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TESTIMONY OF THE
ALLIANCE FOR RESPONSIBLE CFC POLICY
BEFORE THE
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE
SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

April 16, 1991

Good Morning. My name is Kevin Fay, and I am Executive Director of the Alliance for Responsible CFC Policy. The Alliance is a coalition of CFC and HCFC users and producers in the United States. The Alliance has been a strong supporter of the international framework for protecting the ozone layer. (See Exhibit I). We have participated in all of the negotiating sessions leading to the Montreal Protocol and its most recent revisions, and in the development of Title VI of the Clean Air Act Amendments of 1990. We appreciate this opportunity to appear before your subcommittee to discuss the new data on the depletion of the ozone layer and its implications for future action on ozone protecting technologies.

The recent announcement from EPA of new NASA data indicating accelerated depletion of the ozone layer over North America is a cause for great concern among citizens, industry, and policy officials worldwide. The global ozone protection process has been guided by significant state of the art scientific analysis. While this issue has been at the leading edge of scientific investigation for the last fifteen years, it points up the difficulties of developing effective policies in response to rapid changes in scientific understanding.

Rowland said *
concentrations
increasing.

Despite the new data, the global and domestic policy process is working. The phaseout of CFCs, and the reduction in buildup of atmospheric chlorine concentrations is moving forward. It is chlorine concentration that has served as the surrogate for measuring our response to the ozone depletion concern. With this as our guide, it appears that we have reduced the potential peak chlorine concentration by more than 50%.

The response to the new data should not be to discard the policy process, but rather to rely on it. The data calls for:

--continued emphasis on the participation and enforcement of the global regulatory framework;

--rapid approval and commercialization of substitute compounds and processes, including HCFCs and HFCs;

--aggressive recovery and recycling of used CFCs and recognition of the challenges posed by the installed equipment base;

--efforts to accomplish technology transfer to developing countries to encourage the acceleration of the phaseout among these nations; and

--significant new research efforts concerning the effects and potential remediation of ozone depletion.

The Montreal Protocol on Substances that Deplete the Ozone Layer, originally signed in September 1987, remains an unprecedented agreement for addressing this critical global environmental issue. It is a solid regulatory achievement built on a foundation of global cooperation and goodwill among governments, industry and environmental organizations. It addresses a complex scientific objective while balancing the social and economic concerns of the developed and less developed nations.

But other countries going much further.

The 70 signatories to the Protocol represent more than 90% of the worldwide CFC production and usage. The treaty is a dynamic agreement based on scientific understanding, technological feasibility, and economics. The amendments adopted to the Protocol in London last year showed that the process can and will work.

It is apparent that our only hope of ultimately reducing global atmospheric chlorine concentrations is by using this international process to ensure that we achieve a 100% participation rate and full compliance by all parties. Anything less than 100% participation and compliance will lead to a higher peak chlorine level and elevated chlorine concentrations (in excess of 2 parts per billion) well beyond the year 2100. (See Exhibit II).

The 1990 amendments to the Protocol, a phaseout of CFCs by the year 2000, the addition of other ozone depleting compounds (carbon tetrachloride, methyl chloroform, and several small volume CFCs), and a resolution concerning the phaseout of compounds with low ozone depletion potentials (known as HCFCs), were all guided by rigorous scientific and technical analysis. There was also a keen awareness among the policymakers that a balance must be struck between the rapid phaseout of CFCs, the availability of safe substitutes, and the needs of existing installed equipment. It was understood that this balance must be struck if we are to have an effective global mechanism that encourages the 100% participation rate necessary to reduce atmospheric chlorine.

The new data we are discussing today create a greater sense of urgency concerning the effects of ozone depletion, and highlight the need for additional effects research and identification of steps for potential effects remediation. These new data emphasize the continued need for a balanced and effective global process that maximizes global participation.

Our scientific understanding several years ago was sufficient to lead U.S. industry to be the first to announce its support for a global phaseout of CFCs. We have worked since 1986 with the government, the international community, and our colleagues worldwide to assure that an effective global mechanism is implemented.

The industry has also made significant technological progress in reducing CFC usage and emissions, in recovering and recycling used CFCs, in identifying potential substitute compounds to assist in the elimination of the fully-halogenated compounds, and in shaving years off the normal commercialization process for these new compounds and technologies. Chemicals, manufactured products, and manufacturing processes, are being introduced today which offer the hope that we can eliminate CFC compounds from new products and processes in relatively short order.

Market forces have already led some industries, such as food packaging, to eliminate CFC usage entirely. Other industries, such as electronics manufacturers, have substantially curtailed their usage.

Industry has also worked to implement recovery and recycling programs for mobile and stationary air conditioning equipment, beginning with the development of necessary industry standards and the building of new infrastructures in order to reprocess these compounds. In 1989, the Alliance petitioned EPA to establish uniform national recycling standards and requirements.

As a result of the work on new compounds, processes, and recovery and recycling, we believe that the market for substitute chemicals will be less than half the size of the CFC markets they replace. In other words, conservation and replacement with not-in-kind substitutes will eliminate over half of the traditional markets.

All of this work was begun several years ago, long before Clean Air Act amendments were adopted or even before the revisions to the Montreal Protocol. While the Clean Air Act amendments provide EPA with all the necessary authority to regulate (or accelerate) the CFC phaseout and the introduction of substitute chemicals, they can do little to affect global atmospheric chlorine concentrations that is not already being done.

Pt. is for U.S. to lead govt effort.

By our analysis, the Clean Air Act amendments will have the effect of reducing chlorine over and above that which would be achieved by the Montreal Protocol (assuming full global compliance) by only 0.1 ppb, a de minimus amount, over the next several decades. Atmospheric chlorine concentrations are currently above 3 ppb. If all CFC activity were ceased today, stratospheric chlorine concentrations would still reach approximately 3.5 ppb. We are projecting that the chlorine concentration will peak at approximately 3.9 ppb. In contrast, the original 1987 Montreal Protocol would have resulted in atmospheric chlorine concentrations in excess of 8 ppb.

But duration of exposure is the key

U.S. usage of CFCs has declined substantially ahead of the schedule provided by the Protocol or the Clean Air Act. Usage in the first Protocol control year was approximately 25% less than that allowed by the Protocol. This reduction is due in large part to the industry actions described earlier. It is currently expected, assuming EPA's rapid approval and acceptance of HFCs and HCFCs, that the transition to ozone protecting compounds and technologies could be virtually complete for most new products $\boxed{\text{by 1997.}}$ - So, 15 yrs to recoup & develop subs.

This does not address one issue of major concern to the U.S. economy, the existence of a huge installed base of equipment that relies upon CFCs for operation. The United States has the highest utilization rate for air conditioning and refrigeration equipment in the world. This equipment has been valued at more than $135 billion and is owned by consumers, small business owners, building owners, and industry. It includes:

--140 million home refrigerators and freezers
--80,000 large building and industrial chillers
--90 million mobile air conditioning systems

--45 million residential and commercial central air conditioning systems

--50 million room air conditioners

--5-10 million commercial refrigeration units

None of the identified substitute compounds are "drop-in" substitutes for the CFCs used in this existing equipment. It is estimated that approximately 216 million pounds of CFCs are used annually to service this existing equipment base. Under the current CFC reduction schedules for 1997 (the Protocol and the Clean Air Act amendments are consistent between 1997-2000), the U.S. is allowed only 108 million pounds of virgin production, creating a potential shortfall of 108 million pounds of essential refrigerant material. recycle

Absent other technological breakthroughs, CFC shortfalls after 1997 will result in the early retirement of this equipment or reduced operating efficiencies. The latter effect could lead to significantly increased energy consumption by this equipment.

It is expected that some of the shortfall will be made up as a result of CFC recovery and recycle operations, and that retrofitting of some existing equipment may be possible. No study by government or industry has indicated that this projected shortfall in CFCs can be eliminated through even the most aggressive recycling efforts. Therefore, while it is expected that most manufacturers of new products will have ceased to rely on CFCs, careful policy consideration must be given to the consumers and owners of existing equipment that may remain in service from anywhere from 10 to 40 years. recognize, subs.

Much has been made of calls among European countries for accelerated CFC phaseouts. It should be noted that none of these countries relies to the same extent on air conditioning and refrigeration technology as does the United States, nor do they have the climate conditions that would require such reliance. Also, to our knowledge, the policies adopted by these countries are silent on the

this is unrealistic really. even if Arego a/c's.

issue of existing equipment and whether CFCs will be allowed to be used for such equipment.

Need EPA to cooperate.

The sooner EPA signals the acceptance of the substitute compounds that have been identified, such as HFCs and HCFCs, the sooner manufacturers will be able to broadly commercialize non-CFC reliant equipment. This will alleviate some of the pressures expected in the latter 1990's and after the year 2000 and the concern for premature obsolescence of the existing equipment base. According to a study performed for the Department of Energy, a three year delay in making the substitute compounds available nearly doubles the capital obsolescence costs from $13 billion to $22 billion.

Substantial retrofit of existing equipment may be possible. However, this too will entail substantial investment. One large corporation has estimated the cost of its program to retrofit its 476 industrial CFC-reliant chillers at $90 million. The cost for accomplishing the same task for the more than 80,000 industrial chillers in the United States would be more than $15 billion. (Even if only one-third of these units were converted the cost would still be in excess if $5 billion.)

In any case, the policy requirement is the same, rapid approval of substitute compounds, and identification of the technological needs of the installed equipment base. The sooner the substitute compounds are commercialized, the smaller the need for CFC production and the smaller the base of existing equipment at the end of the CFC phaseout schedule.

