

# Facts About Ozone: Its Effects on People and the Environment

Briefing Paper for Xerox Customers



## What is ozone?

Ozone (O<sub>3</sub>) gas is an unstable form of oxygen (O<sub>2</sub>). It is created by natural processes such as ultraviolet radiation in the upper atmosphere and by lightning. Ozone is also a pollutant generated by automobile exhaust and certain industrial activities. Xerographic copying and printing equipment generates ozone when high-voltage charging devices produce an electrostatic discharge during a copy run. In standby mode no ozone is produced.

The word “ozone” is derived from the Greek word for “smell.” Its odor can be detected when very low concentrations are present, as low as 0.0076 parts-per-million (ppm). At low concentrations ozone has a sweet, clover-like odor often noted outdoors after an electrical storm. At higher concentrations the odor becomes pungent and irritates the eyes, nose, and throat.

Ozone has been classified as an air pollutant by most regulatory bodies around the world. Ozone is different from most pollutants, however, in that it rapidly reverts back to oxygen. The rate of decomposition is described by a parameter known as “half-life”. The half-life of ozone is the time required for its concentration to be reduced by half. For typical offices the half-life of ozone is five minutes or less.

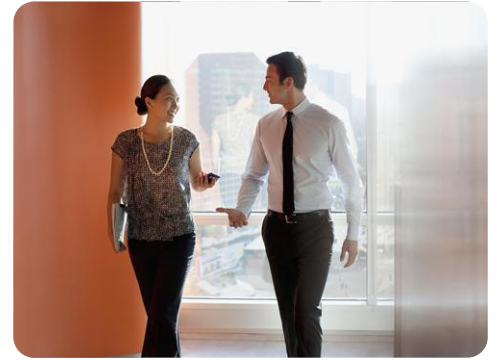
## Is exposure to ozone harmful?

The health effects of ozone have been extensively studied. In recent years, environment, health & safety agencies through their medical experts have generally agreed that exposure to a concentration of 0.1 ppm is acceptable for an 8-hour occupational exposure. The United Kingdom Health & Safety Executive established an occupational exposure limit of 0.2 ppm for shorter 15 minute periods. Above these levels, subtle, pulmonary effects can be measured; these effects are enhanced as exposure levels increase. Concentrations above 0.3 ppm can also produce headaches, eye irritation and breathing difficulty. However, because of the strong, pungent odor, these concentrations are easily recognized and avoided. Ozone, like oxygen, does not accumulate in the human body.

## Ozone Emissions from Xerox® Machines

Xerox strictly controls emissions of ozone from its machines. However, the concentration of ozone in the air around the machine is affected by the usage rate, the size of the room and the rate of air exchange or ventilation. Xerox requires that the ozone concentration at the operator position not exceed a Time-Weighted Average (TWA) of 0.01 ppm as a result of machine operation when the machine is operated at 3 times the average usage rate in a room with no forced ventilation. This level is 10% of the level considered acceptable by regulatory agencies and is measured under worse than expected conditions.

If machines are located in unfavorable conditions or operated in excess of expected copy volumes, ozone concentrations may rise above the level which Xerox recommends. Also, since the odor detection level of ozone is very low, a strong odor of ozone may be perceived, even though levels are within acceptable limits. In these instances, measures may need to be taken to ensure that ozone concentrations will not cause discomfort to those operating the equipment or located near it. This could include improving ventilation or moving the machine to a more favorable location to dissipate the ozone. However, since ozone is generated by automobile exhaust and other industrial processes, ambient levels can be the biggest contributor to indoor ozone levels.



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# FAQ's

## Here are the most common questions concerning ozone and Xerox® products:

Question	Answer
<b>Can the ozone level be easily measured at customer installations?</b>	No. Accurate measurement of ozone concentration at the levels we are involved with requires the use of sophisticated instruments under controlled conditions. In our engineering areas there are ozone measurement chambers in which Xerox® products are tested for emissions.
<b>Does Xerox® equipment comply with occupational exposure limits for ozone?</b>	<p>Yes. The Xerox "Ozone Management Program" requires that all Xerox® products be tested with ozone reducing devices fitted where necessary, and characterized by an "intrinsic ozone emission rate." This rate is used to predict ozone concentrations at customers' premises.</p> <p>These computer predictions are based on stress conditions where three (3) times the average copy/print volume is being produced while the machine is situated in the smallest siting location recommended, and with only natural ventilation to the room.</p> <p>The results for each Xerox® product can be found in the 'Emission/Exposure Information' section of the relevant Xerox® Product Safety Data Sheet. All Xerox® equipment, operating in the minimum specified environmental conditions, meets all national and international occupational exposure limits.</p>
<b>Does my machine have an ozone filter fitted, and if so, how often should it be replaced?</b>	<p>It depends on the machine. The need for an ozone filter is determined from the ozone emission testing during product development. Most machines that do incorporate an ozone filter have filters that are fitted for product life and, therefore, do not normally need replacing.</p> <p>However, some products have filters with replacement intervals, and this is addressed through service or routine maintenance activities.</p>
<b>There is a smell coming from my machine; is it ozone?</b>	<p>It is possible that transient, low levels of ozone may be noticed; if so, a slightly sweet odor may be detected. However, ozone is sometimes mistakenly blamed for other odors, in particular the 'new smell' (similar to the odors experienced from new cars) that can be associated with newly commissioned machines.</p> <p>The use of non-Xerox consumables, such as some paper products, has also been observed to result in odor generation.</p>

Question	Answer
<p><b>Ozone emissions from our machine are making me ill.</b></p>	<p>It is highly unlikely that a correctly sited machine will produce ozone levels that would result in the symptoms associated with ozone exposure — e.g. headaches and irritation to the eyes and throat.</p> <p>Other possible causes should also be considered. The whole working environment should be investigated. Poor temperature control and ventilation can lead to general discomfort, and low humidity has been found to lead to similar symptoms such as sore eyes and dry throat.</p>
<p><b>What effect does ozone have on the environment?</b></p>	<p>At high altitudes ozone produced by solar radiation is essential to filter out harmful ultraviolet rays.</p> <p>At low altitudes outdoors, high levels can contribute to smog. The concentrations generated by Xerox® equipment are extremely small and considered to have no impact on the environment.</p>