# A Second Look at HCFCs

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The major actions of the Montreal Protocol are final in so far as the fire protection community is concerned because Halon 1301 and 1211 are no longer in production in the developed countries of the world. The U.S. Environmental Protection Agency has published the first version of the Significant New Alternatives Policy (SNAP) list, which identifies acceptable alternative firefighting agents in the eyes of the EPA.

The situation for total flooding agents looks to be reasonably well in hand. Some fifteen agents have been identified, of which about ten seem to have viable replacement properties; five or six have industrial support from commercial suppliers. In addition the Halon Recycling Corporation has been established as a broker for recycling Halon 1301 for those uses for which replacements have not been identified, such as aircraft engine/military crew bay protection and isolated area protection like the North Shore petroleum processing facilities in Alaska.

On the other hand, the situation for streaming agents is bleak. The SNAP list, as shown in Table 1,identifies only three firefighting agents that will be produced past the year 1995 that are viable alternatives for the streaming application, including portable or hand-held units.

## VIABLE STREAMING AGENTS
## SNAP LIST "ACCEPTA81E"

| Agent | Formula (major comp) | ODP | Lifetime Yrs | NOAEL % | LOAEL % |
|---|---|---|---|---|---|
| FE-232 | $CHCl_2CF_3$ | 0.02 | 2 | 1.0 | 2.0 |
| FE-241 | $CHClFCF_3$ | 0.02 | 7 | 1.0 | 2.5 |
| Halotron I | $CHCl_2CF_3$ | 0.02 | 2 | 1.0 | 2.0 |
| NAF P-III | Mixture of HCFCs & HFCs | | | | |
| BLITZ | $CHCl_2CF_3$ | 0.02 | 2 | 1.0 | 2.0 |
| CEA 614 | Cali | 0.0 | 3,100 | 40 | -- |

Table 1

One of these has no commercial support, leaving only two “acceptable” agents, Halotron I, manufactured by American Pacific Corp. and CEA-614, manufactured by the 3M Corp. Of these two agents the EPA has already decided that they do not “like” the 3M product, and special restrictions on it are included in the SNAP rule.

This leaves only one streaming agent, Halotron I, which contains a HydroChloroFluoroCarbon compound (HCFC) as one of its components.

HCFCs are currently destined to be phased out by the year 2030 according to the Montreal Protocol, as shown in Table 2.

**HCFCs -- CURRENT PROTOCOL PHASE-OUT SCHEDULE**

- **1996 -- Cap Production at 3.1% of the ODP of the CFC 1989 Production + 100% of the ODP of HCFCs Produced in 1989**
- **2004 -- Production reduced to 65% of the 3.1%**
- **2010 -- Production reduced to 35%**
- **2015 -- Production reduced to 10%**
- **2020 -- Production reduced to 0.5%**
- **2030 -- Production reduced to 0.0%**

Table 2

This should make Halotron I a satisfactory choice for streaming application for several decades; however, the U.S. Clean Air Act prohibits the use of HCFCs in pressurized containers except under special conditions where there is no alternative agent. This further restricts this agent to "fixed" systems. The EPA will permit the use of portable HCFC systems in critical use applications such as in aircraft, but this adds a level of red tape to any portable application.

For many firefighting applications that require portable extinguishers, there is currently no alternative except recycled Halon 1211. As of today there is no organized Halon 1211 recycling program. Further, the price of 1211 increased dramatically during its last two

years of production, and there is no reason to think that it will decrease or even level off as the supplies decrease with time.

## Environmental Properties of HCFCs

Just how bad are the HCFCs? Let's look at their properties. Many HCFCs have very low Ozone Depletion Potentials (ODP), on the order of 0.01 or 0.02. This means that their effectiveness for destroying the stratospheric ozone layer is only about 1/1000th of the ODP of halons! Halon 1301 has an ODP of 16 and Halon 1211 has an ODP of **4.**

Of equal importance today is the Global Warming Potential (GWP), which is based on a computer model comparison with the warming potential of carbon dioxide which is given an arbitrary value of one. The GWP values for the HCFCs on the SNAP list are on the order of 0.1 of the halons. It is important to understand that carbon dioxide, though most often cited as the culprit in global warming, is actually pretty inefficient as a global warming gas; most CFCs, including the halons, are hundreds and sometimes thousands of times more efficient than carbon dioxide. So the HCFCs with their GWP of about 0.1 are insignificant global warmers when compared to the halons or CFCs.