Concern has been expressed for the use of HCFC compounds as part of the transition out of CFCs, because of their low, but measurable, ozone depletion potential. The industry recognizes this concern. U.S. industry was the first to acknowledge that HCFCs are "bridging" compounds. As a family they are an 85% to 98% improvement over CFCs. (See Exhibit III). The Protocol's technology assessment panel has determined that commercialization of these compounds is essential in order to accomplish the first priority of the Montreal Protocol, i.e., the elimination of CFCs.

HCFCs are not perfect, but they allow the continuation of high priority products and services such as refrigeration, air conditioning, and energy efficient insulation materials, while offering similar consumer and workplace protections characteristic of the CFC compounds. HCFCs are treated as a class in the Clean Air Act and in the Montreal Protocol. It is already clear that the market has identified a preference for the low or no ozone depletion products. EPA and policymakers at the international level have recognized the essentiality of these compounds and the need to ultimately phase out their use as well. Industry is continuing to work with EPA and other Protocol parties on the appropriate use of these compounds.

It is important that EPA speak clearly now so that final commercialization decisions can be made by the chemical manufacturers and the user industries. Although some of these compounds are "bridging" compounds, the most recent scientific data urge that we begin to build this bridge now and continue the search for the next generation of chemicals and technologies beyond HCFCs. Any delay in hopes of finding a "perfect" solution will only lead to additional chlorine build-up in the atmosphere. * YES!

But what, why?

Reasonable HCFC use will not add to the peak atmospheric chlorine levels. If phased out in accordance with the timetables set forth in the Clean Air Act, HCFCs will not delay the return to pre-Antarctic ozone hole chlorine levels. The phaseout for HCFCs in the Clean Air Act, and the resolution adopted as part of the 1990 Protocol revisions, are based on sound scientific analysis, as well as the practical consideration that some assurance of a reasonable lifetime for HCFC technologies is necessary in order to persuade the users to shift to these technologies.

Furthermore, if HCFCs and HFCs are not rapidly commercialized, we believe that the task of encouraging a more aggressive phaseout policy on the less developed countries and current significant Protocol non-signatories will be made virtually impossible. Continued CFC use by those nations for the timeframe currently allowed by the Protocol will lead to significantly higher atmospheric chlorine concentrations for several additional decades. (See Exhibit IV).

HCFCs and HFCs have been more thoroughly tested and scrutinized than any chemicals ever proposed for commercialization. The concern for exposures to these compounds has been recognized by the industry and has led to an unprecedented cooperative research effort by the industry and the government on the potential toxicological and environmental effects (including global warming potential) of these compounds.

Finally, the new ozone data are cause for great concern from the perspective of the possible health and environmental effects, as a result of the stratospheric ozone losses. The United States has spent in excess of $1 billion on scientific study of the atmosphere, but we have spent insignificant sums on researching the potential effects of ozone depletion or possible remediation steps.

EPA Administrator William Reilly has spoken frequently in the last year on the need for the Agency to speak clearly and accurately on potential environmental risks. While the risks as a result of stratospheric ozone losses are potentially significant, it is imperative that they be properly characterized in the context of actual scientific analysis. To date, the research on the effects of ozone depletion, including measurements of ground level ultraviolet radiation, has been inadequate. It is imperative that this research now be carried out.

In sum, the new scientific data call not for a change in policy, but for the continued aggressive implementation of the international and domestic policy frameworks already in place.

U.S. industry is poised for the rapid commercialization of ozone protecting technologies. The development and use of CFC substitutes on a worldwide scale is a technological accomplishment that is being achieved in an unprecedented brief period of time, literally altering technologies in ten years that were originally developed over the last 60 years. The global policy process that is producing this technological evolution is working better than anyone could have anticipated. It is imperative that we continue to rely on it to achieve the next crucial steps in the ozone protection process.

We appreciate the opportunity to participate in this hearing and look forward to answering any questions that you may have.

Exhibit I

ALLIANCE FOR RESPONSIBLE CFC POLICY
1901 NORTH FORT MYER DRIVE, SUITE 1200
ARLINGTON, VIRGINIA 22209
(703) 243-0344

FAX (703) 243-2874

POLICY STATEMENT

BACKGROUND

The Alliance for Responsible CFC Policy is a coalition of industries in the United States that produce chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs), and products and services that rely on these compounds. The Alliance was organized in 1980 to ensure that the establishment of reasonable government policies regarding the further regulation of CFCs and protection of the stratospheric ozone layer be pursued on an international basis and be based on sound scientific facts.

Thousands of consumer and industrial products and processes rely on CFCs, HCFCs, and HFCs. These compounds have contributed greatly to the quality of life in the United States and around the world because of their unique and beneficial combination of functional properties and excellent safety characteristics.

In 1986, the Alliance was the first industry organization to issue a call for an international agreement to address the concerns of ozone depletion. By 1987, an unprecedented global environmental treaty, the Montreal Protocol on Substances that Deplete the Ozone Layer, was signed by 24 countries and the European Economic Community. At that time, it required the phaseout of 50% of the 1986 levels of worldwide CFC production by 1998. The Alliance welcomed this accord, and endorsed prompt Senate and Presidential ratification. The Protocol represented the unprecedented cooperation of nations, industries, and environmental organizations in addressing an international environmental problem.

Significant scientific research contributed to the basis for the Montreal Protocol. Further research, data gathering, and analysis determined in 1988 that chlorine from long-lived man-made compounds such as CFCs contributes to stratospheric ozone depletion over Antarctica, and that chlorine may also play a role in ozone depletion at other latitudes. This scientific evidence immediately led industry to seek a total phaseout of worldwide CFC production in order to assure that atmospheric chlorine be reduced to the level before development of the "Antarctic hole." In 1990 the Alliance supported the strengthening of the Protocol to phase out CFCs by 2000 at the Second Meeting of the Parties to the Montreal Protocol in London. The revised Protocol has now been ratified by 60 nations representing 90% of world CFC production and use.

U.S. industry is determined to protect the ozone layer by taking precautionary measures to control equitably total global emissions of substances that deplete it, with the ultimate goal of their eliminated production and use based on adequate scientific, technical, and economic considerations. A CFC production phaseout by 2000 is generally achievable so long as alternative compounds including the HCFCs and the HFCs are proven to be safe and effective, and are rapidly made commercially available throughout the world.

The minimization of peak atmospheric chlorine and the reduction of the chlorine concentration to that which existed prior to the appearance of the "Antarctic hole" is a sound environmental goal that is achievable only through 100% compliance with the Montreal Protocol by developed and developing countries, and prudent use of essential alternatives such as HCFCs and HFCs.

A decade after its beginning and three years following the ratification of the Montreal Protocol, the Alliance for Responsible CFC Policy continues its mission of seeking international ozone protection goals that are workable and fair to both developed and developing countries. Further missions for the 1990s include the establishment of responsible national, state, and local policies concerning the regulation of CFCs, HCFCs, and HFCs and protection of the ozone layer; the availability of CFCs before and beyond a phaseout for the industries which will rely on them; and the establishment of a smooth and orderly transition to safe and effective alternative compounds.

MISSIONS

*The Alliance will continue to work within the Montreal Protocol process as the United Nations Environment Programme conducts an assessment of the Protocol and considers an acceleration of the CFC phaseout and an eventual phaseout of HCFCs. In addition, the Alliance will monitor and participate in international efforts concerning technology transfer and any trade implications that arise from the Protocol's implementation.

*The Alliance will monitor and participate in international meetings which address global warming and the implication of CFCs, HCFCs, or HFCs as greenhouse gases.

*The Alliance will actively monitor and advocate the industry's positions on the federal level in Congress, and communicate with members of Congress and their staffs. Congressional activity may include the issues of further taxes on ozone-depleting substances, acceleration of the CFC or HCFC phaseouts, use restrictions on particular industries, or global warming.

*The Alliance will actively monitor and advocate the industry's positions at the federal regulatory agencies. Regulatory activity will include EPA rulemakings to implement portions of the Clean Air Act Amendments of 1990 dealing with CFC and HCFC recovery, recycling, and reclamation; emission reduction; labeling; and a safe alternatives policy. The Alliance will continue to coordinate, monitor, and advocate positions on the EPA's review of the toxicity of the substitute compounds, clarification of hazardous waste requirements, and addition of the alternatives on EPA's list of "Volatile Organic Compounds (VOCs) of Negligible Photochemical Reactivity That Should Be Exempt From State Implementation Plans."

*The Alliance will actively monitor and advocate the industry's position at the state and local level as policymakers in state legislatures, city councils, and regulatory agencies seek to implement ozone protection policies that are unnecessary, environmentally insignificant, and burdensome to consumers and industry. The Alliance will monitor new legislation and ordinances; seek to amend some enacted laws; monitor regulatory activity implementing enacted laws, adding the substitutes to the states' lists of VOCs Exempt from State Implementation Plans, and treating CFCs or HCFCs as toxic or hazardous.

*The Alliance will continue to educate and inform policymakers at all levels of government, the media, the general public, and relevant industries or trade groups which seek information.

*The Alliance will continue to support the research and development of alternative technologies, substitute compounds, reduced emissions, and reduced CFC and HCFC usage.

POSITIONS

*International stratospheric ozone protection goals must be accomplished cooperatively and fairly among the nations of the world through the Montreal Protocol process. The participants must work within the Protocol's framework to reassess the Protocol taking into consideration the most recent and credible scientific, environmental, technical, and economic information.

*Federal legislative and regulatory ozone protection policies should be consistent with the Montreal Protocol; consistent with the intent of Congress in passing the Clean Air Act Amendments of 1990; fair and nondiscriminatory to the CFC-, HCFC-, and HFC-related industries; technically and economically feasible; environmentally significant; cognizant of existing products which rely on CFCs; and free of unnecessary burdens on society, including disruptive taxation.

