

News - Winter 2003

Mira Loma: Field Study Moves to the Laboratory

AN UNFORTUNATE COMBINATION OF LAND USE AND GEOGRAPHY ARE RESPONSIBLE FOR ONE OF AMERICA'S WORST PARTICULATE pollution problems, according to a recently completed CE-CERT study – and a new grant from the National Science Foundation will enable Assistant Professor David Cocker to explore the reasons in the laboratory.

Dr. Cocker completed a study of particulate pollution in Mira Loma, an unincorporated area of western Riverside County, in 2002. He and his team of students and staff found that most of Mira Loma's particulate pollution results from reactions in the atmosphere of ammonia and nitrogen oxides. The ammonia comes from the huge dairy farms immediately upwind of Mira Loma, and NO_x is produced by all of the engines and other combustion sources in Los Angeles and Orange counties.

Mira Loma has experienced a significant boom in the development of warehouse and distribution centers, which has increased truck traffic through the area. By looking at the chemical "fingerprints" of the particulate in the air, Dr. Cocker's team concluded that diesel traffic in Mira Loma is responsible for only a small fraction of the pollution in the local air. The study recommends a regional approach to reducing NO_x , ammonia, and primary particulate emissions and concluded that controls confined to the Mira Loma area will not be effective.

As the results were emerging, Dr. Cocker solicited support from the National Science Foundation for laboratory studies to improve our understanding of how the conditions in Mira Loma contribute to particulate formation. The NSF agreed in December 2002 to fund two years of experimental research, much of which will take place in CE-CERT's newest atmospheric reactivity chambers.

Dr. Cocker, postgraduate researcher Kwangsam Na and graduate student Aniket Sawant presented results of the Mira Loma study at the American Association for Aerosol Research conference last fall, and more publications based on the Mira Loma study are in preparation. The new NSF research began in January 2003.

Multi-Year Agreement Will Develop Waste-to-Energy Process

AGRICULTURAL WASTE COULD BECOME A VALUABLE ENERGY RESOURCE AS THE PAYOFF OF A NEW THREE-YEAR PROJECT BASED ON a fuel production concept invented at CE-CERT.

The University is patenting a process developed by Dr. Colin E. Hackett and CE-CERT Director Joseph M. Norbeck to use high pressure and high temperature to break down carbon-containing feedstocks and then to reconstitute the resulting gas into useful products. Viresco Energy LLC, a small start-up company, has agreed to a three-year project to support development of the process, and has negotiated rights to commercialize it.

Numerous processes to convert waste into energy or fuel exist, but most are handicapped by poor efficiency. As a result, the fuel that they produce cannot compete economically against fossil fuels. The process that Dr. Hackett is developing, by contrast, balances the energy needed for breaking down the feedstock with the energy produced by a fuel synthesis process. The results are a synthetic, sulfur-free diesel fuel, which can burn cleanly in a

conventional diesel engine, and leftover heat that can be used to produce electricity. In another configuration, the process can be used to produce hydrogen or other chemicals of value.

The Viresco project is concentrating on optimizing the process for crop waste. Dr. Hackett has other support from Riverside Public Utilities to examine its potential for municipal solid waste, and from the Eastern Municipal Water District for sewage sludge.

A Military Call-Up for CE-CERT's Heavy-Duty Emissions Laboratory

THE DEPARTMENT OF DEFENSE IS A MAJOR USER OF HEAVY-DUTY DIESEL ENGINES, AND EVEN IN TIMES OF INTERNATIONAL CONFLICT it must comply with U.S. environmental regulations here at home. To help with that requirement, CE-CERT has been selected as part of a team to measure emissions from a variety of military vehicles and generators, and to develop new instruments for mobile emissions measurement.

The DoD's Strategic Environmental Research and Development Program (SERDP) selected CE-CERT and the Desert Research Institute, a laboratory at the University of Nevada, to conduct the \$2-million, three-year project. CE-CERT will use its heavy-duty mobile emissions laboratory, originally designed to measure emissions from on-road trucks, to measure emissions from various types of equipment. "We've worked hard to verify that the numbers produced by our laboratory are accurate, so we know we can trust the results," says Dr. Wayne Miller, CE-CERT's principal investigator on the project. "The program requires development of some new measurement methods, and we can evaluate how well they are working by comparing their results with the mobile lab's."

The research will take place at numerous military installations around the United States over the next several years. Researchers from the Navy and Army also are collaborating on the project.

Separately, Professor Yushan Yan has won a SERDP award to develop chromium-free zeolite coatings to protect military equipment from corrosion. Hexavalent chromium is toxic, and the military is looking for effective alternatives for the multibillion-dollar problem of corrosion. Dr. Yan – leading a team involving researchers from the Army, Navy, and University of Massachusetts – will develop and test processes to use non-toxic crystals called zeolites instead of chromium.

In a program closely related to SERDP, Research Engineer Thomas D. Durbin will work with the Navy to explore the environmental impacts of using biodiesel fuel in conventional diesel engines.

[MAP] [1084 Columbia Ave., Riverside, CA 92507](#) | Voice: 951-781-5791 | Fax: 951-781-5790 | info@cert.ucr.edu

[University of California, Riverside](#)
[Bourns College of Engineering](#)
[Center for Environmental Research & Technology](#)