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Methyl Chloroform

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Mr. President, this chemical can and must be eliminated by the year 2000. There is no need to delay. This is a good amendment and I do hope it will be adopted and I hope we can vote on it very soon.

Mr. President, I see no other Senators desiring to speak. I suggest the absence of a quorum.

The PRESIDING OFFICER. The Senator from Rhode Island has suggested the absence of a quorum. The clerk will call the roll.

The legislative clerk proceeded to call the roll.

Mr. GORE. Mr. President, I ask unanimous consent that the order for the quorum call be rescinded.

The PRESIDING OFFICER (Mr. BUMPERS). Without objection, it is so ordered.

Mr. GORE. Mr. President, I rise in support of the pending amendment. But first of all, I would like to congratulate our majority leader, Senator MITCHELL, for bringing this bill to the floor as the first item of business during this session.

I also want to congratulate the Environment and Public Works Committee, particularly Senators BURDICK, BAUCUS, CHAFEE, and DURENBERGER, for the leadership they have demonstrated in bringing the clean air amendments, truly historic legislation, to the floor of this body. It is a comprehensive bill addressing many of the threats now confronting our environment.

I will reserve until a later time general comments on the Clean Air Act itself. For now, I wish to speak specifically in support of the amendment introduced by my distinguished colleague, Senator CHAFEE, calling for a phaseout of methyl chloroform by the year 2000.

Methyl chloroform is one of the manmade chemicals now destroying the stratospheric ozone layer which protects life on Earth from deadly ultraviolet radiation. As has been graphically illustrated by the huge hole torn in the ozone layer above Antarctica, these substances are extremely powerful.

It is not quite as well known that the damage done to the stratospheric ozone layer is not just above Antarctica, but is above Washington, DC, Carthage, TN, Little Rock, AR, and all parts of the United States. Indeed, all mid latitudes throughout the world during the winter months suffer roughly a 3- to 4-percent decrease in stratospheric ozone.

The scientists, predicting that this damage would occur 15 years ago, estimated that by 1990 there would be a 1-percent loss in the thickness of the stratospheric ozone layer because of these chemicals.

Many were skeptical and they said these predictions may well be wrong. Why should we act on the basis of scientific studies and models without emperical evidence? Well, it turns out they were wrong—instead of a 1-percent reduction, we see more than a 3-percent reduction.

It is worth remembering as we hear the debate over global warming and other global environmental problems, that which the models and numbers may be wrong, they may be off on the down side as well as on the up side. Stratospheric ozone depletion is an example of a problem which did in fact turn out to be worse than predicted, and will in fact become much worse unless we take actions like the one recommended in this amendment.

For several years the ozone depletion debate has focused on chlorofluorocarbons [CFC's]. CFC's are the principal culprits in destroying the stratospheric ozone layer. They are also responsible for about 20 percent of global warming. But as the world moves toward controls on chlorofluorocarbons, the scientific community has directed our attention to exactly how they cause damage. The scientists have specifically asked us to pay attention to other chemicals that cause the same damage in the same way.

What CFC's do which is so harmful is release chlorine atoms into the stratosphere which then eat away the protective ozone shield. Methyl chloroform, the chemical that is the subject of the pending amendment, does exactly the same thing. About 13 percent of the chlorine atoms put into the stratosphere are delivered by this particular chemical. It is therefore obvious that we need to pay close attention to controlling the use and the manner of the production of this chemical.

There is a startling graph prepared by the Environmental Protection Agency showing what would happen if the world merely complied with the Montreal Protocol limits on CFC. The graph demonstrates that part way into the next century, the concentration of the chlorine in the stratosphere would triple.

What would happen if CFC's were completely eliminated? Surprisingly, part way through the next century, the chlorine concentration of the stratosphere would still double. Clearly, we cannot get back down to a safe level unless we ban not only the worst offending CFC's but also methyl chloroform and a few other chemicals like carbon tetrachloride and the ACFC's which also catalyze ozone destruction.

This is a good amendment. True, it is not without economic impact. I know; it will impact industry in my home State. But, the cost of continuing to destroy the stratospheric ozone layer is unfathomably higher.

What are the costs? My distinguished colleagues have already described them in thorough detail. Let me just review them here very briefly.

We know that a thinner ozone layer produces millions more cases of skin cancer, many of them fatal. We know that a thinner ozone layer produces millions of cases of cataracts, many of them causing blindness. What is not as well known is that a thinner ozone layer also suppresses the activity of the immune system in all 5 billion people who live on this planet, making human beings more susceptible to disease and infection, particularly in tropical areas. What is even less well known is that the smallest animals and plants at the base of the food chain, are apparently especially vulnerable to the increased ultraviolet radiation that comes through a thinner ozone shield. What consequences there might be for the entire food chain if there is a dramatic impact on the photosynthesis of plankton, for example, or the ability of the smallest plants and animals to survive, we do not know.

We also know that larger plants, some of them, like soybeans, that are relied upon for food also do poorly when more ultraviolet radiation comes through the ozone shield.

So, Mr. President, the threat we are discussing in advocating this amendment is one which is quite serious, indeed. I am proud to be a cosponsor of the amendment, and I was proud to bring this matter before the Environment Committee during the hearings that were conducted last year. Again, I wish to compliment the committee on the work that they have done.

A couple of other points, briefly. At a meeting last May in Helsinki, nations that are party to the Montreal Protocol agreed that that treaty is not tought enough. They recognized that just cutting CFC's by 50 percent and freezing the output of halons would not be enough, and they identified methyl chloroform as a deadly substance urgently in need of attention.

What if we delay action? EPA estimates that if we delayed the phaseout of methyl chloroform by just 30 years, from the year 2000 to the year 2030, we would get a 45-percent increase in the atmospheric concentrations of chlorine over and above today's level. Currently, that level is a little more than three parts per billion, and that will rise to almose four parts per billion if we do not phase out methyl chloroform by the year 2000.

We are also told in the same set of studies that if we fail to eliminate methyl chloroform emissions by the year 2000, we will increase by about 3½ million cases the number of nonmelanoma skin cancer, by about 350,000 the number of cataract cases, and cause about 65,000 additional deaths among people born between now and three-quarters of the way through the next century. So make no mistake, Mr. President, if we fail to enact this amendment, the responsibility for these enormous health tragedies is none other than our own.

Fortunately, I have the feeling that we are going to adopt this amendment, because I think the awareness among our colleagues and our constituents is really beginning to grow. I think people are ready for tough action of

the kind contained in this amendment. I urge my colleagues to adopt this amendment. I compliment its author, and I am proud to be a cosponsor.

