

TerranearPMC Safety Share

Week of July 11, 2011 – Airborne Particulate

Even before the Las Conchas fire threatened the Los Alamos communities and National Laboratory, fires from Arizona, a month earlier, were impacting the air quality of Northern New Mexico. While the initial stages produced odors that were reminiscent of camp fires and cook-outs, the past two weeks have produced airborne particulate concentrations that have gone beyond those pleasant smells that we often associate with outdoor recreation and fun. Monitoring stations throughout the area have indicated particulate concentrations exceeding the health standards established by the Environmental Protection Agency (EPA). As a result, many of us have seen people walking about town with dust masks as a way to protect them.

While the EPA health standards are important regulatory limits designed to protect the general population, from an occupational standpoint, the airborne particulate concentrations are still well within the exposure limits established by the Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH). Both these organizations focus their efforts towards protecting the American Workforce, rather than the general public. While many of us are familiar with OSHA, the second organization, ACGIH, may not be as well known. ACGIH is a group of occupational health specialists that are dedicated to studying the health effects of the various hazardous chemicals used in the workplace; and while their published data is not intended to be enforced under law, their research and published results have gained much respect within the DOE complex that whenever their data for a specific contaminant is more protective than OSHA, DOE demands that contractors incorporate their data instead of using OSAs.

The difference between occupational health standards and EPA public health standards is that the EPA has a concern for the entire cross-section of the general population: this includes the elderly, the sick or persons with medical problems as well as infants and toddlers, whose immune systems may not be fully developed or compromised and therefore, leave them more susceptible to the effects of airborne pollutants. OSHA and ACGIH deal solely with persons in an occupational setting- those that are generally physically stronger healthier than the general public. In addition, their exposure to contaminants is typically for an eight-hour daily period, five days a week, while the general public will be exposed to an airborne contaminant for 24 hours every day, seven day per week. Therefore, there is a continuous body burden with no time for recuperation: something that work exposure assessments always consider.

The EPA has established the *National Ambient Air Quality Standards* for six principal pollutants, known as Criteria Pollutants. These are: Carbon Monoxide, lead, Nitrogen dioxide, Ozone,

Sulfur dioxide and particulate matter (PM). This last class of criteria pollutants is subdivided into PM₁₀ and PM_{2.5}. PM is a complex mixture of extremely small particles and liquid droplets and made up of numerous particle types, such as nitrates, sulfates, organic chemicals, metals, soil and dust. The size of the particles is directly related to their potential to cause health problems. In general, particles that are 10 microns (mean diameter) or less can bypass our natural defenses and enter the lungs. PM_{2.5} (those particles that are 2.5 microns or less) can be found in smoke and haze and can be directly emitted from sources such as forest fires or can form when gases emitted from power plants, industries and automobiles react in the air.

EPA's NAAQS for PM₁₀ is 150 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), based on a 24-hour period, while for PM_{2.5}, it is 15 $\mu\text{g}/\text{m}^3$ as an annual average and 35 $\mu\text{g}/\text{m}^3$ for a 24-hour period. As of last week, the airborne PM_{2.5} concentration is above the 24-hour average of 35 $\mu\text{g}/\text{m}^3$ (ranging from approximately 29 – 66 $\mu\text{g}/\text{m}^3$) while PM₁₀ concentrations are within the EPA limits (ranging from approximately 40 – 90 $\mu\text{g}/\text{m}^3$).

These limits are well within the Occupational limits of OSHA and ACGIH. OSHA's permissible exposure limit for respirable particulate (particles 10 microns or less) is 5 milligrams per cubic meter (mg/m^3), while the ACGIH threshold limit value for the same particulate size is 3 mg/m^3 . These numbers represent exposure concentrations based on an eight-hour work shift. In either case, the occupational levels are much higher than the EPA NAAQS limits for particulate.

Regardless of whether particulate concentrations are within a health standard or not, every person has his/her own unique susceptibilities, so while one person may not be affected by the fires ashes, another may exhibit such health effects as coughing, respiratory irritation, difficulty breathing, or have an existing medical condition exacerbated, such as persons with asthma. If the members of the general public exhibit such conditions, leaving the area to a location where the air quality is more favorable should be considered. This is preferred over wearing dust masks, as these devices are only designed for comfort and will not truly filter out particles that can enter a person's breathing zone; thereby resulting in an uptake into the respiratory system. For employees working outdoors, voluntary use of a respirator may be considered even though the particulate levels are well within a level of magnitude of the occupational exposure limits. For any respirator to be effective, fit testing is mandatory. This ensures that the air that we do inhale has been properly filtered. In addition, one needs to be medically qualified to wear a respirator and that the proper respirators - with cartridges - are used. This requires the subject-matter expertise of a Safety and Health professional. So, if one feels that their health is being compromised due to the particulate levels, it is important to get your S&H professional involved. This person can not only prescribe the right respiratory protection, but help institute other controls so that wearing a respirator may not be necessary.

You miss 100% of the shots you don't take.

Wayne Gretzky