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Environmental Pollution Due to Freons

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ABSTRACT: Although Freon is a chemical molecule utilised in a wide range of industrial operations, its widespread use has prompted concerns about Freon exposure and human health. Freon is the brand name for a class of chemicals known as chlorofluorocarbons, including carbon, hydrogen, chlorine, and fluorine. The most well-known members of the Freon family are Freon 11, Freon 12, and Freon 22. Freon is primarily used in refrigeration, lubricants and fluorocarbon resins, and as a solvent in aerosol propellants. It is available as non-flammable, colourless liquids and gases. Despite its many applications, Freon may be a health risk in some conditions. Apart from CO₂, freon gas is a greenhouse gas. The Law on the Protection of the Ozone Layer via the Control of Specific Substances and Other Measures currently limits the use of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) as refrigerants in train and building air conditioners. As a consequence, hydrofluorocarbons and perfluorocarbons are being increasingly used as substitutes. Alternative freons are being employed to replace certain freons with significant potential for ozone depletion. On the other hand, alternative freons contribute to greenhouse gas emissions, so conversion to new refrigerants is being studied. Other greenhouse gases, such as sulphur hexafluoride, are strictly controlled and regulated from manufacturing through disposal and are never released into the atmosphere.

KEYWORDS: freons, chloroflorocarbons, refrigeration, ozone, atmosphere, aerosol, consitioners, greenhouse

I.INTRODUCTION

Freon gas is a very strong greenhouse gas, retaining heat that would otherwise be expelled into space by the planet. As a result, the earth's temperature increases, resulting in rising sea levels, droughts, stronger storms, flash floods, and a plethora of other adverse effects. Freon's chemical components degrade the ozone layer as it passes through the air. Depletion of the ozone layer increases the amount of ultraviolet radiation reaching the earth's surface, providing a serious health risk to people. On the other hand, increased ozone levels cause respiratory problems and may even kill plants. If you are exposed to Freon on the job, keep in mind that the chemical is not completely safe. As a consequence, you should get regular checkups at a minimum of once a year. All medical evaluations should account for the possibility that Freon is causing damage to your heart. In most cases, such as when a refrigerator or air conditioner leaks, exposure to freon is minimal. However, if you have a history of cardiac problems, you should avoid Freon since it may cause an irregular heartbeat.[1]

When present in high quantities, freon gases may cause dizziness, hypoxia, and a loss of coordination and concentration. They may irritate sensitive skin (rashes, dermatitis, etc.), but the good news is that Freon has no long-term health risks. Freon is neither mutagenic, teratogenic, nor carcinogenic and has no hepatotoxic impact. Bear in mind that this material is three to four times heavier than air and hence stays close to the earth's surface. Consequently, you inhale more freon the closer you are to the earth or the floor. Children and pets (particularly dogs, which are more sensitive to freon's effects) are significantly more susceptible to its effects. If you suspect a Freon leak in your home, immediately open all windows and doors and use fans to assist in ventilating the area. Take your children and pets outside and immediately contact an expert to repair the leaking equipment. Freon has been identified as one of the most egregious environmental contaminants. As it passes through the air, the chemical compounds in it erode the ozone layer. Depletion increases the quantity of ultraviolet radiation that reaches the earth's surface, providing serious health risks to people. As a consequence, Freon is being phased out in modern appliances. Simultaneously, only drug trafficking outnumbers attempts to transport the chemical across US border ports. Freon smuggling is illegal, and federal agents conducting "sting" operations on the "black market" for Freon have apprehended a number of

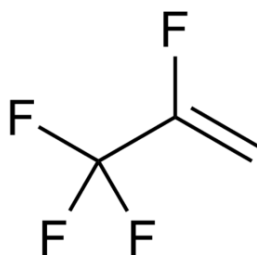
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smugglers. In addition to CO₂, freon gas is a greenhouse gas. The Law on the Protection of the Ozone Layer through the Control of Specific Substances and Other Measures currently restricts the use of CFCs and HCFCs as refrigerants in trains and building air conditioners. As a result, hydrofluorocarbons and perfluorocarbons are increasingly being used as substitutes. Alternative freons are being used to replace certain freons that have a high ozone depletion potential. Alternative freons, on the other hand, contribute to greenhouse gas emissions, so conversion to new refrigerants is being researched. Other greenhouse gases, such as sulphur hexafluoride, are strictly controlled and regulated from production to disposal and are never released into the atmosphere. However, most countries have banned the use of Freons due to the potential environmental and health effects of ozone depletion and the greenhouse effect.[2]



