

UPDATE ON THE NATIONAL AIR EMISSIONS MONITORING STUDY (NAEMS) PROJECT

Larry D Jacobson¹ and Albert J. Heber²

¹Bioproducts & Biosystems Engineering Department
University of Minnesota, St. Paul, MN 55108

²Department of Agricultural and Biological Engineering
Purdue University, West Lafayette, Indiana 47906

The National Air Emissions Monitoring Study (NAEMS) was initiated by a U.S. EPA air consent agreement, in which livestock producers agreed to collect air emission data in exchange for more time to report their emissions and apply for any necessary permits. Field measurement of livestock air emissions, both from barns and outdoor manure facilities, is the main focus of the study. Compared with most previous field studies of emissions, the NAEMS was designed to measure several pollutants simultaneously including particulate matter (PM), ammonia (NH₃), hydrogen sulfide (H₂S), CO₂ (carbon dioxide), ethanol / methanol, and non-methane volatile organic compounds (NMVOC) over a long duration (two years) of time. The study carefully selected the farms to enhance their representativeness, using similar protocol and a high level of quality assurance and quality control as required by the U.S. EPA, which is supervising the study.

The NAEMS is collecting continuous air emission data from 38 barns at five dairies, five pork production sites, three egg layer operations, one layer manure shed, and one broiler facility plus intermittent monitoring of 9 outdoor manure storages (4 dairy and 5 pig sites) and 1 dairy corral all begun in 2007. At each barn monitoring site, an on-farm instrumentation shelter houses equipment for measuring pollutant concentrations at representative barn air inlets and outlets, barn airflows, operational processes, and environmental variables. A multipoint gas sampling system delivers selected air streams to gas analyzers. Mass PM concentrations are measured at one representative exhaust location per barn using real-time monitors. Motion sensors monitor activity of animals, workers and vehicles. Building ventilation rate is assessed by monitoring fan operation and building static pressure in mechanically ventilated barns, and air velocities through ventilation openings in naturally-ventilated buildings. Data is logged every 15 and 60 s and retrieved with network-connected PCs, formatted, validated, processed, and delivered to the U.S. Environmental Protection Agency (EPA). Two sets of traveling instrument trailers and equipment are used to collect short duration (approximately 2 weeks) from the area sources in the study. The two trailer sets rotate between 5 outdoor sources (divided into eastern and western US) and use open path instrumentation (UVDOAS) to determine emissions of NH₃, H₂S, ethanol and methanol, and NMVOC from these area sources during different seasons of the year and stages of capacity.

The NAEMS study is in the process of producing a large database of air emission from animal production operations including barns and associated manure storage systems for a variety of air pollutants (hazardous gases, particulate matter, and volatile organic compounds (VOCs)) of concern to regulators, producers, and the general public. In addition, there have been a number of "add-on" projects separately funded to determine such parameters as odor, other greenhouse gases (GHG) and VOCs, and bioaerosol emissions from a subset of these NAEMS sites.