Mr. President, I suggest the absence of a quorum.

The PRESIDING OFFICER (Mr. ROBB). The clerk will call the roll.

The legislative clerk proceeded to call the roll.

Mr. HOLLINGS. Mr. President, I ask unanimous consent that the order for the quorum call be rescinded.

The PRESIDING OFFICER. Without objection, it is so ordered.

Mr. HOLLINGS. Mr. President, with respect to our clean air bill, the Committee on Environment and Public Works, and most particularly our distinguished manager here, the Senator from Montana [Mr. BAUCUS] and I have been in conference. We are trying to teach an understanding so there will not be a misunderstanding.

What really occurred, and brought the global change issue to the fore for me, was that sometime early last year, having traveled down to the Antarctic and gotten to the South Pole and looked up at the atmosphere there, and seeing the hole in the atmosphere that they speak of, I realized better than anyone that there were many interested parties in this particular problem of global warming and that what we really needed was a consummate kind of coordinated endeavor by the Government, in all departments and agencies, whatever their jurisdiction or responsibility, to coordinate and periodically report to the Congress. Then we would know what is to be ruled on and to be regulated and controlled. The latter is principally, of course, in the Environment and Public Works Committee.

During that Antarctic trip, it was a NOAA, National Oceanic and Atmospheric Administration, scientist who was pointing out the ozone hole. Incidentally, there were bells ringing in the sun. We have not found out how or why. We were watching all of this occur.

We were down there with the National Science Foundation, and we also had authorities there from NASA, the space agency. NASA, NOAA, and the National Science Foundation, of course, are within our Commerce, Science and Transportation Committee.

Regarding S. 169, once we checked with the Environmental Protection Agency, with both sides of the aisle, with the White House and all the departments and agencies, we reconciled any differences we had learned about, and we ordered that bill reported in April. The bill has been on the calendar, ready to pass.

However, there was a hold on it. The best I could determine about the hold was that it was not anything, really, with respect to the provisions of the particular bill, but rather that there was a definite feel in the Environment and Public Works Committee that there ought to be sequential referral to that committee, and also that that committee should have conferees.

I did not think it was necessary. There could be a time when some bill would come up, and we would want to do that. But I did not see that here, and I did not want to set a precedent.

The situation put this chairman of the Commerce Committee to the task to say, let us raise this issue now when we have the clean air bill up and specifically the amendment of our distinguished colleague from Rhode Island [Mr. CHAFEE].

Senator CHAFEE's amendment, and I am reading section 508(b), and then (c), says: "Monitoring atmospheric concentrations of chlorine—the Administrators of the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration shall monitor"—and so forth and so on.

I said, well, now, if we are going to get technical, we will have to get the clean air bill referred to the Commerce Committee and then we would have to have conferees.

So, in order to establish an understanding, to forestall misunderstanding, I raised that point. I have discussed it at length now, as well as other provisions at issue, sponsored by the Senator from Arizona, Senator MCCAIN. And I think with this colloquy and understanding there is no reason for us to have the referral. We are going to have enough problems with the conference on the clean air bill.

I generally support the clean air bill. There are some amendments. But I commend the Senator from Montana and his leadership in this regard, and the Environment Committee for bringing to the Congress in the early part of the session a clean air bill. I am ready to vote for the Chafee amendment. But I had to establish this understanding for our committee members because they wanted to know.

This is what has occurred. There are overlapping jurisdictions. There will be those questionable provisions from time to time. But I think the Members working together, as we are trying to do here on the floor this afternoon, will clear the air on that. And I do not believe my distinguished colleague, having seen and been able to study our bill, S. 169, on global change, wants sequential referral and conferees, as I understand it.

The PRESIDING OFFICER. The Chair recognizes the Senator from Montana [Mr. BAUCUS].

Mr. BAUCUS. The Senator from South Carolina has accurately stated the situation. The stratospheric ozone depletion that exists around the world, and particularly the Antarctic hole that the Senator from South Carolina was able to observe, along with other global warming phenomenon in this world, affect a number of different committees in the Senate. No one committee has the total exclusive jurisdiction over all environmental matters.

However, it is true the Environment and Public Works Committee is the primary committee of jurisdiction over environmental matters. It is, after all, the Environment and Public Works Committee and, under the Standing Rules of the Senate, the Environment and Public Works Committee has jurisdiction over environmental research, and over environmental policy, research and development. It is the premier environmental committee.

However, the Committee on Commerce, Science, and Transportation also has a very strong, definite, deep stake in the matter. After all, NOAA and other agencies are certainly within their jurisdiction, relevant agencies are within the jurisdiction of that committee.

This Senator will not object to S. 169 when it is brought up; will not object seeking sequential jurisdiction or even the appointment of conferees. However, the staffs of our two committees have been discussing and have agreed upon, at least at the staff level, some substantive changes that would be appropriate for S. 169 when it is brought up, and I think the Senator agrees to that.

In addition, I can speak for Senator CHAFEE in saying he has spoken with Senator MCCAIN, and Senator MCCAIN has indicated his desire that we proceed here today and that Senator MCCAIN, does not object to us bringing up the present amendment by the Senator from Rhode Island.

I think it is appropriate that the chairmen of the committees, as I know they will, work these matters out as they come up. This is not going to be the first time this Senate will visit global warming or chlorofluorocarbons. It is going to come up again. And when it does, Mr. President, I know the Senator from South Carolina, the chairman of the Commerce Committee, and Senator BURDICK, the chairman of the Environment and Public Works Committee, will be able to work out the appropriate delineations of jurisdiction both committees have. There is some overlapping jurisdiction here. It is clear. I think we can work this out.

My statement, Mr. President—I think I can speak on behalf of the committee—that I will not object to S. 169, is really a statement of good intention and good faith to work with the Senator from South Carolina.

There may be other instances, though, with other legislation before this Senate, where it would be appropriate for this Senator to object on a jurisdictional basis. But based on the discussion I have had with the Senator from South Carolina, this Senator will not object.

Mr. HOLLINGS. I thank the distinguished Senator. There are those fine points, as the distinguished Senator talks about research, and there are

Methyl chloroform is a deadly substance. Because of its high volume of production, methyl chloroform is responsible for 13 percent of the chlorine that is dumped into the atmosphere annually. Clearly, any delay in eliminating emissions of methyl chloroform will significantly exacerbate our ozone depletion problem.

The Environmental Protection Agency for example, estimates that delaying the phaseout of methyl chloroform from 2000 to 2030, will result in a 45 percent increase in atmospheric concentrations of chlorine over today's level. Currently at 3.0 ppb, chlorine concentrations will rise to 3.9 ppb by 2030 if we fail to phase methyl chloroform out by 2000. This is an increase we cannot afford.