Freon gas is a potent greenhouse gas that traps heat that the planet would otherwise emit into space. Freon has indeed been identified as one of the most egregious environmental contaminants. The chemical components of the substance contribute to the depletion of the ozone layer as it travels through the atmosphere. It is predicted that depletion will result in an increase in UV radiation reaching the earth's surface, posing serious threats to human health. Photochemical dissociation of Freons and related CFCs was identified as a major cause of the apparent degradation of the Earth's ozone layer in the mid-1970s. Because ozone absorbs ultraviolet radiation, which can cause skin cancer, ozone depletion could endanger animal life on Earth. In the late 1970s, the use of Freons in aerosol spray containers was prohibited in the United States. By the early 1990s, mounting evidence of ozone depletion in the polar regions had raised global public concern about the issue, and by 1996,[3] nearly all developed countries had banned the production of nearly all Freons. Because of their role in ozone depletion, most CFCs are now banned or severely restricted by the Montreal Protocol of August 1987. Brands of Freon containing hydrofluorocarbons (HFCs) have replaced many uses, but they, too, are strictly regulated under the Kyoto Protocol as "super-greenhouse effect" gases.[4]

II.DISCUSSION

Freon is either of a number of simple fluorinated aliphatic organic compounds used in commerce and industry. Freons frequently contain hydrogen, chlorine, or bromine in addition to fluorine and carbon. As a result, Freons are chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and related compounds. The name Freon is a registered trademark of E.I. du Pont de Nemours & Company. Freons are water-insoluble and have a high level of chemical inertness. They are unaffected by molten sodium and remain stable in hot concentrated mineral acids. As a result, the Freon gas structure is formed by solid C-F bonds that become shorter as the fluorine atom to carbon ratio increases. Freons are colourless, odourless, non-flammable, non-corrosive gases or liquids with low toxicity that were introduced as refrigerants in the 1930s; they also proved useful as aerosol propellants and in a variety of technical applications. Because of their low boiling points, surface tension, and viscosity, they are particularly useful refrigerants. They are inert, extremely stable compounds. In their circulation through refrigerating and air-conditioning systems, Freons pose no fire risk and emit no detectable odour. Dichlorodifluoromethane (Freon 12), trichlorofluoromethane (Freon 11), chlorodifluoromethane (Freon 22), dichlorotetrafluoroethane (Freon 114), and trichlorotrifluoroethane have been the most important members of the group (Freon 113). Let us now discuss about the Environmental Effects of Freons. Freon gas is a powerful greenhouse gas that traps heat that would otherwise be emitted into space by the planet. As a result, the earth's temperature rises, causing rising sea levels, droughts, stronger storms, flash floods, and a slew of other negative consequences[5].

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As it passes through the air, the chemical components of freon degrade the ozone layer. The ozone layer's depletion increases the amount of ultraviolet radiation reaching the earth's surface, posing a serious health risk to humans. Increased ozone levels, on the other hand, cause respiratory problems and may even kill plants. One of the most egregious environmental contaminants has been identified as freon. The chemical compounds in it erode the ozone layer as it travels through the air. The amount of ultraviolet radiation that reaches the earth's surface increases as a result of depletion, posing serious health risks to people. As a result, Freon is gradually being phased out of modern appliances. Only drug trafficking outnumbers attempts to transport the chemical across US border ports at the same time. Smuggling Freon is illegal, and federal agents conducting "sting" operations on the Freon "black market" have apprehended a number of smugglers. Freons have numerous applications due to their low boiling points and viscosity. The most common refrigerant applications are Refrigerators and Air-conditioning units.

Other applications for Freons include:

- Aerosol propellants
- Foam-blowing agents
- Solvents
- Glass chillers
- Polymer intermediates

Furthermore, many teenagers and young adults have used Freons as inhalants. Inhalants are legal substances that, when inhaled heavily, produce a high. To get high, people may inhale refrigerant gases, paint thinners, sprays, or gasoline. Bare in mind that if you are exposed to Freon on the job, the chemical is not completely safe. As a result, you should have regular check-ups at least once a year. All medical evaluations should take into account the possibility that Freon is causing heart damage. Exposure to freon is usually minimal in most cases, such as when a refrigerator or air conditioner leaks. If you have a history of heart problems, you should avoid Freon because it can cause an irregular heartbeat. Freon gases, when present in large quantities, can cause dizziness, hypoxia, and a loss of coordination and concentration. These may irritate sensitive skin (rashes, dermatitis, etc.), but there are no long-term health risks associated with Freon. Freon is not mutagenic, teratogenic, or carcinogenic, and it is not hepatotoxic. The freons are colourless, odourless, and extremely stable. The presence of Group 17 elements such as fluorine, chlorine, and other such elements contributes to their stability. The molecule is extremely stable due to the presence of C-F and C-H bonds. However, in the presence of ultraviolet rays in the stratosphere, freons die out due to UV ray exposure. There are over 300 different types of freon gases. Freon gases are broadly used, and it was in laboratories that they were first synthesised due to their widespread industrial applications. Refrigerators, air-conditioning systems, aerosol propellants, foam-blowing agents, solvents, glass chillers, polymer intermediates, fire extinguishers, and anaesthetics are some of the applications for freon gases. Freons have also been used as inhalants by teenagers and young adults because they are everyday legal substances that produce a high when inhaled intensely. Despite the fact that freon gases have a wide range of industrial applications and are chemically inert at room temperature, there are some side effects of these gases that were not anticipated during their synthesis in the lab. When UV rays were passed through these gases, it was discovered that the freon gases broke down and produced radical Halogen ions. These ions were extremely reactive, and in the stratosphere, they began reacting with the ozone gas, depleting the ozone layer and exposing the earth's surface to harmful ultraviolet radiation.[6]