*Conservation and recovery, recycling, and reclamation of used CFCs and HCFCs are responsible and beneficial practices because they limit venting of these compounds to the atmosphere, result in reduced production, and provide a mechanism to assure the availability of CFCs to service and maintain existing equipment which is designed to operate with CFCs beyond a phaseout. State and local governments eager to establish their own recovery and recycling requirements should adhere to the national uniform requirements which the U.S. Environmental Protection Agency (EPA) will promulgate and which are required by the Clean Air Act to prohibit venting and to mandate recovery and recycling of used CFCs and HCFCs.

*State and local legislative and regulatory ozone protection policies are unnecessary because the Montreal Protocol framework, the Clean Air Act Amendments of 1990, and industry's progress toward recovery and recycling and implementation of alternatives are adequate for achieving the goal of protecting the ozone layer and restoring the atmosphere to a suitable condition.

*Policy at all levels of government must recognize the essentiality of HCFCs and HFCs in assuring a rapid phaseout of CFCs by developed as well as developing countries within the Protocol's time frames; and policy must recognize that investment in substitute compounds and alternative technologies must not be discouraged or prematurely curtailed before society has achieved benefits commensurate with required resources, unless compelling scientific reasons justify it.

*Efforts to address global warming and the implication of CFCs, HCFCs, or HFCs as a greenhouse gases must be conducted internationally and be based on sound scientific facts. Further scientific research is essential to increase the understanding of human activity on global warming. Any policy formulation addressing global warming must take into account direct and indirect energy consumption, and overall energy efficiency.

*Research and development of safe and effective ozone-protecting compounds and technologies, and reduction of CFC and HCFC usage and emissions are essential in order to protect the stratospheric ozone layer and to achieve the goals of a smooth and orderly transition from CFCs.

*Technology transfer and financial assistance are necessary to encourage the participation of the lesser developed countries in the Protocol process. These must be carried out in a manner consistent with free market principles in international trade.

GLOBAL COMPLIANCE IS MOST IMPORTANT ISSUE

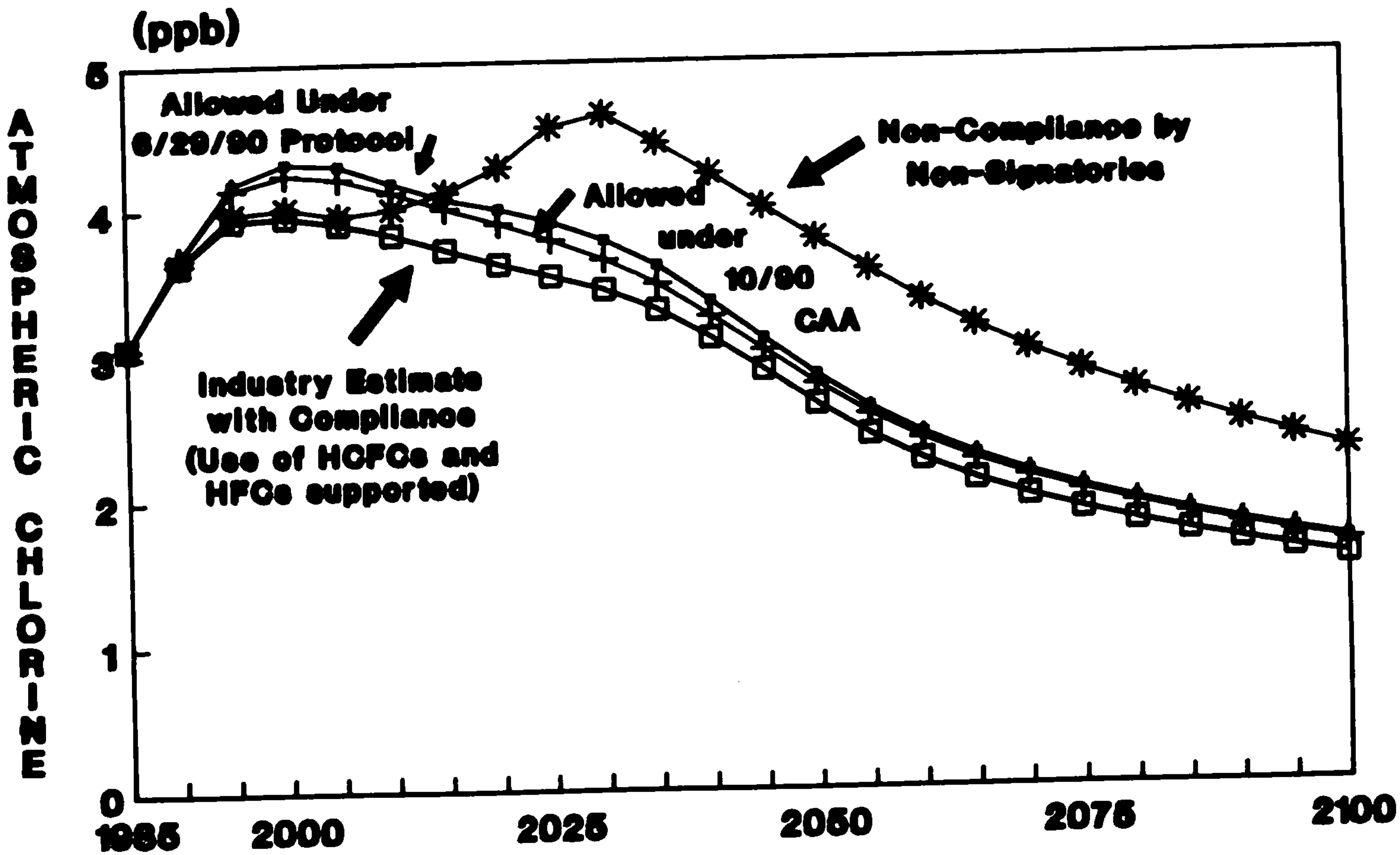
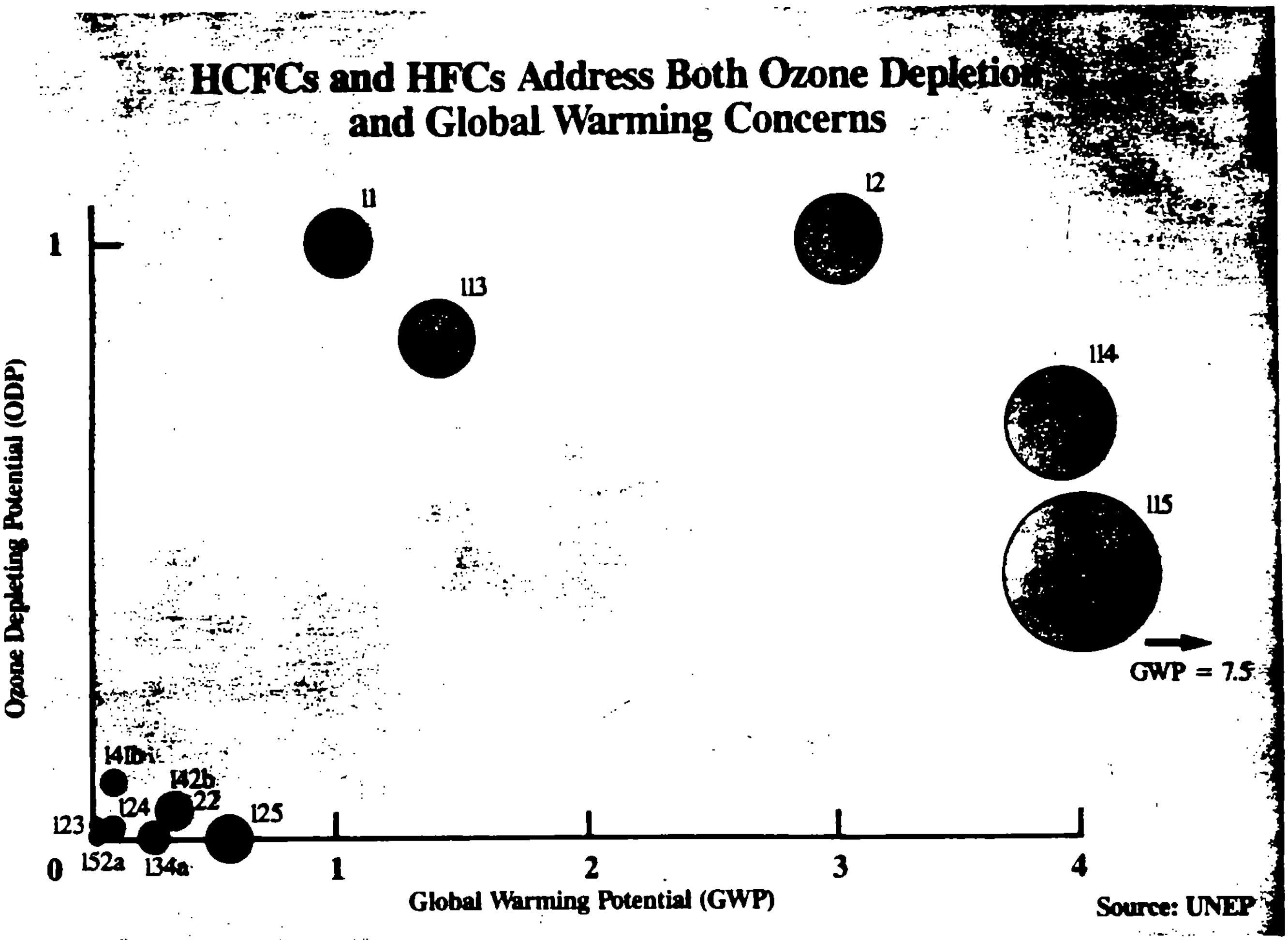


Exhibit II

Exhibit III



The large yellow circles at the top and right of the figure show the relatively large ozone depleting and global warming potentials of the CFCs. The small blue circles at the bottom and left of the figure show the significantly reduced potentials of HCFCs and HFCs. The area of circle is proportional to the atmospheric lifetime of the compound. Note: CFC-11 is the reference compound and hence has an ODP and GWP of 1.

