

NEW WIND TUNNEL

will allow breakthrough
air quality research

by Steve Olson



Cary Edmondson

A newly-constructed dust tunnel on the Fresno State campus is enabling research to help improve air quality in the San Joaquin Valley and throughout California.

The tunnel will measure water misting as a means of controlling particulate matter caused by agricultural field operations.

Athanasios Alexandrou, associate plant science professor, is leading the work along with support from staff engineering specialists Diganta Adhikari and Patrick Barnes of Fresno State's Center for Irrigation Technology.

“The main objective of this project is to investigate the efficacy of a dust plume suppression system in lab conditions,” Alexandrou says.

Dust raised by agricultural operations carries particulate matter, which can be harmful to humans when inhaled. Alexandrou says particulate matter control in the agricultural industry has been a focus of both local and state air pollution control agencies.

Over the past two years the project team has collaborated with a local industry partner

to test a modified disk designed to spray a water mist during operation. The problem, from a scientific perspective, was the lack of control in field conditions. “By the time we set up to start the mist and measure the effects, the temperature changed or the wind shifted, changing the whole dynamic of the experiment,” Adhikari says.

To achieve reliable data, the team needed a laboratory setting. With no wind tunnel of appropriate size in Central California, the team contracted with Texas A&M University to use a tunnel on that campus. The testing produced important preliminary data, but the long-distance travel and work became too costly and time consuming. With the support of area industry partners and funding organizations, the team decided to build its own tunnel on the Fresno State campus.

“The tunnel offers a high degree of automation, which allows the system to start, stop and record each event automatically, avoiding human error,” Alexandrou says. “The design allows the research team to add various devices and to monitor the particulate matter using a variety of instruments.”

One of the goals of the research is to prove that the misting process can effectively reduce particulate matter. This will require extensive testing under a variety of treatments. It will also provide the research team with solid data for use in developing techniques that will mitigate particulate matter not only for agriculture but potentially for other industries that raise or emit particulate matter into the air.

“The interest for the agricultural industry in this work is significant since the project may provide us with a technique to reduce fugitive particulate matter emissions during disking operations,” Barnes says.

The wind tunnel is housed in the large open laboratory area of the International Center for Water Technology at Barstow and Chestnut avenues on the Fresno State campus. The tunnel boasts a 40 horsepower, three-phase variable-frequency drive electric motor with a blower capable of generating wind speeds up to 25 miles per hour in a three-by-three-foot-square tunnel.

“It feels like a cyclone in there at top speed,” Adhikari says.

Experimental work and data recording will continue over the next year. Partial funding for the work is from the California State University Agricultural Research Institute.

– Steve Olson is publications editor for the California Agricultural Technology Institute at Fresno State.