

Center for Air Toxic Metals

CATM[®]

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EERC

Energy & Environmental Research Center[®]



**University of
North Dakota**
Grand Forks

Center for Air Toxic Metals® (CATM®)

Focus on Mercury

Over the past several years, a significant amount of research has focused on hazardous air pollutants (HAPs), specifically mercury. In 1992, the U.S. Environmental Protection Agency (EPA) established the Center for Air Toxic Metals (CATM) at the University of North Dakota Energy & Environmental Research Center (EERC) to focus national research efforts on trace element emissions. Subsequently, EPA released its Mercury Study Report to Congress in 1997 and the follow-on Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final Report to Congress in 1998. CATM contributed research results to both reports.

In 2000, EPA announced that mercury emissions from coal-fired power plants must be reduced. On March 15, 2005, EPA released its final rule that calls for a reduction in mercury emissions from 48 tons presently emitted to 38 tons through copollutant control of SO_x and NO_x. Full compliance is expected by 2018 and will put a cap on mercury emissions of 15 tons. Canada also released a draft mercury rule this year. Coal-fired utilities have until March 2007 to draft proposals outlining how they will meet the emission limits. Europe, too, is calling for a reduction in mercury emissions. As regulatory standards continue to be developed, the research community believes that, while progress has been made, many technical issues still need to be addressed concerning the availability and effectiveness of control technologies and the atmospheric transport and deposition of different forms of mercury.

The CATM Program

For the last decade, CATM has addressed the critical issues and forged its reputation as the world leader in air toxic research. The CATM Program is a cooperative agreement between EPA and the EERC targeted at minimizing the impact of air toxic metals on the environment worldwide. Formed in 1992, CATM is designated by EPA as the National Center for Excellence on Air Toxic Metals. Since its inception, CATM has established partnerships with government agencies, industry, and environmental groups and, through these partnerships, answered critical questions concerning health risks, toxic metal transformations and pathways, sampling and measurement of toxic metal emissions, and related toxic metal control technologies. Through CATM outreach programs and open forums, the public is made aware of air toxic emission issues and the need for pollution prevention as the first step toward improving air, water, and soil quality.

CATM Program Direction

On the cutting edge of air toxic metal research and technology development, the CATM Program evolves based on regulatory mandates and industry needs. Currently, proposed regulatory measures and legislation suggest the following needs:

- More data on source emissions.
- Fundamental mechanistic information necessary to understand the conversion of mercury to other chemical species.
- Improved mercury emissions measurement and monitoring protocols and methods.
- Cost-effective control technologies.
- Determining if mercury is reemitted from products derived from, or the disposal of, energy conversion by-products.
- Address health effects and risks related to air toxic metal exposures.
- Improved access to critical information to the public.

Technology Commercialization

The EERC is recognized internationally for its ability to commercialize technology. Not only is it a business within a university, but since the late 1980s, the EERC has also been able to aggressively move technologies out of the laboratory and into the marketplace. Commercialization of innovative technologies is the key to the creation of new jobs, new wealth, and economic prosperity. At the EERC, every new contract and every project are considered commercialization opportunities. The ultimate goal is to work in partnership with clients in industry and government to develop, refine, demonstrate, and commercialize marketable technologies to provide practical solutions to real-world problems. Within the CATM Program, all activities are conducted with the focus of demonstration, deployment, and commercialization.



“Overall, the Center appears to be among the best of those funded by EPA.”

—EPA 2003 Peer Review Panel

CATM Research Has Focused Programs

Program Area 1 – Transformation

Mechanisms is designed to provide the information needed by industry and environmental research organizations to establish effective trace element control strategies and technologies for incinerator and fossil fuel systems. This goal is accomplished by developing the criteria needed to identify the transformation kinetics and behavior of air toxics during combustion and incineration. Program Area 1 research involves:

- Formulating toxic metal transformation mechanisms from scientific relationships and empirical tests.
- Testing kinetic reactions in bench, pilot, and field systems.