Exhibit IV

Alliance for
Responsible CFC Policy

1901 N. Ft. Myer Dr., Ste. 1200, Rosslyn, Virginia 22209

June 1990

REALISTIC POLICIES ON HCFCs NEEDED IN ORDER TO MEET GLOBAL OZONE PROTECTION GOALS

In March 1988, an international scientific panel issued the first consensus report implicating fully halogenated chlorofluorocarbons (CFCs) in the depletion of stratospheric ozone. The Alliance For Responsible CFC Policy, a coalition of U.S. industries that use or produce CFCs and HCFCs, announced its support for the revision of the Montreal Protocol on Substances that Deplete the Ozone Layer to achieve the phaseout of CFCs as soon as possible, consistent with the availability of safe acceptable substitutes and assuring the needs of existing installed equipment (valued in the U.S. alone to be worth more than $135 billion).

Because CFCs have many important uses—ranging from food preservation and air conditioning to energy-efficient insulation and medical devices—the Alliance has also stressed the need for an orderly transition to replacement products of less or no ozone depletion potential.

There are several options that jointly can achieve a timely phaseout of CFCs. First, recovery and reclamation will lower the demand for CFCs long term. Second, some CFCs will be replaced by "not-in-kind" materials, such as water-based systems or hydrocarbons for certain cleaning agent applications. Third, replacement chemicals in the fluorocarbon family will be uniquely qualified for such key uses as refrigeration, air conditioning, energy saving foam insulation and specialty cleaning for medical or critical electronics. These compounds—the hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs)—perform in a similar manner to CFCs and offer dramatically improved environmental characteristics.

HCFCs and HFCs are the best alternatives available to society during the next several decades for certain uses. The HCFCs have, on average, 95 percent less ozone depletion potential than today's CFCs, and the HFCs have no impact on ozone. Both classes of compounds make minor contribution to calculated global warming, but much less than that of the CFCs.

We acknowledge that industry's ultimate goal is to develop CFC replacements and technologies that are energy-efficient, safe in use and have no environmental impact. At this time, however, no such compound or technology has been developed for certain key applications, nor does any appear likely in the near future.

Until such products or technologies are developed, the HCFCs can facilitate a timely CFC phaseout by serving as bridging chemicals. Because the HCFCs contain small but measurable chlorine, the Alliance believes that responsible international policy will include realistic provisions for controlling these compounds so that pre-Antarctic "hole" atmospheric chlorine levels can be achieved. This approach is consistent with the goals of the science panel to the United Nations Environment Programme.

Prudent policy would support the introduction of these alternatives and their use in new equipment until at least 2030. Recycle

Global compliance to a CFC phaseout is required in order to minimize atmospheric chlorine concentrations and maximize ozone protection. A 100 percent global compliance would ensure maximum ozone protection, but uncertainty of hydrochlorofluorocarbon (HCFC) availability via production caps, ozone depletion potential (ODP) limits or regulations requiring a phaseout of HCFCs before the time period 2030 to 2050 will encourage noncompliance.

Chlorofluorocarbons (CFCs) serve many needs considered valuable to society. Those in developing countries desire to improve their standards of living through the use of goods currently dependent on CFCs. Technology assessments show that HCFCs are the only safe, viable alternatives for about 30 percent of CFC demand.

Continued use of CFCs by countries accounting for a small percentage of current CFC consumption would lead to an increase in chlorine concentrations in the stratosphere and a risk of unnecessary ozone depletion for decades. Developing countries currently account for about 15 percent of CFC consumption and, of those, countries accounting for about 10 percent of current consumption have not signed the Montreal Protocol.

Conversely, scientific analysis indicates that a transition from CFCs to HCFCs would reduce chlorine concentrations in the stratosphere, thus increasing ozone protection. An HCFC phaseout over the period 2030 to 2050 would "repair" the Antarctic ozone "hole" at the earliest possible date.

Continued use of HCFCs beyond 2030 to 2050, however, could lead to an increase in chlorine and prevent "repair" of the Antarctic ozone "hole." Recognition that HCFCs are transitional solutions and establishment of prudent HCFC phaseout dates is therefore encouraged.

and some new production provides HCFCs for servicing the declining balance of capital equipment for its 1–15 year residual life. (Some capital equipment, such as large air conditioning and refrigeration systems, last more than 30 years.)

This approach would facilitate a timely phaseout of CFCs. It would provide the certainty needed by industry and consumers to support the introduction and use of HCFCs for those CFC applications for which no environmentally benign near-term replacements are feasible. Most important, it would allow the use of HCFCs over a sufficient period to encourage developing countries to phase out of CFC production and transition to the alternative products. Without such an approach, some developing countries would likely continue to produce and/or use CFCs, leading to increased potential for environmental harm.

To date, U.S. companies have invested several hundred million dollars in research and capital for development of HCFC, HFC, and other ozone protecting technologies. The total for U.S. producers could reach $2 to $3 billion over the next decade. Much larger investments will be necessary by the industries which currently use CFCs to produce industrial and consumer durable goods.

Premature unilateral national regulations by a major nation in alternatives development could create continued uncertainty about the status of the HCFCs, thus deterring marketplace acceptance and adoption.

The Alliance For Responsible CFC Policy strongly supports global action through the Montreal Protocol that would include provisions for a complete CFC phaseout in developed countries by the year 2000 (2010 in developing countries) and controls on HCFCs that would allow their use as transitional compounds at least until the period between 2030–2050.

INTRODUCTION

United States industry strongly advocates strengthening the Montreal Protocol to completely eliminate the production of fully halogenated chlorofluorocarbons (CFCs). However, the phaseout must occur in concert with an orderly transition to alternative products, particularly the hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) to minimize disruptions to society.

HCFCs and HFCs, which are necessary to achieve a safe, orderly global phaseout of CFCs, should not be regulated over the period of a normal product life cycle (30–40 years for these chemicals and capital equipment that uses them). Regulation of these compounds will increase uncertainty among producers and users and could delay or stop necessary investment. Near-term production and use regulations will likely lead to prolonged use of CFCs, resulting in increased chlorine concentrations in the atmosphere and increased probability of damage to the ozone layer.

As little as 1% noncompliance to a CFC phaseout in high growth LDC (less developed countries') economies contributes more total chlorine emissions than would occur from ten years of HCFC use by the entire world. For this reason we believe HCFCs must be in the world's alternative plans for sufficient time to assure that LDCs do not postpone CFC phaseout while waiting for solutions that have no environmental impact but may be available only in the distant future.

Since HCFCs contain chlorine and can contribute low, but measurable, amounts of chlorine to the ozone layer, some policymakers and environmentalists have been reluctant to support the introduction of HCFC alternatives without restrictions. They fear that unlimited, continued growth in the emissions of these compounds could eventually lead to increases in atmospheric chlorine.

Thus an approach is required that will encourage a series of investments over the next two decades for the transition from CFCs to HCFCs and at the same time prevent unlimited growth in the use of HCFCs. Time certain dates for the phaseout of HCFCs that allow a normal product life cycle beyond the transition period satisfy this requirement. It would provide the regulatory certainty needed to encourage development of HCFCs and would also ensure that the search for "non-chlorine" options continues.

Time certain phaseout dates in the time period 2030–2050 for HCFCs could provide the regulatory certainty to minimize atmospheric chlorine throughout the next century. Specific phaseout dates within this time period can allow for differing atmospheric lifetimes for HCFCs and appropriate time lags for developing countries.

CFC PHASEOUT REQUIRED

The discovery of the Antarctic ozone "hole" in 1985 and the role that chlorine plays in the development of this localized, seasonal ozone depletion, has undermined confidence in the calculations of ozone changes that might result from continued use of CFCs.

A conservative approach to projecting potential effects involves examining future chlorine concentrations in the atmosphere under various assumptions of emissions of chlorine-containing compounds. An approach that minimizes chlorine concentrations and still meets societal needs provides the optimum solution.

Using this approach, the items of most concern from an ozone protection standpoint are the long-lived, fully halogenated compounds—CFCs and carbon tetrachloride. Current scientific information indicates that most, if not all, of the chlorine content of these compounds is transported to the stratosphere where it has the potential to destroy ozone. Furthermore, these compounds remain in the atmosphere for about 100 years, providing a significant background chlorine concentration.

An 85 percent reduction in global CFC emissions from 1986 levels is necessary just to maintain current atmospheric levels of chlorine from these compounds. If the goal is to reduce, rather than stabilize, chlorine concentrations in the atmosphere, the overall reduction in global CFC emissions must be much greater that 85 percent.

U.S. industry believes CFC emissions should be reduced by more 'han 95 percent worldwide to ensure otection of the ozone layer. The ɹnited States has announced its policy to support a phaseout of CFCs and Halons by the year 2000 provided that safe substitutes are available.

