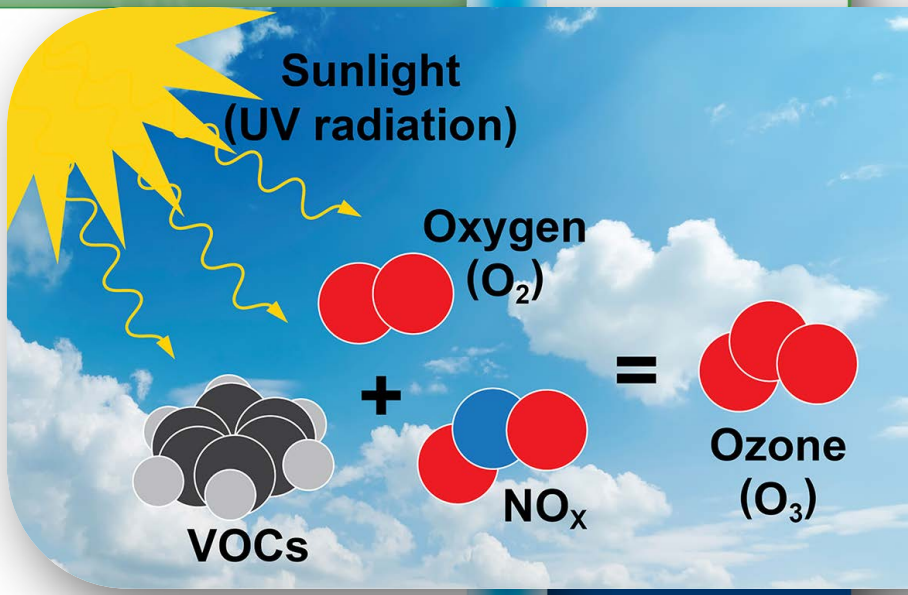
OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

Ozone

General



Ozone (O3) is a highly reactive form of oxygen, and at normal ambient concentrations is colorless and odorless. At very high concentrations, O3 is a blue, unstable gas with a pungent odor. Unlike the other criteria pollutants, O3 is not usually emitted directly into the air but is created by the sun's ultraviolet (UV) radiation triggering chemical reactions between diatomic oxygen (O2) and precursors like nitrogen oxides (NOx) and volatile organic compounds (VOCs). Common sources of NOx and VOCs include motor vehicle exhaust, industrial emissions, gasoline vapors, chemical solvents, and some natural sources.

O3 can be good or bad depending on its location in the atmosphere. The natural ozone layer in the upper atmosphere protects us by absorbing most of the sun's damaging UV radiation. Ground-level O3 (also known as smog) in the lower atmosphere is considered bad because it is in the breathing zone. Many urban areas tend to have high levels of bad O3, but even rural areas can have high O3 because wind carries it and its precursors hundreds of miles away from their original sources. Essentially, O3 is good up high - bad nearby.

Ground level O3 occurs naturally from non-manmade sources in very low concentrations. Even though O3 production is a daily occurrence, peak O3 levels typically occur in summer months from May to August when days are longer, and the atmosphere is stagnant. Typical conditions needed for high O3 concentrations include:

- weekdays when traffic and industrial activity is prevalent,
- the time is between 11 a.m. and 5 p.m. when the sun is high,
- winds are light or calm, and
- little or no cloud cover is present.

A high concentration of ground level O3 is mostly an urban problem; however, both O3 and the O3-forming VOCs and NOx can be transported long distances under certain weather conditions.

Effects

O3 affects both public health and public welfare. O3 may cause health problems because it may damage lung tissue, reduce lung function, and sensitize the lungs to other irritants. It also severely irritates the mucous membranes of the nose and

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throat, causing coughing and increased infection of the lungs. It has been estimated that 90 percent of inhaled O3 is never exhaled. Its effects are more severe in individuals with chronic lung disease, asthma or diseases of the heart and circulatory system, and can affect these individuals at lower concentrations.

O3 damage can result from prolonged exposure to low concentrations or from exposure to higher concentrations for a shorter period. Short-term exposure to O3 in the range of 0.15 to 0.25 parts per million (ppm) may impair mechanical functions of the lung and may induce respiratory and related symptoms in highly susceptible individuals. Exposure to O3 for several hours at relatively low concentrations has been found to significantly reduce lung function in normal, healthy people as well, particularly during exercise. This decrease in lung function generally is accompanied by symptoms such as chest pain, coughing, sneezing, nausea, headache, and pulmonary congestion. Results from animal studies indicate that repeated exposures to high levels of O3 for several months or more can produce permanent structural damage in the lungs.

Ground level O3 affects plants more than humans. It interferes with the production and storage of starches in plants, resulting in leaf injury or reductions in growth and yield of plants. Some plants such as soybeans, alfalfa, oats, corn, beans, clover, shrubs, and deciduous trees are especially sensitive to O3 and show damage at low concentrations. The deterioration of nylon and other synthetic materials, as well as degradation of rubber, metal, and paint, is also associated with O3.

Standards

There is one primary and one secondary national ambient air quality standard (NAAQS) for ozone, which have the same form: the fourth highest daily maximum 8-hour average of 0.070 ppm (70 parts per billion, ppb), averaged over three years.

Primary standards are designed to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are designed to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The highest Oklahoma O3 values can be found online at **https://tinyurl.com/ms5c55y**a.

If you have any questions, please contact our Air Quality Division at **(405) 702-4100**.