HCFCs approved for interim firefighting agents are two to three orders of magnitude less damaging to the atmosphere than are the halons. These HCFC agents also have passed extensive toxicity testing that was

never required of the halons. And yet we read in the science journals that the environmentalists are clamoring for accelerated phase-out of HCFCs. And it looks like the Technical Options Committee for the Montreal Protocol might be listening to these extreme demands.

## Current Research Studies Make Us Wonder

In the past few years it has become very clear that the damage to the ozone layer is not simply the fault of chlorine and bromine from the CFCs. Furthermore, some scientists are questioning the validity of the studies that have been used to blame the CFCs. In addition, no definitive evidence has been produced that validates the health problems predicted by a decreased ozone layer!

In a 1992 letter to Science (August 7, 1992), Dr. Kenneth M. Towe of the Smithsonian Institute questioned the downward trend in stratospheric ozone reported by a **NASA** group at Goddard Space Flight Center. Dr. Richard Stolarski of **NASA** admitted in his written response in the same issue that the **NASA** article misstated the data and pointed out that before a trend could be deduced from the data it had to be "deseasonalized," which means that the data had to be mathematically altered before the trend was detectable. Granted, the ozone decrease at the South Pole is real, but as Dr. Towe pointed out, the raw data at other latitudes from 1956 to 1987 presented in Figure 1 hardly look threatening.

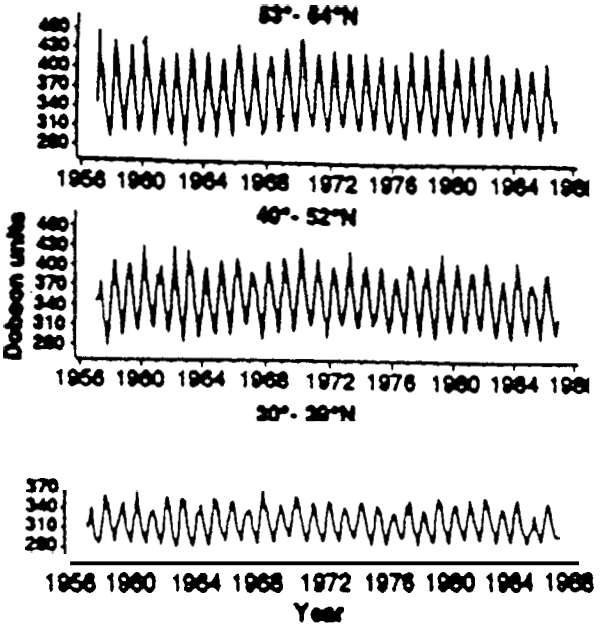


**Fig. 1.** A plot *of* Dobson total ozone monthly averages combined into time series for three latitudinal zones. [Adapted from figure 2.2-3 in

The presence of chlorine compounds is generally at a pretty constant level throughout the stratosphere, but the only real depletion of the ozone (until the 1991 volcanic eruption of Mt. Pinatubo in the Philippines) has been at the South Pole. Scientists from NASA have repeatedly predicted major ozone depletion at the North Pole as well, but it has not happened. It appears that the temperatures there are not cold enough to produce the right conditions for ozone destruction. Some NASA scientists have even blamed the weather for the failure of their predictions in the Arctic. If these extra cold conditions are required to create ozone depletion, it is hard to understand why there is a world wide threat.