EPA also tells us that if we fail to eliminate methyl chloroform emissions by 2000, we will increase by 3.6 million cases the number of nonmelanoma skin cancers; by 364 thousand the number of cataracts cases; ---and --- cause 65 thousand deaths among people born before 2075.

Make no mistake. If we fail to enact this most important amendment, the responsibility for these tragedies is none other than our own. We are to blame.

Jennifer Hess

METHYL CHLOROFORM AMENDMENT

Remarks of Senator Al Gore, Jr.

Mr. President, I rise to congratulate our Majority Leader Senator Mitchell, and the Environment and Public Works Committee, particularly Senators Burdick, Baucus, Chafee and Durenberger, for the leadership they have demonstrated in bringing the Clean Air Act amendments, truly historic legislation, to the floor. A comprehensive bill, S. 1630 addresses many of the threats facing our environment. I will reserve until tomorrow general comments on the Clean Air Act. Today, I rise in support of the amendment introduced by my distinguished colleague Senator Chafee, that calls for a phaseout of methyl chloroform production by the year 2000.

Methyl chloroform is one of the manmade chemicals that are destroying the stratospheric ozone layer which protects life on Earth from deadly ultraviolet radiation. As has been graphically illustrated by the huge hole torn in the ozone layer over Antartica, these substances are extremely powerful. The threat that halogenated chemivals pose to life as we know it simply can not be overstated. Scientists tell us that the incidence of cancer and blindness rises exponentially with increased exposure to ultraaviolet radiation.

Moreover, ultraviolet irradiation jeopardizes the entire food chain because the microscopic phytoplankton which are the base of the chain cannot survive increased exposure.

To combat the terrible threat posed to human health and the environment by ozone destroying chemicals, our campaign to date has been weak. In introducing this amendment to eliminate methyl chloroform emissions, my distinguished colleague Senator Chafee and the Senators who join me in cosponsoring this important amendment recognize that our efforts have been insufficient. And we are not alone.

At a meeting in Helsinki last May, the nations that are party to the Montreal Protocol agreed that the treaty--currently our only weapon against halogen-emitting substances-- is not tough enough. They recognized that just cutting production of chlorofluorocarbons--the worst ozone depleters-- by 50% and freezing the output of halons would not save the Earth's protective ozone shield from chlorine- and bromine-catalyzed destruction. They also realized that, if the ozone layer is to be salvaged, all substances that deliver chlorine into the atmosphere --not just the worst offenders--must be eliminated. Methyl chloroform was identified as just such a substance.

Frankly, the situation we face is grave. When I envision in my mind the hazards we are exposing ourselves and the ennvironment to the picture is really frightening:

Stripped bare of its delicate ozone sheathe, life as we know it is quivering beneath ultraviolets searing glare. We can stop this; we must stop this. I urge you to join me in supporting this most critical provision.

(4) Won't regulating HCFCs and methyl chloroform, two substitutes for CFCs, be counterproductive?

It is important to keep in mind that HCFCs are not benign substances. These chemicals may be less potent ozone depleters and greenhouse gases than the fully halogenated CFCs but they pose a serious threat just the same. Scientific experts have told us that our focus should not be limited to five or six CFCs and halons. We need to consider the total chlorine loading of the atmosphere.

It makes little sense to eliminate one source of chlorine and allow another source to expand to a point where we are right back where we started. The testimony of Dr. Watson and the charts presented by EPA showed us that unless there is some limit on HCFC production and use, atmospheric concentrations of chlorine will remain at unacceptably high levels for more than 100 years.

There is a growing awareness of the need to control the production and use of these "other regulated substances" to assure that such production and use will not --

(A) contribute to an increase in peak chlorine loading;

(B) reduce significantly the rate at which the atmospheric abundance of chlorine is projected to decrease on the basis of a year 2000 global phase-out of all halocarbon emissions (the base case); or

(C) delay the date by which the average atmospheric concentration of chlorine is projected under the base case to return to a level of 2 ppb, the highest concentration at which repair of the Antarctic ozone "Hole" may be possible.

There is a need for a statutory provision that (A) achieves the three environmental objectives set forth above, (B) recognizes the fact that achieving the goal of eliminating the potent, long-lived CFCs as rapidly as possible is, to some extent, dependent on the near-term availability of HCFCs as intermediate substitutes, and (C) provides the regulated community with the certainty needed to make investment decisions.

HCFCs

The controls in this bill will allow HCFC production to grow as substitutes for CFCs while, at the same time, bringing chlorine levels back down to 1985 levels by the middle of the next century.

The producers argue that they cannot make investments in HCFCs as long as there is "regulatory uncertainty." This bill will establish the rules of the game and give them the certainty they need to make investment decisions.

METHYL CHLOROFORM

[unless otherwise noted, the following data and conclusions are from an EPA draft report on the costs of controlling methyl chloroform, dated October 5, 1989]

Because of its high production volume (1.5 billion lbs. worldwide in 1988, more than 700 million lbs. in the U.S.) methyl chloroform (MCF) currently represents a significant source of chlorine to the stratosphere (13 percent, approximately 4 times more than CFC-113 of HCFC-22). The short atmospheric lifetime of MCF allows its contribution to stratospheric ozone loss to be reduced significantly faster than the contribution from any of the CFCs.

EPA has concluded that "a phase-out of methyl chloroform would be the single most important source for near-term reductions in stratospheric chlorine levels.

