Halons as Hazardous Wastes
Policy Implications of Montreal Protocol Decision VII/12

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INTRODUCTION

Since the signing of the original Protocol, fifteen Decisions have had or continue to have a significant impact on the fire protection community [1]. The control measures have maintained four constants throughout these changes: (1) they were deemed appropriate based on the latest scientific assessment of ozone-depletion; (2) they have only been placed on production and consumption; **(3)** they have been only based on stratospheric ozone depletion; and (4) they have always gotten stricter.

Decision VII/12, Control measures for Parties not operatine under Article **5** concerning halons and other agents used for fire-suppression and explosion-inertion purposes [2], keeps to the basic strategy in the continued, systematic tightening of control measures. Without production and consumption, however, the control measures move to the USE of halons. In recommending restrictions on use, this decision breaks from a basic tenet of the protocol. It should come as no surprise that the environmentalists' ultimate goal is to eliminate all of the halon around the world. The only question has been, and remains, when to do this. Hidden behind the innocent term 'voluntary,' this Decision marks the beginning of the process.

Decision VII/12 can become a landmark Decision altering forever the manner in which halons and fire protection are regulated under the Protocol. It consists of three primary areas that can be summarized as follows:

- Promotes the environmentally safe destruction of surplus halon;
- Recommends limiting halon systems to only 'Critical Applications;' and

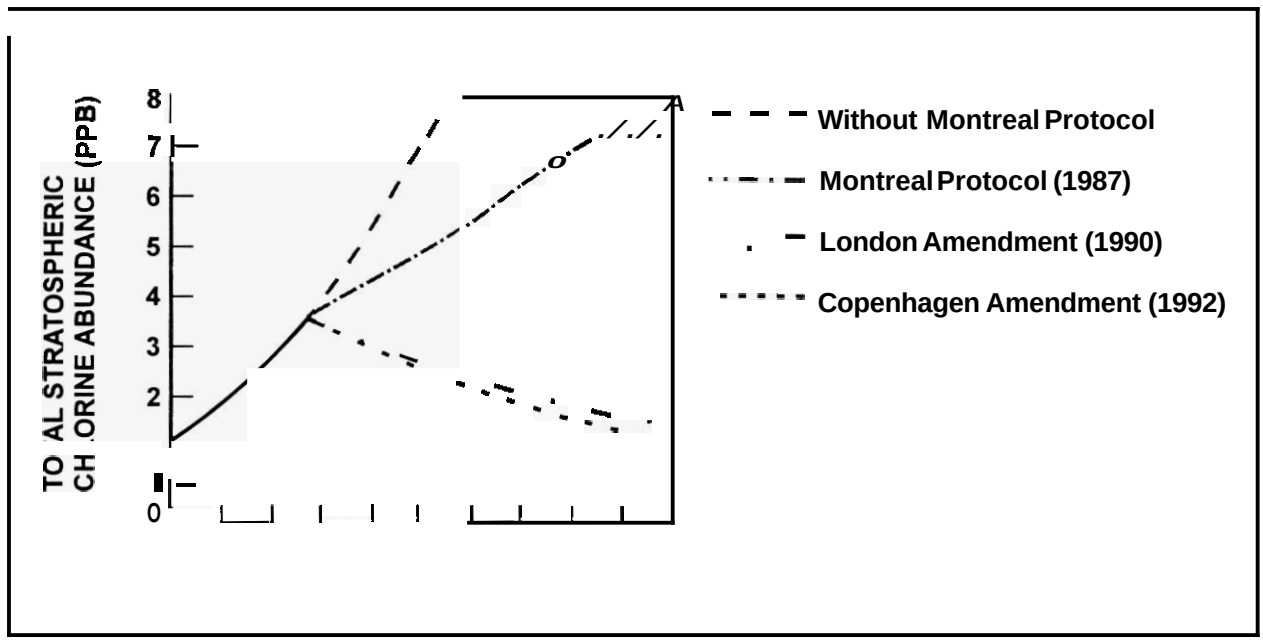
- Advocates including other environmental issues in determining halon alternatives.

The fire protection community should understand the implications of the Decision. A review of the latest scientific assessment of ozone depletion and past Protocol measures is provided within the discussion to assist in understanding the rationale and the potential impacts. Recommended actions for the fire protection community to reduce these potential impacts are also provided.

