P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-6* ISSUE-9*(Part-2) May- 2019
E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

Chlorofluorocarbons - Health Effects& its Alternative Hydrofluorocarbons

Abstract

Chlorofluorocarbons also known as Freon or CFCs. The main properties of CFCs are non- carcinogenic, non-toxic & non-inflammable. It primarily contains Carbon, fluorine & Chlorine atoms. There are mainly five CFCs consists: CFC-11 (trichlorofluoromethane - CFCl3), CFC-12 (dichloro-difluoromethane - CF2Cl2), CFC-113 (trichloro-trifluoroethane - C2F3Cl3), CFC-114 (dichloro-tetrfluoroethane - C2F4Cl2), and CFC-115 (chloropentafluoroethane - C2F5Cl). It is generally found that the life of CFCs in atmosphere is generally between 20 to 100 years, moreover, on chlorine atom has capability of wipe out more than 100,000 ozone molecules before it gets non-reactive. All out efforts are been done by World to control the emissions of CFCs in atmosphere, however, the stratosphere layer is still affected.

Keywords: Chlorofluorocarbons, Non Carcinogenic, Ozone Layer.

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Introduction

CFCs were one of the most important substances that were being used in many different parts in the industry and many sectors of the economy. Chlorofluorocarbons or the CFCs are known to be very important in the manufacture of products such as aerosol sprays, blowing agents for foams and packing materials, as solvents, and as refrigerants (used to cool refrigerators). In the mid1900s, CFCs are known to be alternatives for refrigerants, as it is non-toxic and does not cause any fatal accidents(when it leaks). Therefore, after World War 2, CFCs were very popular amongst customers worldwide, the annual sales and production were at its peak, and no signs of damage were being found. However, a few years' later scientists have discovered the worsen condition in terms of the depletion of ozone from the release of CFCs, leading to the elimination of CFCs at the beginning of the19th century.

Many people may ask for the reasons why CFCs production is a big issue. Researchers in the 70s have discovered that the chlorine in CFCs can be capable of destroying the Earth's atmosphere, orin this case, the ozone layer, as it can stay up in the atmosphere for a very long time. The Earth'sozone is responsible for radiates harmful Ultra Violet radiation (UV) from the sun. This radiation is considered to be harmful for the living organisms on Earth. It can causes biological damage in both plants and animals, such as skin cancer. The loss in the ozone layer can result with more harmful UVsreaching the Earth's surface, having direct affect on living organisms. Researches have proven that a single Chlorine atom can have the ability to destroy up to 100,000 molecules of ozone, predict how much atoms of Chlorine have been released from the use of CFCs in the last few decades.

There are now many alternatives for CFCs being used in each section of the industries; the most common ones are known to be Hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). These substances are now being used widely as a substitute for CFCs, as it is known to be more eco-friendly. One advantage of HCFCs is that it contains Hydrogen, which will react with gases in the atmosphere, resulting in a shorter lifetime in the atmosphere (about 13 years). However, the disadvantage of these substances is that it still contains Chlorine; meaning that it still has what it takes to cause the depletion of the ozone layer (considered as a greenhouse gas), but at a lower rate. In addition, HCFCs are more expensive to produce. Therefore, many countries are planning to eliminate the use of HCFCs, switching to HFCs instead. Nowadays, substances that are considered to be the best substitutes for CFCs are the HFCs. The reason under this statement is that HFCs are known to be having a short lifetime and lack of chlorine, reducing the rate of ozone depletion.

Aim of the Study

Since CFC is affecting ozone layer in atmosphere and in tien affecting human health seriously, the need was arouse to research how CFC is affecting human health and what could be the substitute of CFC which can replace with much lesser damage to human race and environment. Even the Montreal Protocol on Substances that Deplete ozone layer treaty also aim to protect human health and the environment by systematic phasing out of man -made chemicals that has adverse effects on the ozone layer. The treaty was signed on 16 Sept 1987 and brought into force on 01 Jan 1989.

Chlorofluorocarbons (CFCs) and Health Effects

As earlier mentioned that CFCs are five type & forming group. They are colourless, non-combustible liquids, known as Freons. CFCs mostly used as dry cleaning solvent, .refrigerants, propellants in aerosols, metal degreasers, & in fire extinguishers.

Generally CFCs are very unstable substances and weakly soluble in water. They mainly escape in atmosphere during production & while in use. On soil CFCs easily percolate in ground water & mortify slowly.

The World is seriously worried about the damage of atmospheric layers because of past use of CFCs, now phased out mostly all chemicals related to CFCs. However, some amount still exists in ground water because of their earlier uses in refrigerators, freezers, and air conditioners which may still exist in atmosphere and will mortify slowly.

Effects on Health

The research has been carried out on CFCs family on health effects and it was found that three common CFCs in group have mostly same effects on health: trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), and trichlorotrifluoroethane (CFC-113).

Absorption/Metabolism

CFCs are mostly absorbed in body by inhalation, and to a minor amount through intake and via the skin. CFCs are generally stored in fat tissue and within 24 hours nearly all absorbed CFCs are cleared from the human body.

Short-term (acute) Effects

The short term effects includes to the skin as well as to the upper airway if inhaled. It is due to experiencing to pressurized CFCs, which generally may takes place due leakage of refrigerant. When CFCs gases are exposed to high temperatures, it can degrade into more highly toxic gases such as chlorine and phosgene.

The major part of human body which is mostly affected due high concentration inhalation of CFCs is central nervous system (CNS). The symptoms are alcohol-like intoxication, reduced coordination, light-headedness, headaches, tremors, and convulsions. Even it disturbs the heart rhythm and be a reason of death in some cases. Higher the concentration, higher is the impact of CFCs on human body organs.

Long-Term (Chronic) Effects

In long term effects, the workers engaged in profession related to CFCs in industry has hardly observed any adverse effect. However, the studies carried out on animal indicate that it has affected liver (Guinea Pig), especially CFC-12 & no ill effects on other animals in same condition of exposure.

Carcinogenic Effects

There are no research inputs available that exposure to CFCs can cause cancer or CFCs is a Carcinogenic agent.

Reproductive/Developmental Effects

The exposure of animal to high level of CFCs exposure does not indicate any effect on their reproductive or on developmental growth or any health effects.

Conclusion

In conclusion, even though CFCs were not being use in the industries anymore its alternatives (substitutes) are still not the best solution into eliminating human's depletion of the ozone layer. These two gases have certain disadvantages towards the Earth's ozone layer and many further researches are still being conduct to eliminate the use of HCFCs and HFCs. Until further researches were due, HFCs are still very commonly used as an alternative to halocarbons and is the best way to maintain the normal lives of the people on this planet. Many products are still requires the usage of these gases in order for it to be produced. If there were no further researches about other alternatives to CFCs, HCFCs, and HFCs than the rate of depletion of the ozone layer would still increase, although at a much slower rate. People should now be aware that the elimination of CFCs does not mean that the Earth's ozone is now safe. There are still many CFCs left flowing around in the atmosphere due to its long atmospheric life, destroying more and more ozone molecules. What we did right now is to prevent more of it to enter the atmosphere. The rates of global warming are now still increasing continuously. We should all be informed that the climate in a few years would even be worst than what it is right now and as far as we all know, we could not do anything about it except letting it happen.

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