In 1993 there was indeed a decrease in the stratospheric ozone, more than the computer models had predicted. This decrease is generally blamed on the aerosol generated by the eruption of Mt. Pinatubo, but it is clear that this effect is not accounted for in the current computer models of the stratosphere. In a recent article in Chemical & Engineering News (May 24, 1993), Dr. Joe W. Waters of NASA's Jet Propulsion Laboratory is quoted as stating that the excessive Antarctic ozone depletion of 1993 "caught us completely off guard because we hadn't thought of the heterogeneous processes [associated with volcanic aerosols] that turned out to be so important. I can't help worrying what processes we may be overlooking now." The truth is that the current computer models do not adequately reflect the reality of the stratospheric processes.

Another recent article in Science reports for the first time the fact that the decomposition byproduct, $CF_3$, which would be present from most HCFCs, causes essentially no ozone depletion in the stratosphere. This article presented the first experimental data on this chemical species. Previously, the computer models either ignored the chemistry of this component or made arbitrary assumptions regarding its effects.

Solar activity also appears to have an effect on the ozone layer. When there are major solar flares, there is an observed decrease in the ozone layer. This fact has also been ignored by the modelling scientists.

We must conclude from the recent scientific literature that the stratospheric computer modelling is inadequate, that there are undoubtedly natural processes taking place that have not been included, and that until the Mt. Pinatubo eruption, there may well have been no real ozone depletion trend anywhere in the world but the South Pole. Several of these issues to consider are listed in Tables 3 & 4.

## SOME ISSUES TO CONSIDER

- THERE HAVE BEEN NO SIGNIFICANT HEALTH PROBLEMS DIRECTLY TIED TO OZONE DEPLETION
- UNTIL TUE MT. PINATUBO ERUPTION THERE WAS NO SIGNIFICANT OZONE DEPLETION ANYWHERE BUT AT TUE SOUTH POLE
- EACH YEAR WE ARE FINDING NEW ATMOSPHERIC CHEMICAL PROCESSES TUAT WERE UNKNOWN AND WHICH CHANGE OUR UNDERSTANDING OF ATMOSPHERIC CHEMISTRY
- OZONE DEPLETION HAS BEEN FOUNV TO CAUSE GLOBAL COOLING!!

## MORE ISSUES TO CONSIDER

- TUE IPCC HAS ADMITTED THAT TUE GWP IS NOT A GOOD INDICATOR OF CLIMATE FORCING EFFECTS
- TUE IPCC HAS REPORTED GLOBAL COOLING EFFECTS VUE TO:
  - -- STRATOSPHERIC AEROSOLS
  - -- TROPOSPHERIC $SO_2$ EMISSIONS
- ADDITIONAL RESEARCH HAS INDICATED GL08A1 CLIMATE EFFECTS DUE TO:
  - -- SOLAR VARIATION
  - -- €1 NINO (OCEAN EFFECT)
  - -- NEW MEASUREMENTS OF ATMOSPHERIC SOLAR ABSORPTION

Tables 3 & 4

Dr. S. Fred Singer, has pointed out that there is no scientific proof of any increased health problems that can be related to the stratospheric ozone concentrations. UVB radiation from the sun is credited by the EPA as the cause of the projected health problems due to the decrease in

stratospheric ozone. A study of the effects of UVB on diatoms, a part of the phytoplankton community in the antarctic ocean, covering the past 20 years was published in Nature (August 18, 1994) by a group of Australian scientists. They found only natural variation in these sea diatoms and no adverse effects due to the annual increase in UVB.

In spite of all these uncertainties, there is a clamor to accelerate the phase-out of the HCFCs that have been approved by the EPA. Some of these agents have been fully tested and proven to be acceptable replacements for many firefighting applications. For example Halotron I has been extensively tested by the FAA, military, UL, and firefighting equipment manufacturers for application in fuel spill and serious three dimensional engine nacelle fires. Further, it has been approved for airport application by the FAA.

Maybe it is time to reevaluate our haste to remove these valuable firefighting agents. They have exceedingly low ODP and GWP values, orders of magnitude lower than the halons. Instead of accelerating the phase-out, the EPA and the UNEP Technical Options committee should be extending and protecting their use for many years to come.

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