



TECHNOLOGY COMMERCIALIZATION, EDUCATION, AND PUBLICATION

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Principal Investigator

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Goal

The goal of this activity is to transfer technical information on trace metals produced through the CATM Program to interested parties in research organizations, federal and state agencies, and the energy and environmental industry as well as to encourage and support activities that provide training and educational opportunities for both students and professionals. Specific goals for the past year were as follows:

- Provide support for a Master's-level student at the University of North Dakota (UND) involving the study, modeling, and testing of different scrubber chemistry and additives targeted at mercury control.
- Provide seed funds to establish a sustainable energy and environmental education program at the EERC.
- Prepare, publish, and present CATM results at conferences and workshops and in peer-reviewed journals and conference proceedings.

Since its inception in 1993, the CATM program has striven to improve on and provide educational courses and materials that make students and the public more aware of environmental issues and serve as reference documents to the scientific community [1–7]. With respect to education, the goals of the CATM program are consistent with the goals of the U.S. Environmental Protection Agency (EPA), which state that: “Increased information exchange between scientists, public health officials, businesses, citizens, and all levels of government will foster greater knowledge about the environment and what can be done to protect it” [8]. Additionally, CATM strives to develop and demonstrate products and technologies that aid in pollution prevention and/or control and works with partners to commercialize these technologies in the marketplace.

Rationale

Because of increasing environmental concerns, training, education, and dissemination of up-to-date information to industry and government agencies (e.g., EPA and the U.S. Department of Energy [DOE]) in a timely manner are critical. Sharing with and transferring the latest research findings to industry, environmental groups, state agencies, and EPA will greatly assist in establishing scientifically based regulatory standards.

Approach

To facilitate the transfer of information to government, research organizations, academia, industry, and the general public, several vehicles of communication are necessary. During the past year, activities included 1) coordination of the CATM annual meeting in conjunction with EPA, program affiliates, and the Research Advisory Council (RAC); 2) coordination and sponsorship of the Air Quality III: Mercury, Trace Elements, and Particulate Matter (AQIII) Conference; 3) distribution of the *CATM Newsletter*; 4) updating and maintaining the CATM Web page; 5) serving on environmental advisory committees; 6) continuing efforts of the Environmental Education Committee (EEC); 7) education involving college and postdoctoral students; 8) education involving Grades K–12; 9) education through publications; and 10) overall administration of the CATM program.

Progress

Meetings

The eighth annual CATM RAC meeting was held at the Sheraton Arlington Heights Hotel in Arlington Heights, Illinois, August 22, 2001. The meeting was held in conjunction with the EPA–DOE–EPRI Combined Power Plant Air Pollutant Control Symposium: The Mega Symposium. The purpose of the meeting was to provide a forum by which industry, government, and the research community could exchange information on air toxic metals and provide direction for CATM research, development, and commercialization programs for the following research period. Approximately 15 people participated, representing government (including EPA, DOE, and the Minnesota Pollution Control Agency [MPCA]), industry, and other research organizations.

Scott Renninger, a senior project manager for the Environmental Projects Division at DOE National Energy Technology Laboratory (NETL), was named the new Chair of CATM's RAC. Scott leads several multimillion dollar cooperative agreements within DOE's mercury control technology development program. Scott's experience with mercury and his involvement in DOE's mercury programs will enable him to serve effectively as the new RAC Chair.

AQIII Conference

CATM has been positioned globally as one of the leading research centers on issues related to mercury and other trace elements. The EERC, along with EPA through CATM, DOE NETL, and EPRI, are collaboratively organizing and sponsoring a third conference on Air Quality. This conference will be a follow-up to the first two Air Quality Conferences held in 1998 and 2000. AQIII will take place September 10–12, 2002, at the Marriott Crystal Gateway, Arlington, Virginia. The Air Quality Conference is a forum for reviewing the current state of science and policy on mercury, trace elements, and particulate matter in the environment.

AQIII will provide two streams of oral presentations: one focusing on mercury issues and one focusing on trace elements and particulate matter. Sessions have been added on By-Products Management and Mercury Issues and Advanced Power Systems. A poster session will include topics from both streams. The conference will focus on air quality impacts on health and ecosystems, emission prevention and control, measurement methods, and atmospheric reactions and modeling.

The intent of this conference is to provide the opportunity for representatives from industry, environmental groups, the research community, and state and federal government to present and discuss critical issues facing our nation and the world. Conference participants will gain up-to-date information and

benefit from discussions on potential health risks, available and developing control technologies, control strategies and research needs, and current and pending regulatory policies.

CATM Newsletter

One “Special Edition” of the *CATM Newsletter* was published and distributed to industry and other interested parties. The newsletter is circulated in all 50 U.S. states and to 43 countries internationally. The newsletter is designed to inform interested parties on air toxic issues and CATM activities and to encourage further participation and collaboration among industry and government. Upcoming issues of the newsletter will feature articles on a mercury model being developed and on the EERC’s advanced hybrid particulate collector, a project that was started in the CATM Program. The newsletter is also available on the EERC’s home page at www.undeerc.org.