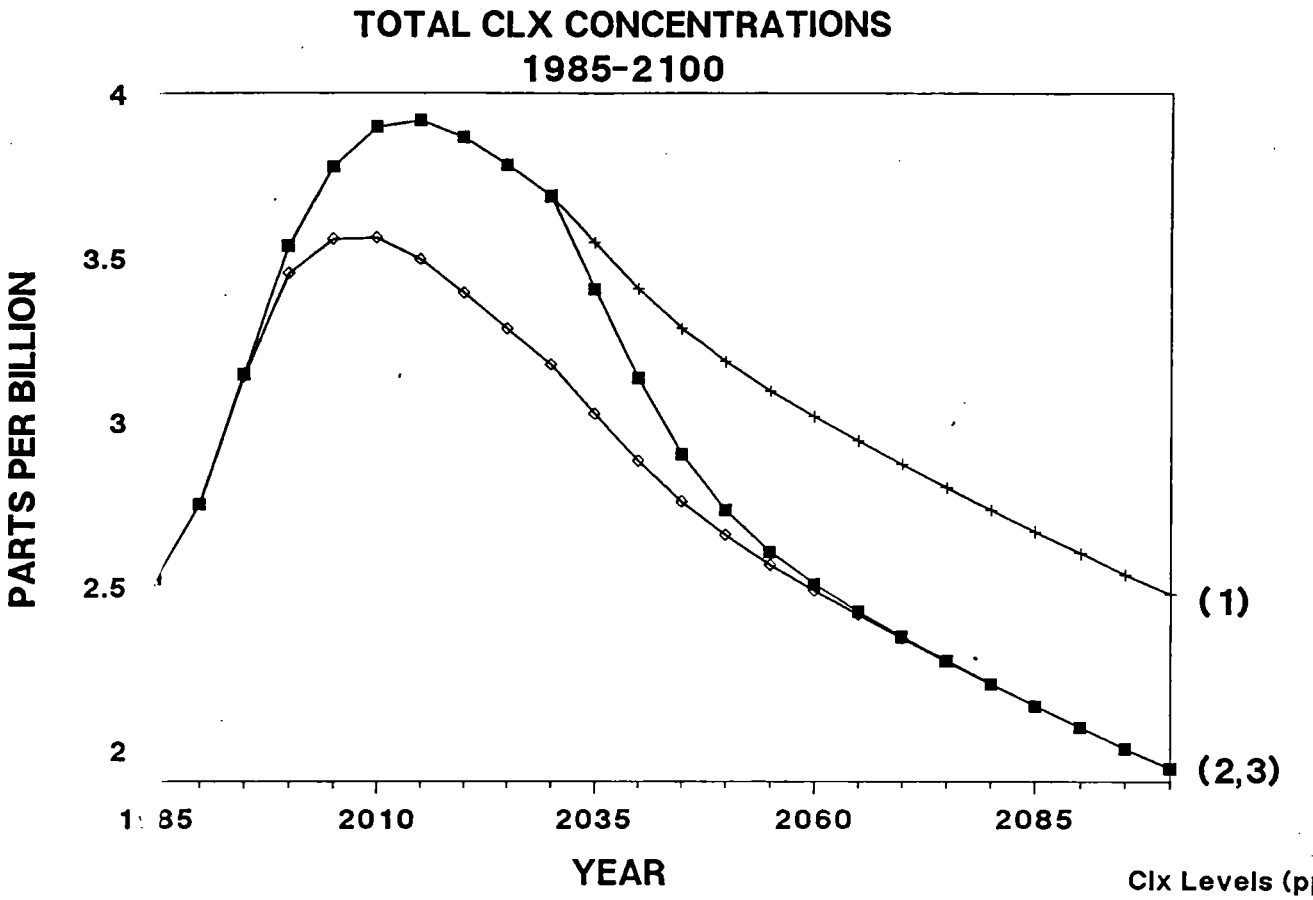
"A phase-out of methyl chloroform is the most effective means of limiting increases in peak chlorine concentrations and in achieving significant near-term reductions in stratospheric chlorine concentrations.

"Controls on methyl chloroform emissions will reduce stratospheric chlorine levels more rapidly than controls on any of the CFCs."

Updates of the Ocober 5th analysis show that delaying the phaseout of MCF from 2000 to 2030 will significantly affect the increased risks of greater ozone depletion from higher chlorine concentrations. The difference between peak chlorine levels resulting from a year 2000 phaseout of MCF (3.5 ppb) and a year 2030 phaseout (3.9 ppb) represent a 45 percent increase in risks from today's level (3.0 ppb). See Figure 7-6, copy attached.

Data from EPA's November 3, 1989 draft report "Costs and Benefits of Phasing Out Production of CFCs and Halons in the United States" and EPA's October 5, 1989 draft report show that the addition of methyl chloroform to the CFC and halon year 2000 phaseout will increase health benefits alone in just the U.S. by $89 to $348 billion through 2075. These benefits exceed the long term social costs of a methyl chloroform phaseout ($42.8 - $58.2 billion through 2075) by a substantial margin. Short term costs (1989-2000) are estimated to be $1.2 billion (an average of $100 million/year).

A June 30, 1989, report of the Montreal Protocol's Technical Review Panel (an international panel of experts) concluded that "substances currently exist for 90 to 95 percent of the methyl chloroform uses." EPA's October 5th report agreed that "technically feasible technologies that reduce or eliminate the use of MCF are available for all end-users of MCF."
See Exhibit 15 from EPA report, copy attached.



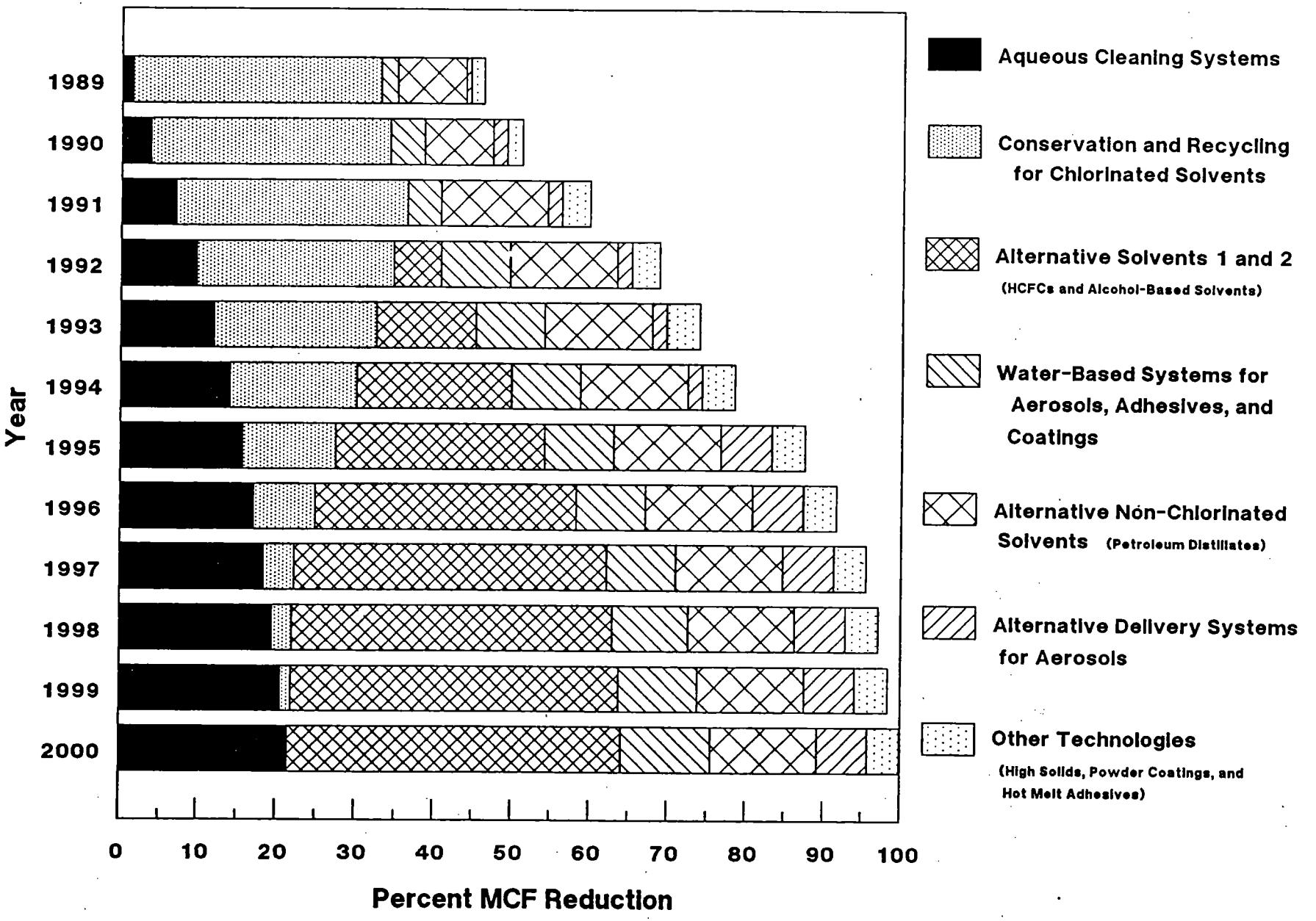
	Clx Levels (ppb) Maximum	2075
(1) Methyl Chloroform Freeze in 1991.	3.92	2.80
(2) Methyl Chloroform Freeze in 1991; Phaseout in 2030.	3.92	2.27
(3) Methyl Chloroform Freeze in 1991; Phaseout in 2000.	3.56	2.27