RESULTS

Freon (made up of chemicals known as chlorofluorocarbons) is a generally colorless, non-flammable gas or liquid. It is primarily used as a refrigerant and chemical intermediate in the manufacture of lubricants. Freon is also used as a solvent in aerosol formulations/propellants, as a foaming or blowing agent, and as an intermediate in the manufacture of fluorocarbon resins. As of the year 2017, it will be illegal to manufacture hydrochlorofluorocarbon in the U.S. Hydrochlorofluorocarbon goes by a couple of other names, like R-22, HCFC-22, or Freon (DuPont's proprietary name). Freon is the refrigerant chemical that has been used in all kinds of refrigeration and cooling appliances, like air conditioners, since its [invention in 1928](#). The inventors of Freon were praised for creating a "non-toxic" material that made refrigeration safer by ridding refrigerators of the previously used toxic gases like methyl chloride and ammonia. That is until the

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Environmental Protection Agency (EPA) realized the damage that R-22 can do to the earth's ozone layer and [announced](#) a Freon phase-out by January 2017.

When Freon releases into the atmosphere, it reacts with the ultraviolet rays of the sun and the molecules of Freon are broken down. Chlorine atoms are then released, which causes a chain reaction that breaks down the oxygen molecules that make up the earth's ozone layer. The ozone keeps dangerous ultraviolet rays from reaching the surface of the planet, which is why Freon is widely considered one of the most harmful environmental pollutants. Freon is [classified](#) as an ozone-depleting substance (ODS). The EPA has banned all-new production of Freon, R-22, HCFC-22, or hydrochlorofluorocarbon. As the supply of Freon refrigerant becomes more limited in the United States, the cost of replacing it will become more expensive; Thus, increasing the cost of replacing the chemical in your air conditioner or cooling equipment. Without any refrigerant in your air conditioner, you may not have access to the cool air you depend on during the summer months. So, what can you do about this phase-out. While it will still be legal to use a condensing unit that utilizes Freon or recycled R-22, there are some Freon alternatives available, such as R-410A or Puron. The chemical is ozone-friendly and performs similarly to R-22, with a few caveats. You cannot simply swap out and replace your outdated refrigerant with Puron. Freon and Puron require different pressurization to operate so you would need to retrofit your old air conditioning unit. However, the potentially [high cost](#) and overall effectiveness of air conditioner maintenance as your model ages may not be desirable. While the phase-out is meant to help, homeowners switch over their air conditioning on a regular schedule replacing your older air conditioner may still be intimidating due to the replacement or retrofitting costs. Fortunately, upgrading to an energy-efficient and environmentally friendly air conditioner qualifies for Property Assessed Clean Energy (PACE) financing! PACE offers homeowners the financing they need for qualified energy-efficient upgrades, without having to put any money down upfront. Any home upgrades financed with PACE are split up into payments over the long term and appears as a line item on your property tax bill. Stay ahead of the Freon phase-out and upgrade your HVAC using PACE financing.[7]

CONCLUSIONS

Freon is an irritant to the skin and respiratory system. Contact with the skin may cause dermatitis or skin rashes. Upper respiratory exposure (particularly to high concentrations) to Freon may cause an irregular heartbeat (cardiac arrhythmia), asphyxia, dizziness, and loss of concentration and coordination. If workers should experience these medical conditions, they should contact a physician for the appropriate medical care. When seeing a doctor, affected workers should make sure that they indicate that their work involves exposure to Freon. Freon has been identified as a significant environmental contaminant. As Freon vaporizes into the air, the chemical mixture causes a depletion of ozone in the stratospheric or upper atmosphere. This depletion of ozone results in increased amounts of ultraviolet radiation reaching the earth's surface that, in turn, can cause serious human and environmental health effects. Because of the harmful effects that Freon has upon the environment, a ban on the production of chlorofluorocarbons went into effect in 1995. Employers should provide all employees who work with or around Freon annual physical exams. If the employer does not presently give such exams, these should be negotiated into the collective bargaining agreement. All physical exams should include possible cardiac or heart effects from acute exposure to Freon. Employers should utilize engineering (such as enclosed systems or local exhaust ventilation equipment) and administrative controls (like less time worked in Freon exposed work areas) to eliminate/minimize worker exposure to Freon. If this is not possible, employers should provide the necessary personal protective equipment including:

Non-porous gloves and gauntlets, protective clothing or aprons, goggles or face shields, and shoe protection. If necessary, respiratory protection should be provided.[8]

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