Industry Estimate of How CFC Demand Could Be Satisfied in Year 2000

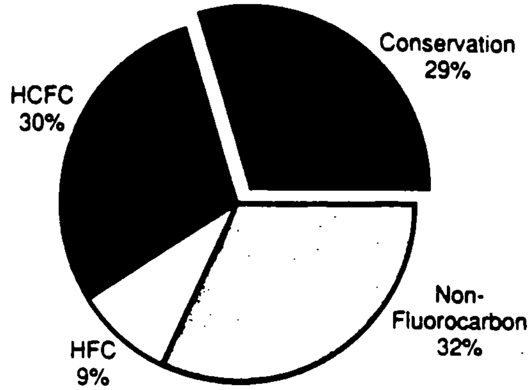


***Figure 1.** About 60% of future demand can be met through increased conservation measures (practices which actually decrease overall demand for new production) and use of non-fluorocarbon alternatives. The only viable options for meeting the remaining 40 percent of demand for essential societal needs in the year 2000 are HCFCs and HFCs.*

SATISFYING CFC DEMAND IN THE YEAR 2000

The research of U.S. industries and others has identified HCFCs and HFCs as the leading candidates to meet societal needs and protect the environment.

The Technology Review Assessment Panel Report sponsored by UNEP and presented in August, 1989, at Nairobi, Kenya, concluded that HCFCs and HFCs now being developed must be commercially available if the phaseout of CFCs in developed countries is to be accomplished by the year 2000.

Industry analysis has been performed on the potential for satisfying demand for goods and services ovided by CFCs, assuming full mpliance to a CFC phaseout by the year 2000 in developed countries.

Figure 1 shows the results based on a global market model and current information on alternatives to CFCs. About 30 percent of the demand could be met through improved conservation practices, including better maintenance of refrigeration and air conditioning systems, recovery and recycle during servicing of equipment and recovery and recycle of material used for cleaning applications. These practices are currently being implemented for CFCs and it is likely that they would be continued for the new compounds. Conservation actually decreases overall demand; hence, that part of the pie is shown removed.

Non-fluorocarbon alternatives could meet another 30 percent of the demand. Most of the aerosol propellant uses (about 20 percent of global CFC use in 1988) will probably be ⁻ⁿnverted to non-fluorocarbon ɜrnatives as they were in the U.S. ..ɹring the late 1970s. Several cleaning agent and blowing agent applications also will be converted to alternatives outside the fluorocarbon family.

Based on current data, the only viable options for meeting the remaining demands for essential societal needs are HCFCs and HFCs.

About 10 percent of these demands, primarily in refrigeration applications, could be met through the use of HFCs. Because HFCs do not contain chlorine, their vapor pressures are generally higher and their solubility properties generally lower than CFCs. These two characteristics limit their use for many applications. HCFCs could meet the remaining 30 percent of demand, primarily in the areas of refrigeration and air conditioning, energy-efficient insulating foams and cleaning of critical electronic and medical components.

HCFCs WILL REDUCE ATMOSPHERIC CHLORINE LEVELS

HFCs do not contain chlorine, the compound believed to contribute to the formation of the Antarctic ozone hole. In HCFCs, the addition of hydrogen (H) to the CFC structure allows the removal of virtually all chlorine in the lower atmosphere before it can reach the ozone layer. Because the chlorine is dissipated at lower altitudes, the HCFCs have relatively short atmospheric lifetimes—from 2 to 20 years—and only a small fraction (2 to 15 percent) of their chlorine is transported to the ozone layer.

The timing of CFC emission reductions is important because CFCs have long atmospheric lifetimes (60 to 400 years) and because continued emissions would increase the background concentration of these long-lived chlorine-containing compounds. The introduction of HCFC and HFC substitutes is a critical factor in the timing of CFC phaseout and the resultant peak atmospheric chlorine levels.

Figure 2 (next page) shows results of a sensitivity analysis provided to UNEP by Drs. R. T. Watson and M. J. Prather of the U.S. National Aeronautics and Space Administration. They assume a phaseout of all manmade chlorine compounds with lifetimes longer than one year in the year 2000 and a wide range of HCFC substitution scenarios starting in 2000. Use of HCFCs is assumed to stop suddenly in 2030.

The sensitivity analysis shows three important factors that must be considered in formulating policy to assure protection of the ozone layer:

- The peak chlorine concentrations are controlled primarily by the rate of transition away from CFCs.
- Replacing CFCs with HCFCs leads to reductions in chlorine concentrations.
- Use of HCFCs does not affect the time required to return to chlorine concentrations that existed before the Antarctic ozone "hole" if HCFC use is stopped during the 2030–2050 timeframe. The time required to return to these chlorine concentrations is determined primarily by the rate of transition away from CFCs.

Because of the threat of near-term regulation of HCFCs, less than 10 percent of the needed capacity to transition away from CFCs is available or announced as under construction; hence, CFC phaseout is threatened. Thus, policy should be formulated to encourage the rapid development of HCFCs and the goods and services that use them in order to minimize the peak chlorine concentration and the time required to return to chlorine levels that existed before the Antarctic ozone "hole". However, growth in the use of HCFCs beyond the period 2030–2050 could lead to increases in chlorine concentrations.

GLOBAL COMPLIANCE REQUIRES HCFCs AND HFCs

Policies that discourage the rapid development and use of HCFCs will slow the transition away from CFCs and discourage global compliance to a CFC phaseout. Developed countries would need to use CFCs for a longer period to continue to meet current needs. Countries striving to develop their economies and to improve their standard of living through the use of goods and services currently using CFCs (refrigeration is an example) will be reluctant to participate in a CFC phaseout if viable alternatives are not available. Prolonged use of CFCs would result in increased chlorine concentrations. However, if viable, cost-effective HCFC and HFC alternatives are widely available, CFC use will be minimized.

Environmental Goals Can Be Met Through Use of HCFCs

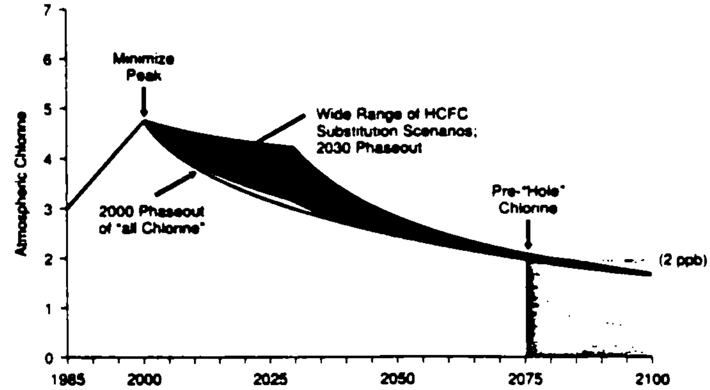


Figure 2. Analysis presented by Drs. Watson and Prather at the Nairobi, Kenya, UNEP meeting (September 1989). It assumes a total phaseout of CFCs, HCFC-22, carbon tetrachloride and methylchloroform in the year 2000. The baseline decline of CFCs is shown along with two "bracketing" HCFC substitution scenarios. The upper band assumes use and emissions of 1.8 billion kgs/yr of a compound that has a 15 year lifetime and contains one chlorine atom. The lower band assumes 450 million kgs/yr of a compound that has a 6 year lifetime and contains one chlorine atom. Current CFC use is about 1 billion kgs/yr. The analysis assumes 100% world compliance and HCFC phaseout in 2030. Pre-Antarctic "hole" levels (2 ppb) are reached in approximately 2075 in all cases.

Figure 3 also shows the results of an analysis of chlorine levels with the most likely substitution levels of HCFCs and HFCs (from Figure 1) for CFCs plus continued use of HCFCs in current applications. The analysis assumes phaseout of CFCs in the developed countries by 2000 and phaseout of HCFCs between 2030 and 2050. Recycle and some new production provides HCFCs for servicing the declining balance of capital equipment for its 1–15 year residual life. Even with higher growth rates in developing countries, atmospheric chlorine levels continuously decrease to pre-Antarctic "hole" levels. Such a scenario requires 100 percent world compliance and has a high probability of success if there are HCFC alternatives available. Consistent with the analysis of Drs. Watson and Prather, this analysis shows that

Use of HCFCs Over Normal Product Life Cycle Will Minimize Chlorine

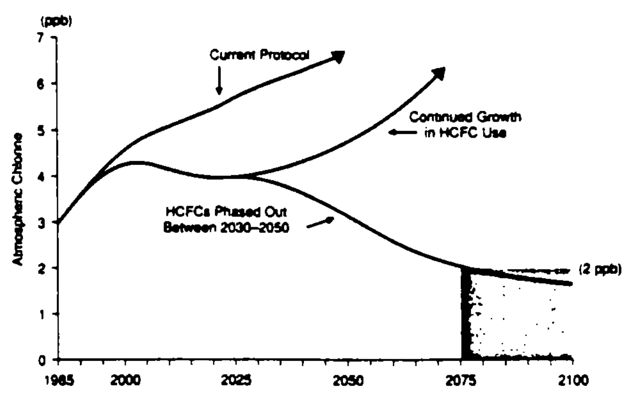


Figure 3. Acceptance of cost-effective alternatives including HCFCs and HFCs will encourage global acceptance of a CFC phaseout and minimize atmospheric chlorine. A curve for chlorine levels that assumes 100% world compliance to the present Montreal Protocol (50% CFC phasedown by mid-1998 is shown). No growth in methylchloroform emissions is assumed. A curve for phaseout consistent with the Prather/Watson analysis in Figure 1 is also shown. The curve contains industry estimates of HCFC substitution rates and assumes that HCFCs are phased out between 2030–2050. In addition, current uses of HCFC-22 are included in the analysis. A ten year delay in CFC and HCFC phaseout dates is assumed for developing countries.

delay the time for atmospheric chlorine levels to decrease to a goal value.