Assumptions:

- CFCs and Carbon Tetrachloride Global Phaseout in the Year 2000.
- HCFCs Capture 30% of What Uncontrolled CFC Market Would Have Been.
- HCFC Global Phaseout in the Year 2030.
- HCFCs Average an ODP of 0.02.
- 100% Global Participation.

Figure 7-6

Exhibit 15. Maximum MCF Reduction Possible Due to Controls*



* Note: The actual controls selected in any year depend on the phase-out/freeze schedule specified. This exhibit does not show the actual controls selected, instead it shows the maximum MCF reduction if all available controls are used.

Why is rapid elimination of MCF as important as (and more effective than) elimination of CFCs?

MCF contributes significant amounts of chlorine to the atmosphere and its relatively short lifetime means rapid controls produce rapid benefits.

MCF differs from the fully halogenated CFCs in that it has a substantially shorter atmospheric lifetime. For example, the lifetime of MCF has been calculated to be on the order of 6-7 years compared to lifetimes of 60 and 120 years for CFC-11 and CFC-12, respectively.

The importance of a chemical's atmospheric lifetime is that the longer its lifetime, the higher the percentage of the compound that will survive to be transported to the stratosphere where its chlorine will be released and begin the process of destroying ozone.

However, the lifetime alone does not determine the risks from that chemical to the ozone layer. The total amount of stratospheric chlorine contributed from a particular chemical will be determined not only by its atmospheric lifetime, but also by the quantity of its emissions, and the amount of chlorine it contains.

Because methyl chloroform is currently produced and used in large quantities (e.g., roughly equivalent to the total of all the CFCs combined) and because it contains three chlorine atoms, its contribution to current stratospheric chlorine levels has been significant. Despite its short atmospheric lifetime, MCF contributes 13 percent of the chlorine in the atmosphere. This is about 4 times more than the contribution from CFC-113 or HCFC-22. See Figure 7-4 from page 390 of Senate Report, copy attached.

MCF's short atmospheric lifetime (relative to the fully halogenated CFCs) allows its contribution to stratospheric chlorine concentrations to be reduced significantly faster than the contribution from any of the CFCs. Chlorine from MCF is almost entirely cleansed from the atmosphere in 15 to 20 years, whereas significant quantities of chlorine from the CFCs remain for well over 100 years. Thus, **controls on methyl chloroform emissions will reduce stratospheric chlorine levels more rapidly than controls on any of the CFCs.**

CONTRIBUTIONS TO ATMOSPHERIC CHLORINE: 1985

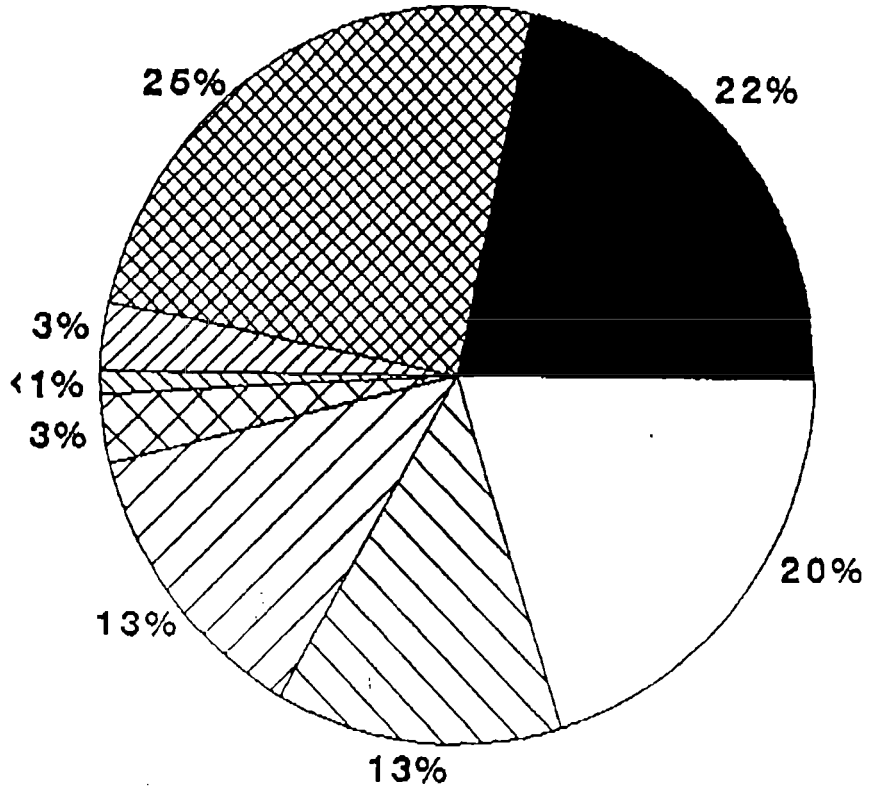


Figure 7-4

Since MCF has an ozone depletion potential (ODP) and lifetime comparable to HCFCs, why not treat MCF the same as HCFCs (i.e. phaesout in 2030) or, at most, freeze production at current levels?

