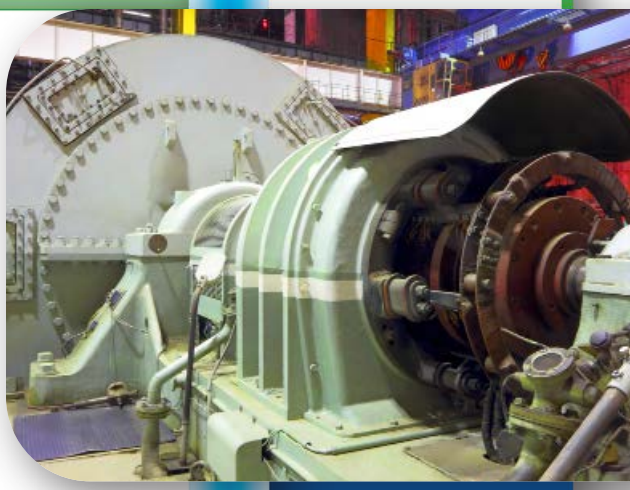
OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

Nitrogen Dioxide



General

Nitrogen dioxide (NO_2) is a reddish-brown, highly reactive gas present in all urban air. NO_2 is a strong oxidizing agent that reacts in the air to form corrosive nitric acid, as well as toxic organic nitrates. It also plays a major role in the atmospheric reactions that produce ground-level ozone (O_3). The nitrogen oxides (NO_x) normally found in the atmosphere include nitrous oxide (N_2O), nitric oxide (NO), and nitrogen dioxide (NO_2). N_2O is a stable gas with analgesic characteristics. The typical ambient concentration of N_2O is well below the threshold concentration for a biological effect. NO is a colorless gas with a typical ambient concentration less than 0.5 parts per million (ppm). At these concentrations its biological toxicity is not significant; however, NO is a precursor to the formation of NO_2 and an active compound in O_3 formation.

Natural sources of NO_2 include biological processes in soil and atmospheric oxidation of ammonia. Man-made sources are more important in the occurrence of NO_2 and O_3 air pollution because those sources are concentrated in populated areas and account for a greater share of the NO_2 emissions in such areas. The major man-made source of NO_2 emissions is high-temperature fuel combustion in motor vehicles and in industrial and utility boilers. These emissions are primarily in the form of NO which is oxidized in the atmosphere to NO_2. The conversion rate depends on the ambient concentrations of NO and O_3. If O_3 is present, the conversion is very rapid. Ground-level emissions account for most of the NO_x that are involved in urban O_3 formation.

Effects

NO_2 is a pulmonary irritant affecting primarily the upper respiratory system. Individuals with asthma, respiratory disorders and lung diseases are more sensitive to the effects of NO_2. Healthy individuals exposed to concentrations of NO_2 from 0.7 to 5.0 parts per million (ppm) for 10 to 15 minutes have developed abnormalities in pulmonary airway resistance.

At typical ambient concentrations, NO_2 has not been proven to be related to lung disease; however, at higher concentrations it can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Continued or frequent exposure to high levels of NO_2 can cause pulmonary edema. Inflammation of the lungs can occur 5 to 72 hours after exposure to elevated NO_2 levels.

NO_x in the air is a potentially significant contributor to a number of environmental effects such as acid rain and eutrophication (where nutrient overload reduces the amount of oxygen in water, resulting in an environment destructive to fish and other animal life). Other effects of NO_x include degradation of vegetation, materials and visibility. NO_2 and NO react with water vapor to form aerosol droplets that limit visibility. NO_2 affects metals by forming salts that increase corrosion. It also fades fabric, degrades rubber and harms vegetation. Plant damage includes bleaching or death of plant tissue, loss of leaves and decreased growth rate.

Standards

There are two primary National Ambient Air Quality Standards (NAAQS) for NO_2.

1. The 1-hour NO_2 standard of 100 parts per billion (ppb), as determined by the three-year average of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations

2. The annual arithmetic mean of 0.053 ppm of NO_2.

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