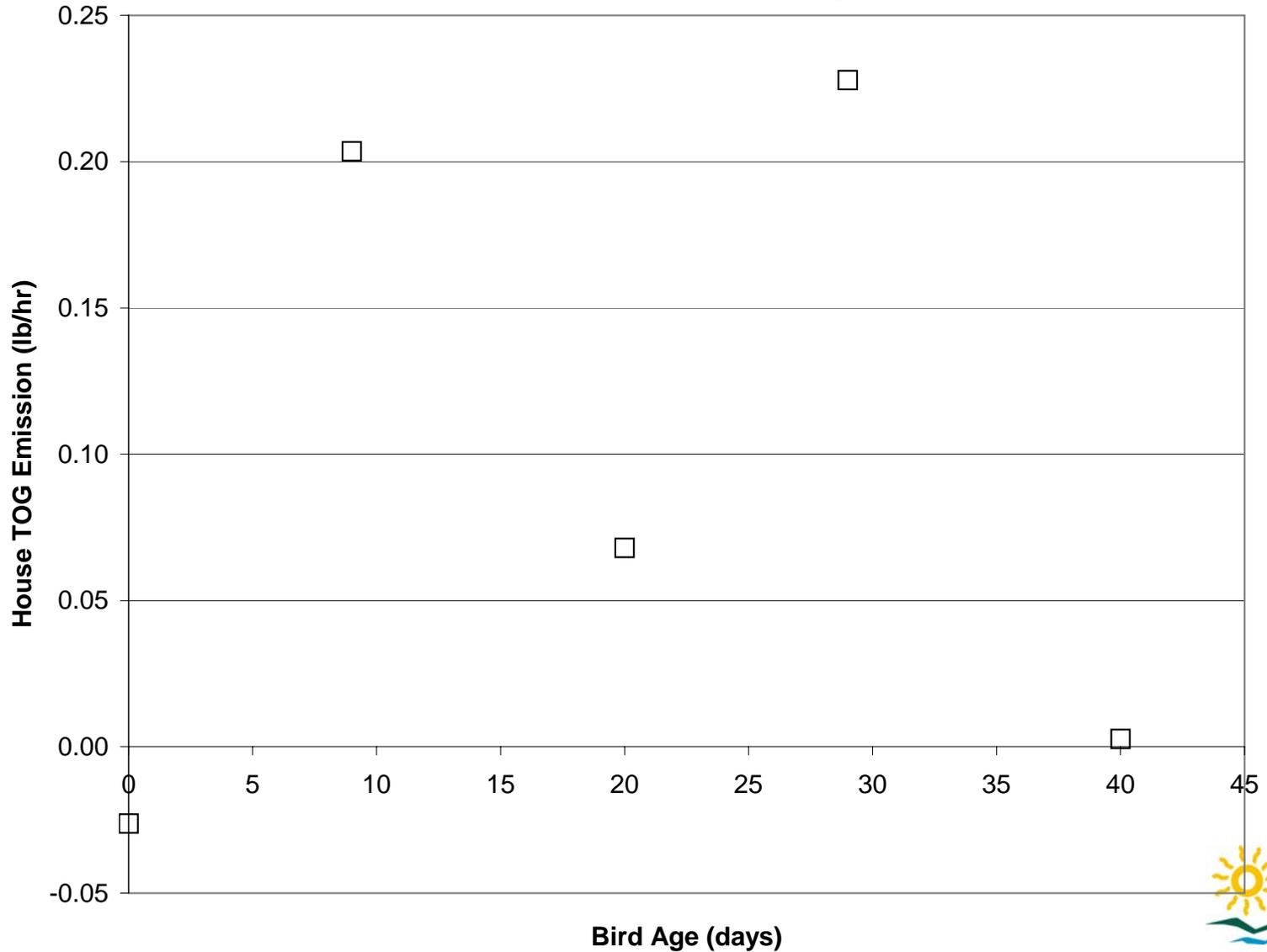
Results: Ammonia



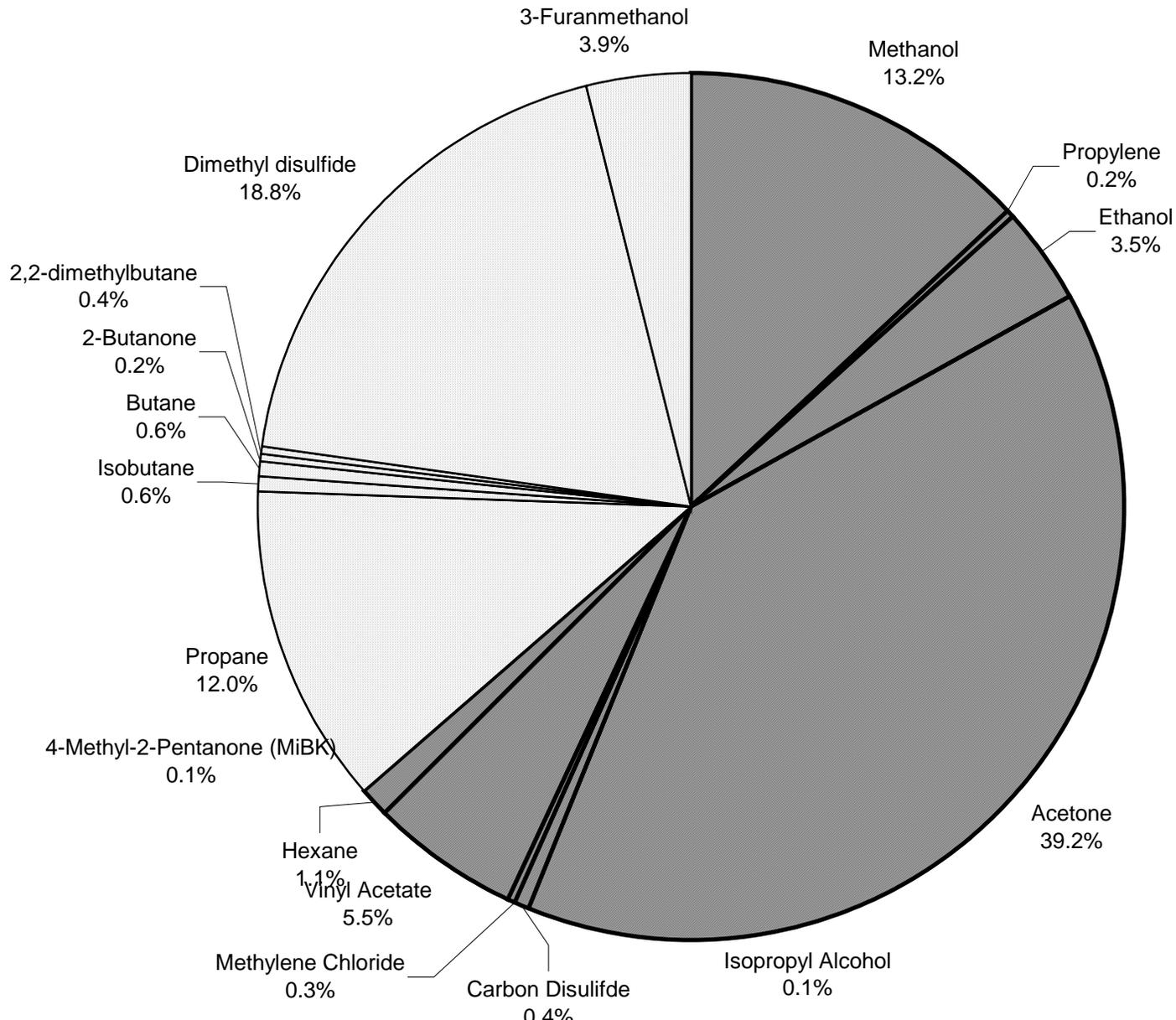
Results: Hydrocarbon methods



Results: Total Organic Gas



Results: Organic gas speciation



Results: Emissions Factors

Compound	Production Emission Factor (lb bird ⁻¹)	Capacity Emission Factor (lb bird ⁻¹ yr ⁻¹)
Ammonia	0.0143	0.096
Total Organic Gas	0.0061	0.041
Reactive Organic Gas	0.0037	0.025

Contact Information

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