EPA has concluded that whether MCF is frozen and eliminated in 2000 or phased out in 2030 will significantly affect the increased risks of greater ozone depletion from higher chlorine concentration. The difference between peak chlorine levels resulting from a year 2000 phaseout of MCF (3.5 ppb) and a year 2030 phaseout (3.9 ppb) represents a 45 percent increase in risks from today's level (3.0 ppb). See Figure 7-6, above.

"A phase-out of methyl chloroform would be the single most important source for near-term reductions in stratospheric chlorine levels. The significant role played by this chemical can be attributed to two factors: it is already a significant contributor of chlorine to the stratosphere and because it has a relatively short atmospheric lifetime, its chlorine contribution can be eliminated relatively rapidly following a phase out.

"A phase-out in 2000 of the CFCs and carbon tetrachloride will not have significant short-term results in reducing stratospheric chlorine concentrations, though they will be critical for achieving long-term reductions. In sharp contrast, the 2000 phase-out of methyl chloroform will result in its full impact being experienced during this near-term period.

"A phase-out of methyl chloroform is the most effective means of limiting increases in peak chlorine concentrations and in achieving significant near-term reductions in stratospheric chlorine concentrations.

What is the cost of a year 2000 phaseout of MCF and is it worth it?

Data from EPA's November 3, 1989 draft report "Costs and Benefits of Phasing Out Production of CFCs and Halons in the United States" and EPA's October 5, 1989 draft report "Costs of Controlling Methyl Chloroform in the United States" show that the addition of methyl chloroform to the CFC and halon year 2000 phaseout will increase health benefits alone in the U.S. by $89 to $348 billion through 2075. These benefits exceed the long term social costs of a methyl chloroform phaseout ($42.8 - $58.2 billion through 2075) by a substantial margin. Short term costs (1989-2000) are estimated to be $1.2 billion (an average of $100 million/year).

analysis of health benefits

Exhibit E-3 (copy attached) shows the range of effects that controls on U.S. methyl chloroform production could have on human health benefits in the U.S.. For example, the addition of methyl chloroform to the CFC and halon year 2000 phaseout will eliminate 3.6 million cases of nonmelanoma skin cancer in the U.S. and 64.9 thousand cancer deaths among people born before 2075. Similarly, 363.9 thousand cases of cataracts will be avoided.

Exhibit E-3 also shows that the difference between a methyl chloroform production freeze and a production phaseout for people born before 2075 is 875 thousand cases of nonmelanoma skin cancer, 15.9 thousand cancer deaths, and 86.2 thousand cases of cataracts.

As shown in Exhibit E-9 (copy attached), if methyl chloroform is added to the CFC and halon year 2000 phaseout, the value of cases avoided in the U.S. among people born before 2075 is estimated to range from 88.96 to 348.16 billion dollars. These health benefits exceed those associated with a methyl chloroform production freeze by 24.65 to 96.35 billion dollars.

analysis of costs

EPA's estimates of social costs associated with a year 2000 phaseout of methyl chloroform production are based on projected annual growth rates of between 2.2% and 4.7%. By contrast, industry demand forecasts show a decline in U.S. demand between 1988 and 2000, suggesting that EPA cost estimates based on assumptions projecting growth rates of even 2.2% may overestimate actual costs.

Exhibit 23 (copy attached) shows that social costs of a year 2000 phaseout of methyl chloroform are estimated (on the basis of 2.2% annual growth prior to 2000) to be $1.2 billion over the short term (1989-2000) and $42.8 billion over the long term (1989-2075).

Is a year 2000 phaseout of MCF achievable?

A June 30, 1989, report of the Montreal Protocol's Technical Review Panel (an international panel of experts) concluded that **"substances currently exist for 90 to 95 percent of the methyl chloroform uses."** EPA's October 5th report agreed that **"technically feasible technologies that reduce or eliminate the use of MCF are available for all end-users of MCF."**
See Exhibit 15 from EPA report, above.

EXHIBIT E-3

NUMERICAL ESTIMATES OF CHANGES OF NONMELANOMA, MELANOMA, AND CATARACTS RELATIVE TO PHASEOUT SCHEDULE 1

Scenario	Nonmelanoma Skin Cancers (Whites Only)				Melanoma Skin Cancers (Whites Only)		Cataracts
	Basal	Squamous	Total Cases	Fatalities	Nonfatal Cases	Fatalities	
Reduction in Cases from Schedule 1 Scenario People Born Before 2075							
1. Schedule 1	0	0	0	0	0	0	0
2. Schedule 1 MC Freeze	1,722,600	1,020,800	2,743,400	43,500	23,400	5,500	277,700
3. Schedule 1 MC Phaseout	2,274,200	1,343,800	3,618,000	57,500	31,100	7,400	363,900
Reduction in Cases from Schedule 1 Scenario Through 2165							
1. Schedule 1	0	0	0	0	0	0	0
2. Schedule 1 MC Freeze	2,139,300	1,213,600	3,352,900	52,200	32,700	7,400	277,700
3. Schedule 1 MC Phaseout	2,784,900	1,579,400	4,364,300	67,900	42,500	9,600	363,900

Source: EPA Nov. 3 '89 draft report

EXHIBIT E-9

SUMMARY OF THE HEALTH BENEFITS FOR PEOPLE BORN BEFORE 2075 BY SCENARIO
(Billions of 1985 Dollars)[a/]

Scenario	Value of Non-Fatal Skin Cancer Cases	Value of Cataracts Cases	Value of Skin Cancer Deaths[b/]	Total Value 1989-2075
Total for Each Scenario				
Schedule 1	8.84	0.48	228.5 - 914.0	237.82 - 923.32
Schedule 1, MC Freeze	7.11	0.40	166.0 - 664.0	173.51 - 671.51
Schedule 1, MC Phaseout	6.39	0.37	142.1 - 568.4	148.86 - 575.16
Value of Cases Avoided				
Schedule 1	-	-	- -	- -
Schedule 1, MC Freeze	1.73	0.08	62.5 - 250.0	64.31 - 251.81
Schedule 1, MC Phaseout	2.45	0.11	86.4 - 345.6	88.96 - 348.16

[a/] All dollar values reflect the difference between the No Controls scenario and the specified alternative scenario. Estimates assume a 2 percent discount rate.

