

## Application Note OS-100

### Ozone Safety Standards

#### HOW IS OZONE HARMFUL?

The same chemical properties that allow high concentrations of ozone to react with organic material outside the body give it the ability to react with similar organic material that makes up the body, and potentially cause harmful health consequences. When inhaled, ozone can damage the lungs. Relatively low amounts can cause chest pain, coughing, shortness of breath, and throat irritation. Ozone may also worsen chronic respiratory diseases such as asthma and compromise the ability of the body to fight respiratory infections. People vary widely in their susceptibility to ozone. Healthy people, as well as those with respiratory difficulty, can experience breathing problems when exposed to ozone. Exercise during exposure to ozone causes a greater amount of ozone to be inhaled, and increases the risk of harmful respiratory effects. Recovery from the harmful effects can occur following short-term exposure to low levels of ozone, but health effects may become more damaging and recovery less certain at higher levels or from longer exposures (US [EPA](#) , 1996a, 1996b).

Manufacturers and vendors of ozone devices often use misleading terms to describe ozone. Terms such as *energized oxygen* or *pure air* suggest that ozone is a healthy kind of oxygen. Ozone is a toxic gas with vastly different chemical and toxicological properties from oxygen. Several federal agencies have established health standards or recommendations to limit human exposure to ozone. These exposure limits are summarized here:

#### US Government Statements about Ozone Hazards and the Maximum Concentrations Allowed

Health Effects	Risk Factors	Health Standards*
<p>Potential risks of experiencing:</p> <ul style="list-style-type: none"><li>• Decreases in lung function</li><li>• Aggravation of asthma</li><li>• Throat irritation and cough</li><li>• Chest pain and shortness of breath</li><li>• Inflammation of lung tissue</li><li>• Higher susceptibility to respiratory infection</li></ul>	<p>Factors expected to increase risk and severity of health effects are:</p> <ul style="list-style-type: none"><li>• Increase in ozone air concentration</li><li>• Greater duration of exposure for some health effects</li><li>• Activities that raise the breathing rate. (e.g., exercise)</li></ul>	<p>The <b>Food and Drug Administration (FDA)</b> requires ozone output of indoor medical devices to be no more than 0.05 ppm</p> <p>The <b>Occupational Safety and Health Administration (OSHA)</b> requires that workers not be exposed to an average concentration of more than 0.10 ppm for 8 hours.</p> <p>The <b>National Institute of Occupational Safety</b></p>

		<p><b>and Health</b> (NIOSH) recommends an upper limit of 0.10 ppm, not to be exceeded at any time. The <b>Environmental Protection Agency</b> (EPA)'s <b>National Ambient Air Quality Standard for ozone</b> is a maximum 8 hour average outdoor concentration of 0.08 ppm.</p> <p>(* ppm = parts per million)</p>
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IS THERE SUCH A THING AS *GOOD OZONE* AND *BAD OZONE*?

The phrase *good up high — bad nearby* has been used by the U.S. Environmental Protection Agency (EPA) to make the distinction between ozone in the upper and lower atmosphere. Ozone in the upper atmosphere — referred to as stratospheric ozone — helps filter out damaging ultraviolet radiation from the sun. Though ozone in the stratosphere is protective, ozone in the atmosphere — which is the air we breathe — can be harmful to the respiratory system. Harmful levels of ozone can be produced by the interaction of sunlight with certain chemicals emitted to the environment (e.g., automobile emissions and chemical emissions of industrial plants). These harmful concentrations of ozone in the atmosphere are often accompanied by high concentrations of other pollutants, including nitrogen dioxide, fine particles, and hydrocarbons. **Whether pure or mixed with other chemicals, ozone can be harmful to health.**

Source: <http://www.epa.gov/iaq/pubs/ozonegen.html>, September 2000