Presentation to
NMERI Conference - May, 1994
Albuquerque, New Mexico

by

Elio Guglielmi
North American Fire Guardian Technology Inc.

Good afternoon ladies and gentlemen. I am Elio Guglielmi, President of North American Fire Guardian Technology Inc.

I would like to thank NMERI for this opportunity to speak about North American Fire Guardian Technology and its fire extinguishing agents -- fire extinguishing agents that have been developed as alternatives to replace the more environmentally damaging halons.

As background, North American Fire Guardian Technology was founded in 1987 and is headquartered in Vancouver, British Columbia, Canada. We have recently established a subsidiary in the US called, North American Fire Guardian Technology U.S.A., Inc., which will be set up to manufacture our products and distribute throughout the United States and Central America.

We have two lines of products - fire extinguishing agents and fire retardants. It will be the company's fire extinguishing agents I will be talking to you about today.

During our six years in operation, we have grown steadily to a point where we now have a well-established network of over 100 distributors worldwide.

Our distribution network spans the world from Australia to Hungary, from Chile to Thailand, from the UK to Korea, and includes five depots strategically placed throughout the US to quickly respond to market demands.

The manufacturing of our products is currently done offshore in Italy by Safety Hi-Tech. Why? Primarily two reasons.

Firstly, unlike North American chemical companies, Safety Hi-Tech was able to guarantee the Company a steady and unlimited flow of base product at reasonable prices through a company called Ausimont, which is of the Montedison Group of companies.

Ausimont is a major manufacturer and worldwide distributor of Chemicals, with plants in Europe, Japan and the United States.

Secondly, Safety Hi-Tech and Ausimont were able to deliver to the company a well-established worldwide distribution network comparable to the network of its competitors.

As you are well aware, there are several fire extinguishing agents on the market today for total flood systems, including our own NAF S-III (which is also known as HCFC Blend A). Although all of the alternatives on the market today are effective fire suppressing agents, none, including our own agent, NAF S-111, can be deemed "perfect". What I mean by perfect is not only an agent that is an effective fire suppressant, but one which has

- no ozone depletion potential
- no global warming potential
- no lifetime in the atmosphere
- no residue
- no electrical conductivity
- no metal corrosion and
- is compatible with equipment materials
- stable
- and non-toxic.

We must accept the fact that every product on the market today falls short of the ideal in one way or another. It either has *an* ozone depletion potential, a global warming potential, a atmospheric lifetime or is toxic. Thus, while the search for the "perfect" product goes on we are forced to embrace what can only be termed "transitional" products because of their imperfections.

There are several agents on the market today for total flood systems which have gone through the rigors of the EPA's evaluation process and have come out the other end by way of the SNAP program as acceptable alternatives to Halon 1301.

One such agent is NAF S-III, which is manufactured and distributed by North American Fire Guardian Technology.

NAF S-III (also known as HCFC Blend A) has proven to be an effective fire suppressing agent under UL 1058 testing procedures. Pre-engineered systems using NAF S-III have already achieved ULC listing. In addition, NAF S-III itself has achieved listing under ULC's Component Recognition Programme, and the computer program developed for the agent just received ULC recognition.

From an environmental point of view, NAF S-III has been accepted as an alternative to Halon 1301 in occupied areas by both Environment Canada and the United States Environmental Protection Agency under its SNAP program. In addition, NAF S-III has been included in the NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems produced by the National Fire Protection Association.

NAF S-111 has also been approved for use in countries such as Australia, Bahrain, Belgium, Hong Kong, Italy, Malaysia, Portugal, Saudi Arabia, Singapore, Spain and Taiwan. Others are pending.

NAF S-III is "overall" the environmentally safest alternative on the market today. What I mean by this is that when taking into account all environmental issues, NAF S-III leads the pack.

Firstly, NAF S-III has a very low ozone depletion potential - 0.044 compared to the 16 for Halon 1301.

As previously mentioned, NAF S-III is a blend of HCFCs. It has been calculated that ozone depletion damage caused by HCFCs for fire fighting purposes would amount to about 0.05% of the total ozone depletion damage caused by CFCs, halons and HCFCs over the next century.

However, any potential damage to our environment must be considered serious and every effort must be made to minimize the impact.

When you compare the impact on the environment of HCFCS versus halons, it becomes very clear how important transitional compounds like HCFCs are, and how disastrous it could be to discourage their use.