However, establishment of time certain phaseout dates for HCFCs could help resolve such uncertainties that surround their introduction. Such dates, if supported worldwide and included in the Protocol, would offer the following advantages:

- Removes uncertainties for industries that are poised for large investments in both HCFC production and equipment that uses HCFCs, provided that normal product lifecycles are built in to the phaseout dates that allow reasonable returns at reasonable prices on those investments.
- Provides assurances that chlorine emissions from HCFCs will be limited.
- Provides incentive for continued development efforts of "ideal" non-chlorine alternatives and allows for normal product evolution from research to development to commercialization.
- Provides certainty for all nations in HCFC product lifetimes and thus provides incentive for world Protocol compliance.
- Provides impetus for most rapid worldwide phaseout schedule for CFCs.
- Minimizes peak atmospheric chlorine levels, minimizes the time at elevated chlorine levels and minimizes the time for disappearance of the Antarctic ozone "hole".

Time certain phaseout dates for HCFCs must be given careful consideration. The following criteria must be considered:

- The best available scientific information should form the basis for any phaseout policy.
- The phaseout dates must recognize that a series of investments must be made over the next 1–2 decades to assure sufficient chemical and end-product supply investments are made to not only phaseout today's CFC but to meet the growing demand, primarily in LDCs, for goods and services using these materials. Phaseout dates must provide normal product lifetimes for all these investments.
- The phaseout date must be sufficiently distant from the required phaseout date for CFCs, particularly in developing countries, so that these countries will not simply continue to use CFCs until the "perfect" solution is offered. It is likely that the developing world will not be switching completely to HCFCs until 2010 primarily because product availability and technical resources will be committed to achieving the 2000 mandated phaseout in the developed world.
- Countries that are considered less developed (LDCs) at that time can be given special allowances in accomplishing the HCFC phaseout, similar to the special provisions allowed for use of CFCs in LDCs in the present Protocol.

Phaseout dates between 2030 and 2050 for HCFCs would meet each of these criteria. In addition, these phaseout dates would allow atmospheric chlorine levels to decrease to pre-Antarctic "hole" levels (2 ppb) at the same time now projected in the Watson and Prather analysis due to the baseline decay of CFCs coupled with the rapid elimination of chlorine from HCFCs.

Thus HCFC phaseout dates will minimize the short-term atmospheric chlorine peak, decrease and minimize the atmospheric chlorine in the next several decades by providing incentives for a rapid transition and world compliance, and produce no long-term HCFC contributions to chlorine levels.

SUMMARY

HCFCs and HFCs provide the balance in meeting essential societal needs while protecting the environment. If a transition away from CFCs is to be completed by the year 2000 in the developed nations and by 2010 in developing countries, major investment decisions by both the producers and users of alternatives must be made now and over the next 20 years.

Uncertainty about availability of HCFC and HFC alternatives delays commitments by producers of goods currently dependent on CFCs. Companies must know what alternatives will be available before committing major investment to the research and development necessary to use the new compounds in their goods.

Regulation or potential regulation of the HCFC and HFC alternatives that attempts to cap growth, volume or ozone depletion potential will delay or prohibit investments and the transition away from CFCs. Policymakers need to provide clear and prompt signals to industry and the consumer. HCFC and HFCs were determined by UNEP to be an essential component to achieve a safe, rapid transition away from CFCs. Premature regulation of these compounds may force industry to focus its resources elsewhere, delaying the introduction of compounds and technologies that will preserve the ozone layer. Such a delay will probably mean continued use of CFCs especially in those nations that have limited resources to invest in frequently changing technologies.

Inclusion of appropriate time certain HCFC phaseout dates into the Protocol should be considered as an environmentally acceptable method of providing the necessary certainty to industry that will spur the introduction of HCFC alternatives and minimize long-term chlorine levels.

Pre-2030 HCFC Phaseout Can Increase Chlorine

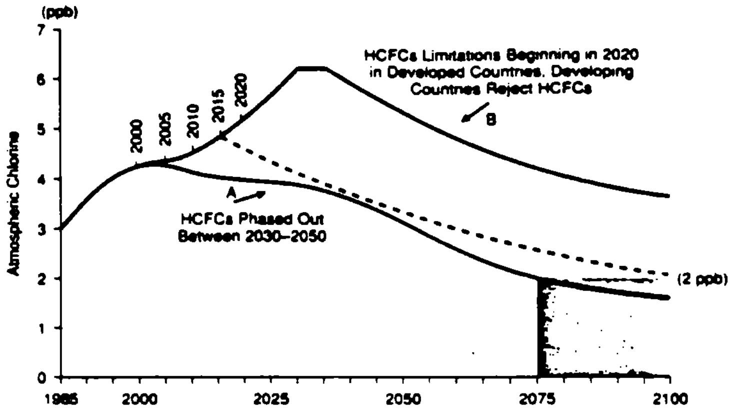


Figure 4. Early or pre-2030 phaseout of HCFCs by developed nations may encourage noncompliance to a CFC phaseout by developing nations. Such action would contribute increasing amounts of long-lived chlorine that would not be purged from the atmosphere for another century. The effect of delay in a CFC phaseout by LDCs can be estimated by drawing a line parallel to the declining section of curve B from the point on the increasing section of curve B at the assumed phaseout date. Even if LDCs only delayed their phaseout until 2015 the increase in long-lived chlorine would assure persistance of the Antarctic "hole" well into the 22nd century.

transition from CFCs to HCFCs with time certain HCFC phaseout dates minimizes atmospheric chlorine.

Acceptance of cost-effective alternatives including HCFCs and HFCs will encourage global acceptance of a CFC phaseout and minimize atmospheric chlorine.

Figure 4 shows an analysis of one probable effect if HCFCs are not available over a normal product life cycle. As shown in Figure 5, regulations requiring an early HCFC phaseout would create a global shortage of HCFCs, encouraging continued use of CFCs by some developing countries. The continued use of CFCs to meet growing demands in developing countries can dramatically increase atmospheric chlorine concentrations, even if a total phaseout of all chlorine-containing compounds was accomplished in developed countries by the year 2000. This noncompliance scenario is compared to chlorine levels with 100% compliance to the present Montreal Protocol.

The demand for CFCs in developing countries is projected to grow at three to four times the rate in developed countries (2.5 percent compounded growth in developed countries is assumed). Those larger growth rates are used in this analysis. Ultimately, the compliance of developing countries to a CFC phaseout will be the critical factor in limiting atmospheric chlorine. Stringent regulations on alternatives could increase the probabilities of noncompliance and thus could actually result in increases to atmospheric chlorine. The availability of HCFC alternatives will reduce the risk of this unintended result.

RAPID INTRODUCTION OF HCFC AND HFC SUBSTITUTES

To achieve a smooth transition within the next ten years, industry must begin now to make major capital investments. The total for producers could reach $4 to $6 billion over the next decade. Much larger investments will be necessary by the industries which currently use CFCs to produce industrial and consumer durable goods.

The CFC producing and using industries need prompt and clear encouragement from policymakers to develop the HCFCs and HFCs that can accomplish a timely transition away from CFCs.

With the support of national and international policymakers and continued promising results from toxicity tests, investments by industry can be made so the transition to HCFC and HFC alternatives can be virtually completed by the year 2000 in developed nations and by 2010 in developing nations. However, if policymakers view HCFCs and HFCs as short-term solutions providing only marginal benefits, industry would have difficulty justifying the significant additional resources that will be needed to develop and commercialize these compounds. To achieve a timely, orderly transition, the following are essential:

- Commitment of capital for facilities to produce commercial quantities of the HCFC and HFC alternatives. Construction of new facilities can take 3–5 years.
- Commitment of resources by manufacturers of goods, such as refrigeration equipment, insulating foams and cleaning processes, to develop the necessary technology to use HCFCs and HFCs.
- Commitment of capital for facilities to commercially produce goods using HCFCs and HFCs.

Uncertainty regarding the acceptability of HCFCs and HFCs will slow each step. Decisions by policymakers will determine the transition time. If these alternative compounds are not regarded as solutions over the period of a normal product life cycle (30–40 years) with provisions for continued service of long-lived equipment, we believe their development will be slowed or stopped.

Regulation, or the threat of regulation, also sends a strong message to developing countries that HCFCs and/or HFCs are not considered acceptable solutions. To avoid a second transition before full value of HCFCs was attained, the developing countries could decide not to consider adopting HCFC alternatives at the outset but continue to use CFCs until the ultimate nonchlorine solutions are made available to them.