SCIENTIFIC ASSESSMENT OF STRATOSPHERIC OZONE LAYER

A basic part of the Protocol has been the role of the scientific assessments. The need and subsequent justification for changes to control measures have been based on these assessments. Figure 1 provides an estimate of the total stratospheric chlorine loading for four scenarios: (1) without the Montreal Protocol, (2) 1987 Montreal Protocol control measures, (3) London Amendment control measures, and (4) Copenhagen Amendment control measures [3]. This graph dramatically depicts the success of the Montreal Protocol in protecting the ozone layer.

The 1994 assessment shows that the greatest amount of chlorine loading and therefore stratospheric ozone depletion will occur over the next decade. It is estimated that near the year 2000 ozone depletion at north mid-latitudes will be 12 to 13% during the winter, with resulting increases in UV-B of 11% [3]. Options for further reductions are limited because the height and timing of the peak are determined by past emissions. Figure 2 shows the amount of atmospheric chlorine loading that can be affected by further control measures [3]. The hatched area represents the integrated ozone-depletion that can be reduced. If all quantities of previously produced halon in the developed world are not emitted, integrated ozone-depletion could be reduced by 10%. The 10% figure has been often misquoted. It is NOT true that collecting all halon will result in an immediate 10% decrease in total ozone-depletion. Since the height and the timing of peak ozone-depletion are the result of past emissions, only how fast chlorine loading returns to pre-ozone hole levels can change.



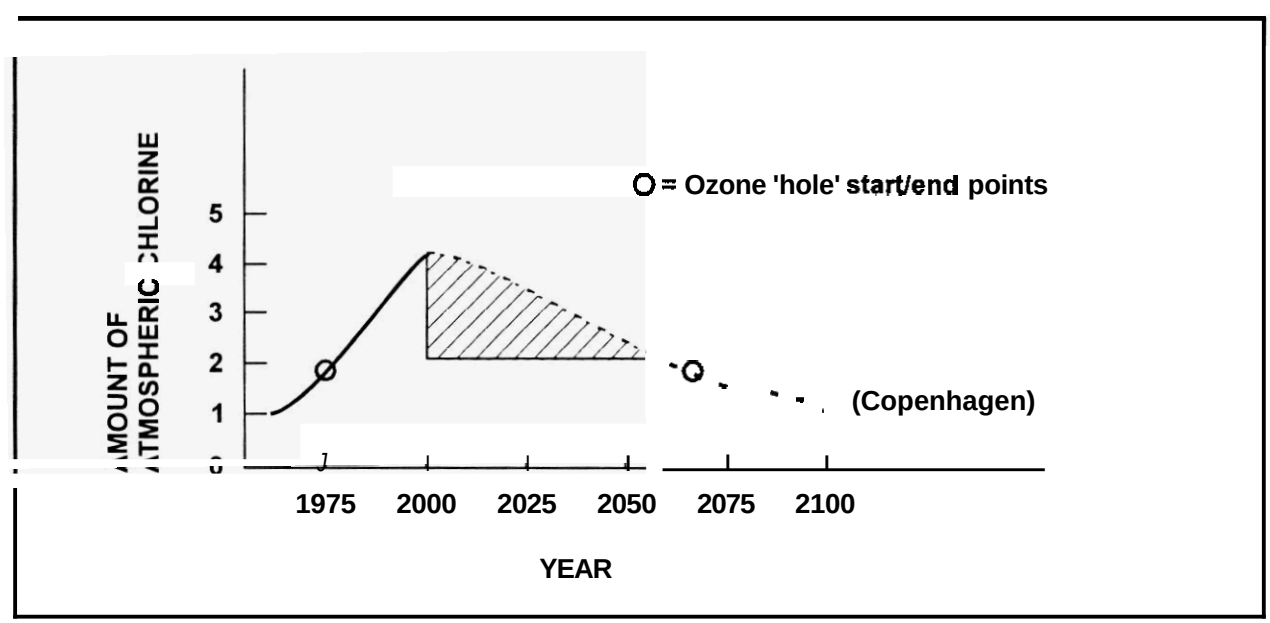


Figure 2 - Integrated Ozone - Depletion that may be Affected by Further Control Measures [3]

Reduction of halon emissions is not the only way to reduce the integrated ozone-depletion. Other examples are the elimination of production of methyl bromide by 2001, 13% less integrated ozone-depletion, and elimination of production of HCFC by 2004, 5% less integrated ozone-depletion [3]. The effective change on integrated ozone-depletion by reducing Article 5 countries' production and consumption allowances was not reported.