Even with the ban on production of Halons they will continue to do considerable damage to the ozone layer for many years to come. Damage to our environment through the leakage of halons alone is significant. The industry generally accepts a leakage rate of 2% per year €or static systems not exposed to excessive vibration. At this rate two month's leakage from a Halon system would cause more ozone depletion than would be caused by the total discharge of the NAF S-III necessary to replace the Halon in the system.

However, in some transport applications, where there is considerable vibration, leakages of 15% per year, or greater, are not uncommon.

When you compare the damage caused by the leakage of Halon 1301 to the potential damaged to our environment by NAF S-III the significance of this becomes clear.

In addition, it has acceptable toxicity and cardiac sensitization levels.

But more importantly, NAF S-III has a very low global warming potential - 0.1 compared to 0.82 for Halon 1301-and a short atmospheric lifetime - 7 years compared to 107 years for Halon 1301.

Although the search for safer alternatives to Halon 1301 started with ozone depletion, the focus is quickly moving to other environmental concerns.

There are a great many uncertainties associated with global climate change. It is thought that there will be very significant shifts in climate associated with global warming - storms will become more severe, rainfall will decrease in some areas and increase in others, winters

may actually become colder as the summers become hotter. The great uncertainties associated with climate change, however, are a number of potential positive feedback mechanisms. Will warming release methane from the perma-frost causing more warming? Will it cause higher levels of water vapour (a greenhouse gas) in the atmosphere? Will rising sea levels cause a decrease in planetary albedo causing further warming? Are any of these reversible? Is the earth at present in an unstable equilibrium with respect to climate? Can we tip the balance and cause massive irreversible changes? Unlike ozone depletion, global climate change may be irreversible.

The atmospheric lifetime of a substance is important because it is an indicator of the certainty we have about the fate of the substance. If a substance has a relatively short atmospheric lifetime, such as is the case with NAF S-III, this indicates that the substance will take part in a known set of reactions and its effect is well characterized. However, in the case of PFCs with atmospheric lifetimes of thousands of years, we may be handing severe environmental problems down not only to the biblical tenth generation, but even unto the fiftieth generation.

As a result of these concerns, the attention of leading environmentalists and government agencies, such as the EPA, is now on global warming and atmospheric lifetime, as witnessed by the recent position paper released by President Clinton and Vice-president Gore in October of last year. As you are probably already aware, the EPA has already moved to restrict the use of alternative agents with unacceptable GWP and lifetimes in the atmosphere.

Getting back to our NAF S-III agent, in addition, to being environmentally friendly, NAF S-III is a clean, non-conductive, non-corrosive agent and is compatible with materials used in current equipment, such as plastic and rubber seals. It has been proven to be stable as evidenced by the fact that after five years, the original NAF blends are still stable.

Finally, NAF S-III has acceptable toxicity and cardiac sensitization levels.

The toxicity level of NAF S-III is 640,000 ppm for 15 minutes. Its NOAEL is 10%. To date we have tested NAF S-III's cardiac sensitization to a concentration of 10%, and there has been no observed adverse effect to, and assumed beyond that level.

Aside from the environmental concerns, the characteristic that appears to be most appealing to the end user is the "drop-in" capability of our NAF S-III agent.

NAF S-III is the only "drop-in" replacement to Halon 1301 on the market today. How can we say that? Because NAF S-III can be used in existing Halon 1301 systems with only minor modifications.

Before I get into what modifications may be needed, let me explain why NAF S-III can be used in an existing Halon 1301 system.

Firstly, because by weight only 10% more of NAF S-III is required to put out the same fire as Halon 1301, it is possible to propel NAF S-III through the same piping system as Halon 1301. This is critical, as it is the piping system that is the most complex and expensive portion of any total food system.

For NAF S-III a different nozzle must be used. Fortunately, the cost of replacing nozzles is a relatively inexpensive proposition in the majority of installations.

As with any overhaul of a system, the O-rings and seals should be replaced when switching from Halon 1301 to NAF S-III. These too are inexpensive items.

Generally, the storage container **of** a system can be refilled with the new NAF S-III agent. In some cases it is necessary to use a slightly larger container.

As this is where most of the confusion exists about our NAF S-III agent as a "drop-in" replacement let me take the time to explain the physical aspects more thoroughly.

Don't be fooled by the fact that the design concentration of NAF S-III is higher than that of Halon 1301. It is the Molecular Weight that, in fact, determines NAF's "drop-in" capability.

