

## Met One Overcomes Environmental Challenges with Owens Lake Monitoring Network

Met One Instruments, Inc. working with CH2M Hill, has put together an environmental monitoring network on the dry lakebed of Owens Lake in California. The system continuously monitors particulate levels, as well as current weather conditions. The dry lakebed was formed when water from the Owens River was diverted to Los Angeles in 1913. By 1926 what was once one of the largest lakes in California was reduced to a large arid alkaline bed (playa). The dry lake bed produces as much as 300,000 tons of windblown dust per year, and some dust level estimates have been listed as high as 8 million metric tons per year. These dust storms, commonly known in the area as the “Keeler Fog”, were named after a local town on the East side of the lakebed. The key environmental concern is that the most of this windblown material is of particle sizes less than 10 microns in size (PM10). These micro sized particles are those that are most commonly associated with respiratory tract problems because they are small enough to be inhaled deeply into the lungs. To make matters worse, about 1% of the dust material is arsenic based, and a smaller amount is cadmium. These are both known carcinogens.

The EPA has given approval to the State of California State Implementation Plan (SIP) for the Owens Valley to ensure clean and healthful air. EPA also approved the State’s request for a five-year extension to the end of 2006 to meet the PM-10 National Ambient Air Quality Standards (NAAQS). To aid in the determination of particulate levels, typical dust levels, and the characteristics of the dust storms on the lakebed, continuous monitoring of a variety of parameters are being measured.

The current Met One Instruments, network consists of 13 remotely located solar powered monitoring sites. Each site has a 10-meter tilt over tower with particulate monitoring at 1 meter, 2 meters and 10 meters. Sites include multi-level temperature monitoring, wind speeds and direction at various levels, as well as humidity and barometric pressure. All data are collected every 5 minutes on the local data logger system and transmit back to the central control site at Keeler via a UHF Spread Spectrum radio network.

Met One Instruments designed the system, and manufactured all of the key measurement equipment



Typical Remote Site at Owens Lake

used at each of the tower sites. The design of the system had a variety of challenges to overcome. It had to be designed to operate with a minimum of maintenance over long periods of times. The operating environment includes temperature extremes, high dust levels, and high levels of static electricity. Since there is no power on the lakebed, it was also necessary that all equipment be of low power. In addition, the data collection software used, would need the ability to allow changes in the operation of each station, without having to re-program each data logger, or send the complete program to each station. Minimum radio ON time was important

since this was one of the primary users of DC power in the system. The other primary power user was each of the three particulate monitors.



**Field Audit of Met One Instruments  
Particulate Unit**

Using a modified version of the Met One Instruments, Model GT-640 particulate monitor, a special unit was designed for low power consumption, and enhanced for operation in the dusty environment. The improvements included automatic zero checks, continuous flow measurement, easy to access filters to speed up maintenance tasks, and an auto-ranging feature to provide dual operating ranges. The PM-10 impactor type of particulate intake unit was replaced by a sharp cut cyclone designed for PM-10 separation. The new cyclone design provided for a sharp cut, and allowed the use of a lower powered pump. Many of these new functions, including the sharp cut cyclone, have now been incorporated in the new version of the GT-640, marketed as the ES-640. The ES-640 provides an accurate system for collection of particulate concentration in real time. The sensing unit provides a clean air isolated pathway for the sample flow through the sensor. This prevents contamination of the sensor optics, and eliminates the need to regularly clean the sensor. All of this was then repackaged into a smaller container with a minimum of connections to eliminate the possibility of dust entry into the package. In addition, the enclosure is provided with a slight positive pressure.



**It may look like snow, but it's not. Temperature is  
at about 110 degrees in the shade.**

Since a data logger was already required for the operation of the system, the particulate monitors internal data logger, was removed. The remote site data loggers internal command program, provides data collection, control of the power to the particulate monitor flow sensor, and activation of the range control switch. It also logs data from the dust impact counter; the wind and temperature sensor, the solar power system charge current, as well as controlling the radio communications system.

The remote site data logger system program was configured to allow the special Met One Instruments software to change such things as radio on times and duration, activation of flow

sensor power, alarm limit values, automatic calibration time, and K factors for each particulate monitor. To allow the users at the Keeler command center to make these program changes to the remotely located data logger, the MicroMet AQ Software was used. MicroMet AQ is an expanded version of the popular MicroMet Plus program that was developed for use in Air Quality Systems. It has the unique capability of being able to make program changes to the internal software of the data logger, of the type that would be necessary in typical Air Quality systems with automatic calibration. Values for alarm limits, calibration gas concentrations, times and durations of calibrations are common changes that need to be taken care of on a regular basis. The special AQ software also provides a menu of these program changes, making it very easy for even an untrained user. Once changed, a short file transfer to the remote logger is all that is required, for the change to become immediately effective. The program also has additional capabilities for use with the radio network that was provided by Met One Instruments to communicate with each of the remote sites.

The Owens Lake project brought into play a wide variety of the Met One Instruments, products and systems engineering. It included our primary meteorological sensors, the particulate level monitors, the special data logger configuration firmware and the software required to operate the system. A reliable UHF radio communications system was provided, as well as solar power to keep it all operating on a year around basis. Each member of the project team brought his or her specific area of expertise into the development of a reliable system for our customer.

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**Trying to beat out the oncoming dust storm.**



**Dust Storm Just Starting to Form**