Integrated ozone-depletion over the next 50 to 75 years can be reduced by as much as 10% by not emitting any previously produced halon. It does not matter in the calculation whether the reduction in emissions occurs immediately or in the future. This means that there is no need to act today to achieve the same results. Time exists to decide if further control measures should be enacted while still achieving adequate fire protection. The logic behind Decision VII/12 – because we can further reduce integrated ozone-depletion, we should do it now – is not supported by the scientific assessment. The recommended changes to control measures are not needed today.

CONTROL MEASURES

Apparently, the intent of Decision VII/12 is to place use controls on halons to achieve surpluses that may then be destroyed instead of emitted. The implication is that halon is not needed in the quantity in use and that policy actions are required to force the fire protection community to give up this *unnecessary* halon. It does not matter whether this presumption is verified in the data or not. There is an international competition to "out green" other countries, to find new ways to tighten control measures further, with little regard to previous agreements.

Previous Control Measures

The two Decisions that are the most known are the ones that accelerated the production and consumption phase-out, Decisions II/1 (London Amendments) and IV/2 (Copenhagen Amendments). These decisions, however, were only made possible by other enabling Decisions. For example, Decision IV/II could only be seen as technically and politically viable with three other simultaneous Decisions: IV/ 24, IV/25, and IV/26. The basis for determining that adequate fire

protection could still be maintained with a complete production and consumption phase-nut by 1 January 1994 was the free exchange of halons (Decision IV/24), the open use of recycled halons (Decision IV/26), and a safety valve to allow for production of halons should the banking scheme fall short of expectations (Decision IV/25). These requirements were developed with participation from the fire protection community through the Halon Technical Options Committee (HTOC). It was the consensus of the HTOC that without these three other Decisions, the move to stricter control measures would not be possible without adverse effects on fire protection.

Decision VII/12 seeks to increase the control measures by negating the enabling decisions that make up its foundation. By destroying this foundation, it is questionable whether the Copenhagen Amendment can still be met without essential-use production or long-term adverse impacts on fire protection. Under these conditions, it seems highly unlikely that tightening the control measures by incorporating use restrictions will not have severe impacts on fire protection.

Halon Use Restrictions

If this policy is carried out, it would require that ALL installations/uses of halon be catalogued and a determination made whether the particular use is 'critical.' Cataloguing has been done for many big users and likely for most. Although it represents a monumentous task, the real problem with such a policy is in the determination of a critical use. Fire protection engineers, policy makers, and environmentalists may all have different views on what is critical.

The Decision recommends using the essential-use definition of Decision IV/25 to decide what is critical. The intent of Decision VI/25 is *to* provide a means to allow for production (and consumption) of halons above that allowed under the Copenhagen Amendment. It **assures** the world that should the banking system fall short, our most 'essential' uses will not be forced to go without halon. It does so in two parts. First, the use must meet the "essential" clause of the definition; the application must be integral to an essential service to society. Second, all other technically and economically feasible fire protection measures must be taken. To meet the definition, the application must be critical, AND the use of halon must be critical in that particular use.

To illustrate, let us use the example of a telephone exchange. It may be widely accepted that telephone exchanges provide an essential service to society. This meets the first criterion but that does not mean it automatically meets the second criterion. The second part of the definition incorporated the idea of 'technically and economically feasible.' In the U.S., we have seen the idea of technically feasible used in the EPA Significant New Alternatives Program (SNAP) list. ***So*** far, the determination has been left to the opinion of the cognizant fire protection professional. It is not clear how the policy would be administered **on** an international level.

The idea of economic feasibility is much less straight forward. The owner or insurer of the asset may have a considerably different idea on what is economically feasible than the environmentalist. For the hypothetical telephone exchange, economic feasibility may include redundant facilities, passive fire protection, and active fire protection. **A** large corporation may choose to have redundant facilities while a smaller company may choose not to or may not be able to "afford" it. On the other hand, a large company may also choose not to based on their economic assessment. Halon use may be deemed critical in one installation and not critical in the other. Legal implications on defining critical applications abound with fire protection caught in the middle.