TIME CERTAIN PHASEOUT DATE FOR HCFCs

Some policymakers and environmentalists are reluctant to fully support the introduction of HCFCs since they result in emissions of chlorine to the atmosphere. Unrestricted worldwide growth could eventually lead to the growth of atmospheric chlorine levels and can

Pre-2030 HCFC Phaseout Would Encourage Continued Use of CFCs

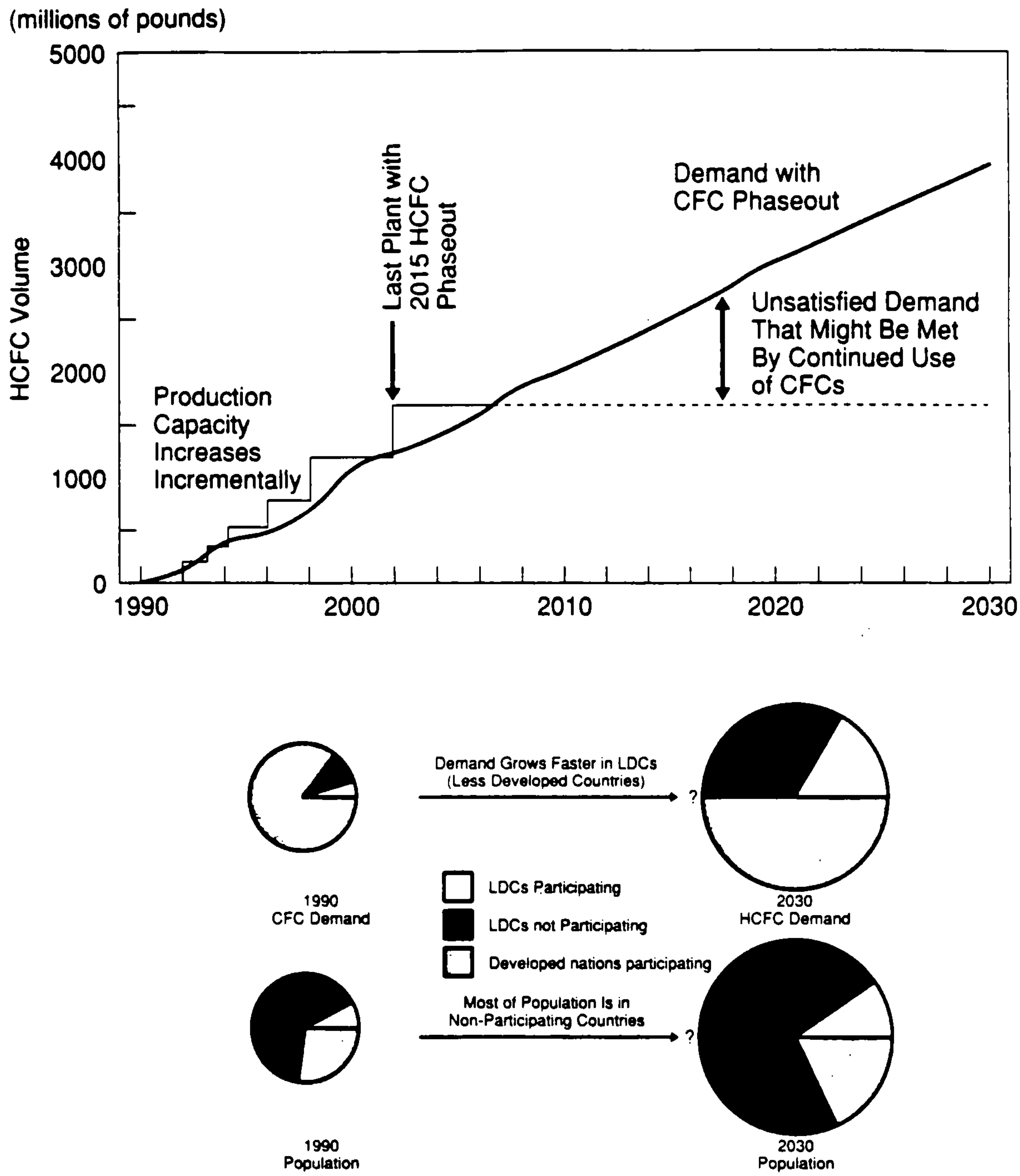


Figure 5. *Regulations requiring an early HCFC phaseout would encourage continued use of CFCs. The pie charts show the distribution of CFC demand and population among less developed countries (LDCs) participating and not participating in the Montreal Protocol and developed countries participating. Currently, countries representing about 90% of CFC demand but only about 35% of population have signed the protocol. With rapidly growing demand and population, those LDCs that have not yet signed the protocol could represent 35% of demand for HCFCs and 70% of the world's population by 2030. If LDCs believe HCFCs will not be available or that a non-chlorine solution will be fully commercial in advance of 2015, they may opt to continue to use CFCs. The graph shows that a 2015 HCFC phaseout would create an HCFC shortage and encourage CFC use. The bold line shows projected global demand for HCFCs with a CFC phaseout. The stairstep shows that capacity to produce HCFCs would be increased about every five years to meet current projected market demand. If regulations require a 2015 HCFC phaseout, producers are unlikely to commit capital for new plants after about 2000, since about 15 years would be required to recover the investment. This would lead to a shortage of HCFC supply by as early as 2010.*

Alliance for Responsible CFC Policy

THE ALLIANCE FOR RESPONSIBLE CFC POLICY IS A U.S. COALITION OF COMPANIES AND TRADE ASSOCIATIONS REPRESENTING COMPANIES THAT USE OR PRODUCE CFCS. THE ALLIANCE IS A KEY SUPPORTER OF THE "MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER."