Program Area 2 – Sampling and Analytical

Methods is focused on developing methods to determine the abundance and association of air toxic metals in fuels and waste materials, measuring and speciating the metals in various process streams of combustion and gasification systems, developing in situ measurement techniques, and providing analytical support for the other program areas. Program Area 2 research involves:

- Developing and testing sampling and analytical methods.
- Characterizing fuels, including distribution and speciation of air toxic metals.
- Characterizing combustion and gasification products.
- Measuring trace element emissions in situ.

Program Area 3 – Control Technologies

is focused on developing and demonstrating technologies to minimize and/or control toxic emissions from energy conversion systems that use coal, waste, and other fossil-derived fuels. Program Area 3 research involves:

- Developing and utilizing advanced sorbents.
- Improving existing control technologies.
- Modifying existing combustion processes to enhance emission control.
- Developing, demonstrating, and commercially testing new and innovative control technologies.
- Managing waste and products derived from energy conversion by-products.
- Developing preventive pollution strategies and solutions.

Program Area 4 – Health Effects

drive legislation and the control strategies of toxic metals. Projects study the exposure risks of metals on target tissues of the nervous, endocrine, and cardiopulmonary systems at the molecular, cellular, and tissue levels in animal and human subjects. CATM is developing, demonstrating, and applying innovative approaches to characterize risk and evaluate preventive and protective measures. A comprehensive approach is used to define and correlate relationships that will prove useful to legislators and those developing control strategies. Current efforts focus on:

- Identifying mercury-selenium interactions and possible ways to partially offset the toxicity of trace metals.
- Evaluating the role of selenium in aquatic environments and implications for mercury bioaccumulation.
- Assessing mercury’s impacts on growth and development through animal studies.
- Examining heavy metal accumulation in the development and pathology of cardiac disease.

Program Area 5 – Technology

Commercialization, Education, and Publication

involves the dual mission of distributing up-to-date technical information and providing environmental education. Scientific and technological advances in the area of trace element emissions have little effect unless the engineers or managers who actually apply the technology in the industrial setting are involved in the technology’s development. This bridge between research and development (R&D) and commercialization of technologies is critical to ensure that R&D efforts are practical and address the most critical needs of industry. The goal of this program area is to provide technical information produced by CATM to sponsors and partners in research organizations and throughout the energy and environmental industries and to provide training opportunities for both students and professionals. Program Area 5 activities involve:

- Disseminating CATM reports, publications, and newsletters.
- Developing and implementing short courses, university courses, and workshops.
- Providing technology options to sponsors and research partners.

“The Center for Air Toxic Metals (CATM) at the EERC has proven itself as a leader in providing quality science that is relevant to industry . . . Florida Power & Light feels strongly that CATM is an exceptional group to lead a sound scientific program that includes industry, government, and the research community.”

—Dr. Edward J. Zillioux, Florida Power & Light

Become an Affiliate Member

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ffiliate membership affords your organization the opportunity to participate in many of CATM's technical program areas. As an Affiliate, you and your organization will provide direction to ensure that R&D aspects of the program meet both your short- and long-term research needs. CATM Affiliates

benefit from:

- Direct access to EERC personnel who can provide technical advice on solving problems associated with air toxic metals.
- Rapid access to state-of-the-art research on air toxic metal sampling, analysis, control, and predictive techniques.
- Up-to-date information, publications, and reports.
- R&D at a fraction of the cost available to an individual organization.
- Interaction with other Affiliates, regulatory agencies, and research institutions interested in air toxic metals.
- Discounted rates on computer software developed through CATM as well as on CATM-sponsored workshops, educational courses, and conferences.
- Access to jointly sponsored research and other integrated funding through EPA, the U.S. Department of Energy, EPRI, the Gas Technology Institute, multiclient consortia, and individual sponsors.

The cost to become a CATM Affiliate is \$18,000 for a 1-year membership or \$15,000 a year for a 3-year commitment.

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