CATM Web Page

The CATM Web page continues to serve as a vehicle for easy access to recent developments and results from the CATM Program. Copies of the *CATM Newsletter* are available, as well as download access to the CATM database. General information about CATM is also maintained and includes background, role and activities, accomplishments, and key education and training activities: conferences, short courses, workshops, and academic programs. The CATM Web page has recently undergone major reconstruction and updates. Future plans for updating the Web site include more links to pertinent information, such as current projects, a calendar of events, and CATM personnel, and more information on publications and reports generated through the CATM Program.

Committees

Advisory Committees. CATM researchers and managers continue to serve on several advisory committees to provide expert advice and technical guidance on a number of issues related to air toxics. Below are a few of the committees that CATM researchers serve on:

- MPCA Mercury Research Advisory Committee
- BiNational Strategy Utility Mercury Reduction Committee

Environmental Education Committee (EEC). EERC/CATM personnel are encouraged to volunteer their time and talents to promote scientifically sound and relevant environmental education through their participation in EEC activities and other outreach programs. CATM assists in coordinating research efforts with the EEC and provides direction and focus on increasing environmental awareness at UND and in the Grand Forks community.

Education Involving College Students

Jeremie Moberg, a Master’s student in Chemical Engineering, has completed his research. During the current reporting period, his thesis entitled “Determination of Baseline Response Data on the Energy and Environmental Research Center Wet Scrubber System” was completed. Mr. Moberg successfully defended his work and graduated in May 2001. His work established baseline data for SO₂ capture in the scrubber. This work will serve as the baseline for future mercury-related scrubber work to be performed on the system.

Yongxin Zhao, a doctoral student in Energy Engineering, began his studies at UND during the current year. His doctoral research is focused on improving mercury capture in a wet scrubber. To date, his work has focused on developing a mercury spiking and sampling system for the EERC wet scrubber. An important part of his work has been to establish a protocol that will provide stable data with good mercury balance closure. Because of the high surface area-to-volume ratio and high heat losses in the scrubber, this task has been difficult and time consuming. However, when complete, his results will allow him to quantify mercury

oxidation and capture results with confidence that any trends observed are real. The scrubber work will be performed under Task 3, Mercury Control Technologies.

Both students work under the direction of Dr. Michael Mann of the UND Chemical Engineering Department.

Education Involving Grades K–12

The funding provided for this task was intended to lay the groundwork for a sustainable energy and environmental education program area at the EERC that will train and inform teachers and administrators with respect to environmental issues in the region. New K–12 science education standards call for activities that engage students in a continuous and integrated process of observation, investigation, and reflection, with an emphasis on an interdisciplinary approach. Activities include 1) building relationships with educators and education providers in the region, 2) identifying potential project partners and funding sources, and 3) developing a group of project preproposals.

During the recent year, the EERC expanded its involvement with key groups dealing with science and environmental education. These included the Tri-College University Red River Basin Institute–Center for Watershed Education (serving on an advisory board with environmental educators and representatives of nongovernmental organizations [NGOs] and government agencies from Minnesota, North Dakota, and Manitoba, Canada), the North Dakota Coalition for Conservation and Environmental Education (represents NGOs, K–12 educators, regulatory agencies, teacher educators), the Grand Forks County Soil Conservation District (coordinators of seventh grade Eco Ed Camps), the North Dakota State University Extension Service, the Minnesota Association of Environmental Educators, and the Minnesota Office of Environmental Assistance (environmental education resource for Minnesota). In addition, EERC personnel established links with Canadian educators while presenting water quality educational materials at the Science Teachers of Manitoba Fall Workshop. Energy- and air quality-related education projects have been discussed with teachers in the school districts involved in three EERC water-related environmental education projects and in one district in Minnesota.

Based on one of the preproposals developed with this funding, the EERC will respond to a National Science Foundation request for proposals to develop and implement an Informal Science Education program for rural and Native Americans focused on energy, the environment, space studies, and the history of technology and medicine. A second preproposal describes an educational water quality monitoring program for the Red River Basin. Potential funding sources have been identified. Biomass, regional haze, energy generation, and transportation fuels are other areas of potential activities.

Education Through Publications

CATM strives to disseminate information in several ways. In the current year, eighteen refereed journal articles have been published or are in preparation. Included is a comprehensive review paper on mercury emission and control for coal-fired power plants. CATM has also been involved in the writing of nine related project reports. CATM staff members also give presentations at and participate in several conferences and workshops throughout the year. In the past year, CATM has presented ten papers at conferences and workshops around the world. In addition to attending workshops and conferences, CATM is also organizing and coordinating the AQIII Conference for September 2002.

Status

Educational and information-sharing activities will continue throughout the year. Involvement in community environmental activities will continue, as well as the programs in place to reach out to and help area schools in their efforts to educate students and teachers.

The newsletters and the CATM Web site have also become a valuable outlet for disseminating information, and both will continue to provide valuable, up-to-date information.

Potential Users/Technology Transfer

Industry and government agencies (specifically EPA and DOE) will benefit from the results of the project, with information and data that will provide a much better understanding of air toxic issues and the control of air toxic emissions. The general public will benefit through the publication of reference papers and documents, college courses, workshops, and numerous outreach programs initiated and supported by CATM.

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