

Stratospheric Ozone Depletion and HVAC Refrigerants

thanks for these definitions to
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Stratospheric ozone depletion is a global threat to the balance of nature resulting in a decreasing concentration of ozone particles in the upper atmosphere. While this event is taking place miles above our heads, the chlorine and bromide molecules that deplete the ozone layer are released in HVAC refrigerants at ground level by human activity.

Ozone Layer

Ozone is a fragile molecule consisting of 3 oxygen atoms (O₃) and is primarily found in the stratosphere, the blanket of atmosphere 6-30 miles above the earth. The term “ozone layer” is a misnomer since ozone makes up only 0.0012% of the molecules in the stratosphere. Although “layer” implies a dense area, that is not the case: ozone is barely a blip in the air volume of the stratosphere.

However, without the ozone blip to absorb the sun’s ultraviolet (UV) radiation, earth would be uninhabitable, scorched by the awesome energy of our sun. Unfortunately, this “blip” is being depleted by industrial chemicals—a process called ozone depletion.

Ozone Depletion

The natural destruction and creation of ozone molecules is an ongoing process, resulting in a stable quantity of ozone molecules in the atmosphere. However, scientists theorize, using laboratory testing and computer simulations, that chlorine and bromine molecules released into the air are destroying ozone molecules faster than nature can replenish them.

When ozone, chlorine (or bromine), and an energy source (UV rays) are brought together, a chemical reaction occurs that results in the destruction of the ozone molecule. However, the chlorine (or bromine) molecule remains intact; each chlorine or bromine molecule can destroy multitudes of ozone molecules. The result—even more ozone depletion.

HVAC Refrigerants

All of the most commonly used HVAC refrigerants are either chlorine or bromine based. When expelled into the air, these chemical compounds break down, releasing chlorine and bromine into the atmosphere. How easily the chlorine or bromine molecules are freed is called the Ozone Depletion Potential for each refrigerant. Refrigerants typically used in commercial equipment (R11, R12, R113) are the worst offenders and the refrigerant used in home air conditioners (R22) is a relatively minor offender.

Phasing Out HVAC Refrigerants

EPA regulations and international treaties prescribe a time table to phase out these refrigerants. Substitute refrigerants are under development and must be quickly utilized to prevent further

stratospheric ozone depletion. In the meantime, all HVAC personnel must adopt procedures for minimizing the expulsion of refrigerants into the air.

Information Sources

Fahey, D.W. *Twenty questions and answers about the ozone layer: 2006 update*.
www.esrl.noaa.gov/csd/assessments/2006/chapters/twentyquestions.pdf. Accessed February 2, 2010