Another problem with using this definition is imbedded within the definition itself. It was not developed for this purpose. It provides a means to allow for, while reducing the need for, production to enable the stricter control measures of the Copenhagen Amendments. As such, the definition sought three things: (1) to foster the use of alternatives - including recycled halon, (2) to enable the newly developed banking system, and **(3)** to balance the halon supply and demand. The alternatives are well underway in proving themselves in many applications. The banking system no longer needs any help in proving its viability. The halon supply and demand balance, however, is still fragile and must be carefully managed. If supply is too large, halons will cease to have enough value to be handled carefully and perhaps vented because it is easier and cheaper in the short term. If supply is too small, production may be enabled, or adequate fire protection may be lost.

Local supplies of halons are not only important but also global supplies. Decision IV/24 opened the way for free and open trade of halons at the international level, by removing recycled

halons from the calculation of consumption rights. The implication of Decision VII/12 is that international restrictions between countries would be needed to ensure halons are only going to critical applications. This policy places another control measure on the use of halons and removes another previous agreement. It raises difficult questions about whom and which country would decide if the use was critical. It would alter forever the global supplies of halons.

Global Halon Supplies

The data for estimating the global supplies of halons come from two different avenues. The first is based on annual production amounts from the major producers and emission patterns [4]. Countries that have required collection of halon for destruction, e.g., Australia and Germany, provide the second. For both countries, the first estimates of the halon to be collected were based on the annual production study. In both cases, these initial estimates had to be revised downward because the actual quantity of halons collected fell short of projections [4]. Three possibilities exist for this: (1) Actual quantities within the country were less than estimated, (2) some halon was emitted instead of collected, or (3) the halon was not returned. Any or all these would provide an adequate answer. The major point is that we just do not know.

If less halon is available than projected, halon shortages may occur in the future. It is imaginable that users may find it necessary to request essential-use production. If more halon is being emitted than expected during these collection schemes, collecting it in this manner does not appear wise. If the halon was diverted from collection, it is still accounted for in the bank (including in service somewhere else) or remains unaccounted for, useless for fire protection or destruction. These possibilities point away from the need to change the control measures to include use. The best solution is promoting the wise and responsible use of the halon bank, not mandating its destruction.

Destruction

Decision VII/12 is not the first Decision to recommend destruction. There have been four previous Decisions, Decisions 11/11, IV/11, IV/12, and IV/24 [1]. What makes Decision VII/12

different is the result not the words. An international consensus is building that it is time to collect halons for the sole purpose of destruction. As part of the response required to Decision VII/12, the HTOC is discussing the possibility of collecting and destroying Halon 1211 on an international level. Others have promoted including Halon 1301 as well.

The irony of the international actions is that production of halon 1211 still exists. Lesser Developed Countries (LDCs), as defined under Article 5, paragraph 1 of the Protocol, have production rights under the 10-year grace period on control measures. During the VIIth Meeting of the Parties, it was confirmed that the LDCs have 10 years from the London Amendments, until 2010, and not 10 years from the Copenhagen Amendments [2]. While the developed world is considering collecting halon for destruction, apparently under the premise that, using the words from Decision VII/12, "...they are not needed in halon banks (existing or to be created)," large quantities are being produced [2]. Estimates show that Article 5 countries' production of Halon 1211 will exceed that of the bank in the entire developed world, and if allowed to produce through 2010, they will produce more than the developed countries did [5].

The phrase in Decision VII/12 "existing or to be created" shows the thought process of the policy makers. In their paradigm, three kinds of halon exist: (1) in-use in 'critical' applications, (2) wasted in noncritical applications, and (3) excess, stored in a warehouse or a bank. However, the bank, as developed in Decision IV/26, includes all of the halon installed, in supply, in backup, or yet to be produced. All halon is part of the one and only global bank. Whether or not a country or a region has a banking mechanism does not mean that the bank does not exist.