A.I.A. Waterproofing & Insulation, Inc.
A/C Supply, Inc.
ACR Supply Company, Inc.
AERO Air Conditioning & Refrigeration
AFC Roofing & Insulation, Inc.
AIRCO Refrigeration, Inc.
AIRECO, Inc.
APCO, Inc.
ARCO Chemical
ARCO Supply Inc.
AT&T
Abbott Laboratories
Abco Refrigeration Supply Corp.
Accoustical Spray Insulators, Inc.
Acme–Miami
Acto-Kleen Company, Inc.
Admiral Company
Aeroquip Corporation
Aetna Supply Company, Inc.
Aim Insulation Company, Inc.
Air Cold Supply, Inc.
Air Comfort Corporation
Air Conditioning & Refrigeration Institute
Air Conditioning & Refrigeration Wholesalers
Air Conditioning Associates, Inc.
Air Conditioning Contractors of America
Air Conditioning Suppliers, Inc.
Air Products & Chemical Inc.
Airflow Company
Airtrol Supply, Inc.
Allan Equipment Company
Allied Protective Coating, Inc.
Allied Supply Company, Inc.
Allied Signal Corporation
Allred's, Inc.
Refrigeration, Inc.
American Association of Meat Producers
American Convenience Products, Inc.
American Frozen Food Institute
American Gasket and Rubber Co.
nerican Meat Institute
nerican Petroleum Institute
merican Society for Hospital Center Personnel
American Standard Inc.
American Supply Association
Amesbury Industries
Amoco Foam Products Company
Anco Insulations, Inc.
Anderson Bros. Refrigeration Service, Inc.
Andrew K. Morris & Associates, Inc.
Andy's Refrigeration and Air Conditioning
Anscott Chemical Industries, Inc.
Arizona Refrigeration Supplies, Inc.
Arjay Equipment Corporation
Arrow-Risco, Inc.
Ashland Chemical Company
Associated Supply Co., Inc.
Association of Home Appliance Manufacturers
Atochem
Authorized Supply Corp.
Automatic Switch Co.
B&H Pizza Company, Inc.
B&H Urethane Systems, Inc.
B. F. Goodrich Chemical Group
Baker Bros., Inc.
Baily Case & Cooler, Inc.
Bard Manufacturing Co.
Basic Industries, Inc.
Beltway Heating & Air Conditioning
Beverage-Air (Tannetics, Inc.)
Blue M–A Unit of General Signal
Bohn Heat Transfer
Bon Air Service Company, Inc.
Booth Refrigeration
Bramec Corporation
Branson Ultrasonic Corp.
Bristol Compressors
Burke Engineering Co.
Burton Plating Co.
Burton-Dixie Corporation
Butler Refrigeration Co.
Cahill Service, Inc.
California Cooling Supply Company
Capitol Refrigeration Company, Inc.
Carnation Company
Carrier Corporation
assidy Supply Co., Inc.
lotex Corporation
ntral Coating Company, Inc.
Central Ohio Heating & Air Conditioning
Cetylite Industries, Inc.
Chase Supply Company
Chemical Manufacturers Association
Chemical Packaging Corp
Chemical Specialties Manufacturers Association
Chemtech Roofing & Insulation Systems, Inc.
Chesebrough-Pond's Inc.
Circle Arrow Urethane Systems, Inc.
Climate Engineering, Inc.
Clinton Chemical Company
Coating Specialists, Inc
Columbia Books, Inc.
Commercial Distributing Co.
Commercial Refrigeration
Continental Research Corporation
Copeland Corporation
Cornelius Company
Creative Urethanes, Inc.
Crescent Manufacturing Company
Crest Systems, Inc
Crown Refrigeration Supply Co.
DK Engineering, Inc.
DUTKO and Associates
Dairy & Food Industry Supply
Davidson Rubber Division
Davidson Supply Company
Day Supply Company
Dennis Supply Company
Deshler Mechanical Con., Inc.
Discount Insulation and Roofing
Distributors, Inc of Colorado
Dolco Packaging Corporation
Domestic Sales Corporation
Douglas Barrels, Inc.
Dow Chemical U.S.A.
Duncan Supply Company, Inc.
Dunham-Bush, Inc.
Dyplast, Inc.
E. I. du Pont de Nemours and Company
EPRI
Ebco Manufacturing
Eggert Company
Elliott-Williams Company, Inc.
Elliott Co. of Indianapolis, Inc.
Emerson Electric Company
En-Tech, Inc.
Engineering and Refrigeration, Inc.
F. E. Winstel Company
F. H. Langsenkamp Co., Inc.
Falcon Safety Products, Inc.
Fallek Chemical Company
Fixturcraft, Inc.
Flex-O-Lators, Inc.
Flick Supply Company
Florida Containers, Inc.
Fluid Packaging Company, Inc.
Foam Applications, Inc.
Foam Enterprises, Inc.
Foam Insulation Contractors
Foam Systems Co.
Foamseal, Inc.
Follett Corp
Fomo Products, Inc.
Food Marketing Institute
Forma Scientific–Div. of Mallickrodt, Inc.
Fort Howard Paper Company
Fox Appliance Parts of Augusta
Fox Service Co., Inc.
Fras-Air Contracting
Free-Flow Packaging Corp.
Freeman Chemical Corporation
Frigoscandia
G&O Thermal Supply Company
G. B. H. Fabricating & Packaging, Inc.
GTE Products Corporation
Gabriel Manufacturing Company, Inc.
Galileo Electro Optics Corporation
Ganser, Inc.
Gas Appliance Manufacturers Association, Inc.
Gebauer Chemical Company
Geldbach Refrigerator Co., Inc.
General Electric Company
General Heating & Cooling
General Motors
General Radio & Electronics Co.
General Refrigeration Supply Company, Inc.
Genesee Refrigeration
Genpak Corporation
Gilbert Foam Insulation Co., Inc.
Gilman Corporation
Glas-Craft, Inc.
Goettl Air Conditioning, Inc.
Great Lakes Chemical Corp.
Great Lakes Systems, Inc.
Greenberg Supply Company, Inc.
Grocery Manufacturers of America
Gusmer Corporation
H. C. Duke & Son, Inc.
H. H. Robertson Company
H. M. Sweeny Company
Hackney Bros. Body Co.
Halocarbon Products Corporation
Halsey Supply Co., Inc.
Halstead/Nomeco
Harold Electric Co.
Harris Environmental Systems, Inc.
Harris-Teeter Supermarkets
Harry Alter Company
Hart & Cooley
Health Industry Manufacturers Association
Hercules Manufacturing Company
Highside Chemicals
Hill Refrigeration Corp.
Hill and Knowlton
Hinshaw Supply Company
Hobart Corporation
Hormel, Inc.
Hosier Refrigeration Supply, Inc.
Howard/McCray Refrigerator Company, Inc.
Hussman Refrigerator Corporation
Hyatt Hotels Corporation
IBM Corp.
ICI Americas
IPS Services Incorporated
ITT Continental Baking Company
ITT Telecommunications
Ig-Lo Products
Igloo Corporation
Ikon, Inc.
Illinois Supply Company
Imperial Clevite, Inc.
Impro, Inc.
Inasco Incorporated
Independent Refrig. Supply, Inc.
Industrial Coatings, Inc.
Industrial Hydrocarbons, Inc.
Industrial Paper Distributors
Insco Distributing
Insoport Industries, Inc.
Insta-Foam Products, Inc.
Institute of Heating & Air Conditioning Industries
Insulated Roofing Contractor–Div. of Urethane-Kentuckiana, Inc.
Insuldeck Corporation
International Association of Refrigerated Warehouses
International Cold Storage Company, Inc.
International Mobile Air Conditioning Assoc.
J&P Supply Co., Inc.
J. "Red" Gaskins Co.
J. R. Simplot Company
Jamison Door Company
John F. Harkins Company, Inc.
Johnson Controls, Inc.
Jordon Supply Company, Inc.
Keyes Fibre–Foam Division
Keyes Refrigeration, Inc.
King & Prince Seafood Corp.
King-Weyler Equipment Co., Inc.
Koldaire Supply Company
Kroger Company
Kuss Corporation
La Roche Chemicals
Lark Refrigeration
Larkin Coils, Inc.
Lear Siegler, Inc./Transport Dynamics Division
Leggett & Platt, Inc.–Urethane Foam Division
Lennox Industries, Inc.
Lewis Corporation
Linford Service Co.
Lintern Corporation
MARVCO–Remac, Inc.
Mammoth/A Nortek Co.
Manitowoc Equipment Works
Manville Sales Corporation
Marin Tek, Inc.
Martin Insulation, Inc.
Mason Supply Co.
Master-Bilt Products
McCoy Electronics Co., Subsidiary of Oak Industries, Inc.
McGee Industries, Inc.
McKesson Chemical Co., Foremost-McKesson Chemical Group
Mechanical Maintenance Company
Mechanical Service Corporation
Mechanical Supply Company
Meier Supply Co., Inc.
Melcoir, Armstrong, Dessau, Inc.
Metal Building Maintenance Company
Metro Refrigeration Supply, Inc.
Michiana Urethanes, Inc.
Micro Care Chemical Corp.
Mid-City Supply Company, Inc.
Midwest Component Sales, Inc.
Miller-Picking Corporation
Mittan, Inc.
Mobay Chemical Corporation
Monsen Engineering Co.
Montrose Sales, Inc.
Morris/Trane Service Agency
Motor Vehicle Manufacturers Association
Murray Corporation
NAHB Research Foundation, Inc.
NCH Corporation
NWAW
Nabisco, Inc.
National Association of Home Builders
National Automobile Dealers
National Commercial Refrigeration
National Fire Protection Assn.
National Refrigerants, Inc.
Neaton Auto Products Mfg., Inc.
Nohle Refrigeration Supplies
Norel Paper Corporation
North Texas Air World, Inc.
Northern Packaging Products Co.
Northern Weathermakers, Inc.
Northland Corporation
Norton Company
Omega Chemical Corp.
Orb Industries, Inc.
Ore-Ida Foods, Inc.
Owens–Illinois
P&H Supply, Inc.
Pameco–Aire
Parker Hannifin Corp.
Patterson Frozen Foods, Inc.
Peerless Pacific
Pennwalt Corporation
Pensacola Refrigeration Supply, Inc.
Perky-Halladay Associates, Inc.
Pet Incorporated
Pioneer Supply Company
Plumb Supply Company
Polythane Systems, Inc.
Polyurethane Foam Association
Powers Service Company, Inc.
Precision Valve Corporation
Pride Solvents & Chemical
Quadrex HPS Inc.
Quaker Oats Company
R&H Supply Company
R&R Supply Company
R. D. Marshall & Company
R. L. Hartley Corporation
RIP, Inc.
RPC Industries
Racon, Inc./Essex Chemical Corp.
Radobenko Distributing Co., Inc.
Ralph Wright Refrigeration
Rawn Company, Inc.
Rectical Foam Corp.–Morristown Foam Co.
Reeves Refrigeration & Heating Supply, Inc.
Refrigeration & Electric Supply Co.
Refrigeration Engineering, Inc.
Refrigeration-Heating, Inc.
Refrigeration Research, Inc.
Refrigeration Sales Co., Inc.
Refrigeration Service Engineers Society
Refrigeration Suppliers Corp.
Refrigeration Suppliers Inc.
Refrigeration Supplies, Inc.
Refrigeration Supply Co., Inc.
Resco, Inc.
Rhode Island Refrig. Supply Co., Inc.
Ritchie Engineering Company, Inc.
River Valley Foods, Inc.
Rmax, Inc.
Robinair
Rogers Supply Company
Rovanco Corporation
S & S Nonlimited, Inc.
S. Eisenberg & Company
Safer Prints Inc.
Sanford Semchak & Speights, Inc.
Sara Lee
Scatena York Company
Schroeder Refrigeration Corp.
Sealed Unit Parts Co., Inc.
Service Parts Co.
Service Supply Company
Service Supply of Victoria, Inc.
Service Supply, Inc.
Sexton Can Company
Sid Harvey Industries, Inc.
Simons Company
Single Service Institute
Singleton Seafood Co.
Simne Environmental Consultants
Snyder General
Society of the Plastics Industry
South Central Co., Inc.
South Texas Urethane, Inc.
Southern Refrigeration Corp.
Southern Supplies
Southland Corporation
Southwest Manufacturing
Spencer Insulation
Sporlan Valve Company
Spray, Inc.
Sprayfoam Southwest, Inc.
Standard Refrigeration Company
Stoelting, Inc.
Sub-Zero Freezer Company, Inc
Suggs Sales & Service, Inc.
Sunstrand Heat Transfer, Inc.
Superior Supply Company
Superior Valve Company
Supply Distributors Corporation
Taylor Freezer
Taylor Industries, Inc.
Tech Spray, Inc.
Tecumseh Products Company
Tekni-Plex, Inc.
Tempaco, Inc.
Temple, Inc.
Tenney Engineering, Inc.
Tesco Distributors, Inc.
Texaco Chemical Company
Texas Instruments
Texas Urethanes, Inc.
Textile Chemical Company
Thaller Electric
The 3M Company
Thermal Company, Inc.
Thermal Products, Inc.
Thermal Supply, Inc.
Thermo-King Corporation
Thermofoam, Inc.
Theurer Atlantic Inc.
Thorpe Supply
Tolin Mechanical Systems Co.
Trane Company
Treasurer Isle, Inc.
Trible's Inc.
Twin City Supply Company
Tyler Refrigeration Corp.
U. C. Industries
U. S. Urethane, Inc.
Uniflow Manufacturing Company
United Refrigeration, Inc.
Universal Applicators, Inc.
Urethane Chemical Company
Valcour Incorporated
Van Waters & Rogers–Subsidiary of Univar Corp.
Van-Wall Urethane Contractors, Inc.
Vertecs Corporation
Virginia Chemical, Inc.
Vollrath Refrigeration, Inc
Voltek–Division of Sekisui America
Vulcan Materials Company
W. A. Brown & Son, Inc.
W. A. Roosevelt Company
W. M. Barr and Company
W. R. Grace & Co
WCI Appliance Center
Warm Springs Enterprises, Inc.
Warren Chemical Co., Inc.
Warren-Sherer–Division of Kysor Industrial Corp.
Warwick Operating Corporation
Wawa, Inc.
Wayne Dennis Supply Company
Wei T'O Associates, Inc.
Westfield Refrigeration & Air Conditioning Company
Whalen Company
White & Shauger, Inc.
William F. Nye, Inc
Williamson Company
Wilson Refrigeration & Electric, Inc.
Wittichen Supply Company
Wm. Wurzbach Co., Inc.
Woodward Governor Company
Worthington Cylinder
York International Central Environmental Systems, Inc.
York International Corporation
Young Supply Company

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