[b/] Range is produced by assuming either $3 million or $12 million per fatal cancer case.

Source: EPA Nov 3 draft report

EXHIBIT 23

ESTIMATES OF SOCIAL COSTS FOR PHASE-OUT AND FREEZE SCENARIOS[a]
(billions of 1985 dollars)

Scenario	Short Term (1989-2000)	Long Term (1989-2075)
A. PHASE-OUT OF MCF PRODUCTION		
1. Growth Rate for Production (1989-2000) = 4.7%[b]		
Base Year: 1986 (Exhibit 25)	2.657	58.215
Base Year: 1988 (Exhibit 26)	2.365	55.558
2. Growth Rate for Production (1989-2000) = 2.4%[c]		
Base Year: 1986 (Exhibit 27)	1.384	43.942
Base Year: 1988 (Exhibit 28)	1.323	43.881
3. Growth Rate for Production (1989-2000) = 2.2%[d]		
Base Year: 1986 (Exhibit 29)	1.357	42.928
Base Year: 1988 (Exhibit 30)	1.233	42.804
B. FREEZE OF MCF PRODUCTION[e]		
1. Growth Rate for Production (1989-2000) = 4.7%[b]		
Base Year: 1986 (Exhibit 31)	0.247	8.455
Base Year: 1988 (Exhibit 32)	0.143	7.004
2. Growth Rate for Production (1989-2000) = 2.4%[c]		
Base Year: 1986 (Exhibit 33)	0.011	0.484
Base Year: 1988 (Exhibit 34)	0.000	0.000
3. Growth Rate for Production (1989-2000) = 2.2%[d]		
Base Year: 1986 (Exhibit 35)	0.009	0.471
Base Year: 1988 (Exhibit 36)	0.000	0.000

[a] Costs are discounted at 2 percent. It is assumed that the baseline growth in MCF production is 2.2 percent per year for the period 2001-2050 and zero after the year 2050.

[b] Corresponds to the "low conservation-high chlorinated solvent switch" scenario presented in the September 19 MCF Draft Report for the CMR end use distribution.

[c] Corresponds to the "high conservation-low chlorinated solvent switch" scenario presented in the September 19 MCF Draft Report for the CMR end use distribution.

[d] Corresponds to the "low conservation-no solvent switch" scenario presented in the September 19 MCF Draft Report for the CMR end use distribution.

[e] It is assumed that the production freeze will continue to be met after 2000 with the set of controls selected in 2000.

Source: EPA Oct 5 draft report

EPA summarized the technologies as follows: "For vapor degreasing and cold cleaning these alternative technologies include primarily aqueous and terpene cleaning, but also alternative cleaning solvents of low ozone depleting potential and engineering controls. For aerosols, adhesives, and coatings and inks, water-based technology offers effective substitutes for MCF-based systems in most applications. In addition, reformulation to petroleum distillates and use of alternative delivery systems currently available can significantly reduce the use of aerosols containing MCF use in adhesives. High-solid and powder coatings are innovative technologies that are currently available to users of coatings.

INDUSTRY DATA

Data prepared for the Halogenated Solvents Industry Alliance, USA in a November 1989 report by Chem Systems shows that: (1) **the U.S. is a significant consumer of MCF (622 million lbs. in 1988, representing 41% of world total) and**
(2) **for all U.S. applications, alternative substances or processes are available and being employed by significant portions of the market.**

For example, MCF accounts for only 31% of the solvent usage in metal cleaning (CFC-113 accounts for only 8%); only 5% of the adhesives market uses solvents and MCF accounts for only 6% of that 5%; MCF accounts for only 3% of the aerosol market; and only 1.2% of the coatings market.

<u>methyl chloroform's share of US market for various applications</u>

1) metal cleaning (vapor degreasing and cold cleaning)
   - US uses 474 thousand metric tons (mt) of solvent
   - methyl chloroform accounts for only 31% (149 thousand mt)
   - CFC 113 accounts for only 8% (41 thousand mt)
   - rest is perchloroethylene, trichloroethylene (TCE), methylene chloride and hydrocarbons (e.g. mineral spirits)
   - methyl chloroform demand in 1995 projected to be 6% less than 1988 and 5% less in 2000
   - an overall reduction of approx. 25% by 1995 and 40% by 2000 "realistically could be achieved"

2) adhesives
   - 76% of adhesives consumed in the US are water-based
   - only 5% are solvent-based (using 415 thousand mt)
   - of this 5%, methyl chlorofrom accounts for only 6% (25 thousand mt)
   - hydrocarbon solvents account for 61% (252 thousand mt) and oxygenated hydrocarbons account for 26% (108 thousand mt)
   - historic decline in solvent use in adhesives is projected to contnue at a rate of 3% per year resulting in reduced methyl chloroform demand of 15% by 1995 and 25% by 2000

3) aerosols
- US uses 912 thousand mt of solvent in aerosols
- methyl chloroform accounts for only 3% (28 thousand mt)
- CFC 113 accounts for less than 0.2% (1.5 thousand mt)
- hydrocarbons and water account for 94% (857 thousand mt)
- demand is projected to grow 18% by 1995 and 36% by 2000

4) coatings (films, inks, and paints)
- total volume of solvents used is 1.7 million mt
- methyl chloroform accounts for only 1.2% (21 thousand mt)
- water and nonsolvent based coatings account for almost 55% (4 million mt) of coatings market (7.3 million mt)
- virtually no growth in demand is forecast

5) electronics
- the use of aqueous cleaning for PCBs is well established in the U.S. accounting for about 40% of the total market
- methyl chloroform demand is projected to rise in the short term followed by a longer term decline as new technologies become progresively adopted. The longer term winners are most likely to be aqueous cleaning, low solids fluxes and semi-aqueous cleaning (terpenes). These are the options which the major companies are currently adopting as their response to CFC 113 supply limitations.
- 1989 consumption of 26 thousand mt is projected to decline 19% by 1995 and 42% by 2000

world consumption

	thousand metric tons	% of total
USA	280 (622 million lbs.)	41
Western Europe	151	22
Japan	151	22
rest	100	15
total	682 (1.5 billion lbs.)	100

production capacity (there are 12 producers worldwide)

USA	480
Western Europe	245
Japan	178
total	903

application	world	US
metal cleaning	66%	55%
vapor cleaning	(42%)	
cold cleaning	(24%)	
electronics	8%	8%
adhesives	8%	9%
aerosols	6%	9%
coatings	3%	7%
other	9%	12%

Explanation of methyl chloroform uses from EPA draft report

Current estimates of MCF demand place total MCF demand in the U.S. at more than 600 million pounds.