Article 5 countries may produce halon until 2010. That halon is part of the global supplies of halon and needs to be included in the calculating the size of the bank. Although halon produced by the LDCs cannot be transferred to a developed country (whose consumption right is zero), the halon from a developed country can be transferred to an LDC to lower their production and/or consumption rights. The scientific assessment does not appear to account for this possibility in determining the effects to the integrated ozone-depletion nor does Decision VII/12 recommend using

any 'excess' halons in this manner. There is either a continued need for halon on a global basis, particularly for Article 5 countries, or an excess global supply. Both cannot be true.

HALON ALTERNATIVES USE RESTRICTIONS

The last major impact of Decision VII/12 is in the recommendation to expand the control measures to other environmental requirements. This is not new. Unilateral actions have been taken by several countries, e.g., the U. S. has incorporated restrictions based on Atmospheric Lifetimes under the **SNAP** list; the European Union developed a Voluntary Code of Practice for the PFCs and HFCs as fire suppressants; and Italy passed a regulation that includes ozone-depletion, global warming and atmospheric lifetimes.

The inclusion of this recommendation within VII/12 is foreshadowing of what will come. Although the Protocol is not the right place to include these policy measures, they are likely to become requirements elsewhere. Fire protection analysis must move toward the incorporation of environmental requirements, and not just for halon alternatives. While past actions for halon alternatives have received much attention, other fire extinguishing agents have quietly been coming under increased environmental scrutiny, e.g., foams. Environmental requirements within fire protection are increasing. Fire protection engineers need to prepare themselves for this inevitability. The environment, safety, and occupational health (ES&OH) concerns of chemicals are inextricably tied with their use and their ultimate life-cycle costs. Fire protection engineers need to educate themselves on the environmental impacts associated with the various agents and include this assessment in their decisions. Proper fire protection requires basing your decision on all engineering requirements: fire extinguishment; cost; reliability; environment, safety and occupational health, etc.

Part of the reason that policy makers feel obliged toward these types of recommendations is based on their impression. It is sometimes the complaint of the fire protection professional that the environmentalists are preventing otherwise good fire suppressants from entering the market. Would the same be said for an alternative to aspirin that provided similar or better pain relief, with a side effect that it causes irreparable injury to the patient?

To illustrate the perception from their point-of-view, let **us** consider the search for halon alternatives. The earliest potential replacements considered, other than the HCFCs, were the HBFCs. From the narrow fire protection standpoint, they are excellent extinguishing agents. From the wider view, their ozone-depletion potential is too high. These chemicals were never allowed to be produced. The next class of agents was the perfluorocarbons. Again, from the narrow fire protection view, they are good extinguishing agents. They have zero ozone depletion, but their atmospheric lifetimes are considered too high for wide spread use. The third class of agents was the fluoroiodocarbons. From the narrow fire protection standpoint, they are excellent fire suppressants. Their ozone depletion and global warming impacts are acceptable, but their toxicity leads to potential safety and/or occupational health issues in some applications.

From their view, fire protection professionals have shown a strong reluctance to include ES&OH requirements. The reality is that these issues are routinely addressed through National Fire Protection Association committees, this conference, and other similar forums. The entire fire protection community needs to change this perception.

SUMMARY

Hidden behind the veil of "voluntary," Decision VII/12 can become a landmark Decision. It breaks from the basic strategy of the Protocol and reneges on previous international agreements. The fragile balance between halon supply and demand is in jeopardy and adequate fire protection with it. While the latest scientific assessment of ozone depletion does not **support** the need for these recommended changes, the world perception is that we must act now to start them. Halon collection and destruction schemes are being considered on an international level. The fire protection community must act now or live with the consequences.

In part these measures are based on the perception that fire protection professionals are not doing all they can to protect **our** environment. The entire community needs to take back the initiative from the environmentalists and environmental policy makers. There is no academic or accreditation requirement to be an environmentalist. The fire protection community should move

towards being as environmentally conscious as anyone, in essence becoming environmentalists. The first step is to change their negative perception by replacing the "environmental slamming" with open dialogue in public forums. Second, the current environmental work within fire protection must receive more visibility and increased publicity. Third, the community as a whole must participate actively in 'non-fire' environmental forums and openly publicize that work. Last, ES&OH requirements must be visibly included in the analysis of agents and system designs. Proper fire protection requires basing your decision on all engineering requirements: fire extinguishment; cost; reliability; environment, safety and occupational health; etc. If you do not it, the environmentalists and the policy makers will! Who better to decide on fire protection, the environmentalist or the fire protection professional?

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