VAPOR DEGREASING AND COLD CLEANING IN THE METAL CLEANING INDUSTRY

Vapor degreasing and cold cleaning account for the largest use of methyl chloroform (approx. 60% of US MCF use). High solvency, low heat of vaporization, non-flammability, and low toxicity make methyl chloroform a good solvent for removing organic compounds, such as grease and oil from the surface of metals or metal manufactured parts. Solvent cleaning is usually an essential part of the production process as it prepares parts for next operations, such as assembly, painting, coating, electroplating, machining, fabrication, packaging, and inspection. Solvent cleaning may be divided into two types: cold cleaning and vapor degreasing. Cold cleaning is usually accomplished by immersing, soaking, or spraying the metal parts with solvent that is at room temperature. Vapor degreasing is a process that uses hot solvent vapor to remove contaminants. The advantage of using vapor degreasing over cold cleaning is that in vapor degreasing the metal parts are always cleaned with pure solvent because it is in the vapor state, as opposed to cold cleaning where the parts are being cleaned with solvent that has been contaminated with organics removed from the metal parts.

It is estimated that current regulatory actions on chlorinated solvents which impose stricter exposure limits may lead some chlorinated solvent users to switch to methyl chloroform instead of trying to control exposure.

Conservation practices in the cold cleaning and vapor degreasing end-uses have in the past and will continue in the future to reduce the use of MCF as users attempt to minimize the costs associated with solvent losses and waste disposal. Based on current consumption, these measures may lead to reductions ranging from 20 to 60 percent of current MCF consumption in these end-uses by the year 2000.

AEROSOLS

Approx. 12% of US MCF use is in aerosol formulations as either an active ingredient or as a solvent of other active ingredients. Its main advantages with respect to other solvents are its non-flammability, the acceptability of its toxicity profile, and good solvency power. In automotive and industrial products, which include various aerosol automotive cleaners and degreasers, methyl chloroform acts as the active ingredient because it is the degreasing or cleaning agent of the formulation. In aerosol pesticides, methyl chloroform is used to dissolve the active ingredients (i.e., the insect toxicant) and to allow rapid evaporation of the product. In household

products, methyl chloroform may act as a solvent of resin-based active ingredients (e.g., in spray shoe polishes and water repellents), or as the active ingredient of cleaning products (e.g., aerosol spot removers and leather/suede cleaners).

ADHESIVES

The main physical properties that make methyl chloroform a suitable solvent for adhesive applications (approx. 9% of market share) are its non-flammability, good solvency power, and high evaporation rate. Methyl chloroform is used to formulate styrene butadiene rubber adhesives, neoprene contact adhesives, and natural rubber and urethane-based adhesives, among others. These adhesives are used in various construction and packaging applications, such as recreation turf installation, hardboard panelling, glued plywood floors, assembly of metal doors, installation of thermal sandwich panels, manufacture of pressure-sensitive tapes and labels, and consumer contact cements.

ELECTRONICS

Approx. 6% of US MCF use is in the electronics industry to remove solder flux from printed circuit assemblies, in the oxidation step during the fabrication of silicon wafers, in the dry photo resists process, and in the degreasing step to clean silicon wafers in the initial wafer fabrication process.

COATINGS AND INKS

Approx. 3% of US MCF use is by manufacturers, printers, and users of protective and decorative coatings and inks. In coatings, methyl chloroform is used alone or combined with other solvents to solubilize the binding substance composed of resin systems such as, alkyd, acrylic, vinyl, polyurethane, silicone, and nitrocellulose resin. In addition to its non-VOC status and good solvency power, methyl chloroform is also used because of its non-flammability and fast evaporation rate. These properties also make methyl chloroform a suitable thinner for spray coating applications. Inks are used to print items ranging from wallpaper to dog food bags to beverage bottles and cartons. Many of these applications involve the application of colored ink to a film (or laminate) in the flexible packaging industry. As for coatings, methyl chloroform is a desirable solvent for ink applications because of its non-VOC status, non-flammability, and fast evaporation rate.

FLUOROCARBON/FLUOROPOLYMER INTERMEDIATES

Approx. 4% of methyl chloroform serves as raw material for the manufacture of polyvinylidene fluoride fluoropolymer. It is also used as the precursor chemical for HCFC-141b and HCFC-142b. Because these captive uses result in little or no emissions of methyl chloroform, they are assumed to remain unrestricted.

MISCELLANEOUS USES

Approx. 3% of US MCF use is in relatively small quantities in a variety of industries including the dry cleaning (primarily for the formulation of spot removers and leather and suede cleaners), fabric protection, film cleaning, and extraction industries. The common practice in the dry cleaning industry is the use of perchloroethylene; however, it is conceivable that stricter worker exposure limits on perchloroethylene may induce users to either invest in tightening up perchloroethylene machines or to switch to methyl chloroform machines. A comparison os the cost of MCF dry cleaning machines with new perchloroethylene machines that comply with the new OSHA standards indicates that there is little incentive to switch to MCF because MCF machines cost 10 percent more than the new perchloroethylene equipment.

RESPONSE TO PUBLIC COMMENTS

The majority of the public comments received on the substitutes for MCF in metal cleaning and electronics cleaning focused on aqueous cleaning in the following specific areas:

- o aqueous cleaning equipment requires much more energy than solvent cleaning;

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Energy consumption of aqueous cleaning system varies from being less than solvent cleaning to four times that of a solvent based systems. The energy consumption of an aqueous cleaning process depends upon: (1) the state of technology uses, (2) the number of cleaning stages used, and (3) the type of equipment configuration used. Newer equipment, both batch and in-line, being installed today is more energy efficient than solvent cleaning equipment (Gengler 1989). In particular, this applies to aqueous cleaning systems that are based on the closed loop recycling principle. The continuous filtering and reusing of the wastewater generated from the wash and rinse stage, reduces the amount of energy needed to heat the water used in these cleaning steps compared to a once-through system. In a once-through system the rinse and wash water after use is discharged and fresh water is then heated to the operating temperature. By avoiding the heat required to raise the temperature of the water from room temperature to the process operating temperature the energy consumption of the aqueous cleaning system is reduced significantly. The number of cleaning stages depends on the cleaning requirement.

Thus for cleaning applications (e.g., maintenance cleaning) where only a wash stage is required energy consumption is generally equivalent to solvent based processes, whereas, for cleaning processes that require all three stages (i.e., wash, rinse, and drying) energy consumption can be greater than solvent based processes.