If you compare the design concentration of Halon 1301, which is **5%,** to the design concentration of NAF S-III, which **is** 8.6%, you would automatically think that for every pound of Halon 1301 needed to extinguish a fire you would need 1 and three-quarter pounds of NAF S-III. But this is not the case at all, because the molecular weight of NAF is lower than Halon 1031 -- 92.9 for NAF S-III compared to 148.93 for Halon 1301. All this translates into the fact that you would need 0.0226 pounds of NAF S-III per cubic foot (at sea level) versus 0.0206 for Halon 1301 -- or just under 10% more NAF S-III than Halon 1301 would be required to cover the same area.

The other factor that comes into play is the maximum fill density of each agent which **is** Halon 1301 is 1.12 kilograms per litre versus 0.9 for NAF S-III. Thus, slightly larger containers may be required for NAF S-III.

I hope I have been able to clear up any confusion regarding NAF S-III's drop-in capabilities. If not, perhaps you will find comfort in the fact that we have hundreds of installations outside North and Central America -- both installations using new equipment and old equipment. There's the European Economic Community Building, Texaco and Brussels Airport in Belgium, BHP in Australia, National Telephone and the Bank of Santander in Spain, Pirelli and the National Library of Genova in Italy, and Minolta and BBC in England, to mention **only** a few.

In the case of the Supreme Headquarters of the Applied Powers in Europe of NATO, space and volume was a key issue in identifying NAF S-III as their halon substitute of choice.

However, more often than not, it is the cost of changing over to an environmentally friendlier agent that is of upper most importance to the end user.

A more specific example, is the study undertaken by the Italian National Electric Company. They took an existing Halon installation and determined what it would cost to replace that system with several of the alternatives available. In determining the total cost, they considered additional equipment that would be needed, and labour and product costs.

The alternatives evaluated were NAF S-III, Inergen and FM 200. In the case of both Inergen and FM 200, a total refitting was required. Thus, the cost of switching to Inergen was $129,000 and to FM *200* was $100,000. In the case of NAF S-III, only minor modifications to the existing system were required and the total cost ended up being only $6,280.

The evaluation is currently in Italian, but we are having it translated and it will be available to you should you wish a copy.

We recommend that a portion of the money customers save on refitting be spent on upgrading detection and early warning systems, thus minimizing unnecessary discharge of harmful chemicals and holding the extinguishant back for critical situations.

In addition to NAF S-III for total flood systems, we also offer a product for hand-held/portable units, called NAF P-III, and BLITZ-III for outdoor use where large quantities of product must be delivered from great distances by way of helicopter drop or large wheeled extinguishers or mechanical pumps.

Like NAF S-III, NAF P-III and BLITZ-I11 have proven to be an effective fire suppressing agent. As a new blends, these formulae have not yet gone through UL testing and listing, however it is assumed that the same success will be achieved in obtaining listing.

Like all NAF fire extinguishing formulas, NAF P-III and BLITZ-III have low ozone depletion and global warming potentials (0.017 and 0.068, respectively) as well as relatively short atmospheric lifetimes (under *2* years for BLITZ-I11 and 4 years for NAF P-III).

Although NAF P-III is a relatively new product its predecessors have been around for some years and it is believed that the modifications in the formula to make it more environmentally friendly will not adversely effect issues such as residue, electrical conductivity, metal corrosion or the stability of the agent.

And like NAF S-III, NAF P-III has been developed for use in existing extinguishers, thus requiring only nozzle changes.

There have been concerns raised from several quarters regarding our NAF fire extinguishing agents, whether our NAF S-III for total flood systems, or NAF P-III for hand-held units which I would like to address.

The key concern centres around the fact that, although very low, our NAF agents have do have ozone depletion potentials. The rumblings in the industry that products with other than a zero ODP value will not have a life beyond 1995 has hurt us in certain parts of the world. But we are confident cool heads will prevail. The United States Environmental Protection Agency and Environment Canada have clearly stated that they are sticking to the Montreal Protocol guidelines which gives our products a life to at least 2020. To put this into proper perspective, a lifetime to 2020 gives our NAF agents longer lives than the halon's they are intended to replace.

The EPA appears to be looking at the "overall" impact of alternative products, environmental and otherwise. That includes ozone depletion, atmospheric lifetime, global warming, toxicity and cardiac sensitization. What NAF agents lack on the ODP side, they more than make up for in the other four areas.

Secondly, although proven effective fire suppressants, NAF agents are blends and many feel more comfortable with single compounds. The reason for this is that historically blends have appeared to be too complex to make them workable. That has not proven to be the case with NAF agents. So much so that major chemical companies are now following our lead and are exploring and having patents filed on blended agents.

The fact that NAF agents are blends of HCFCs also poses a slightly different problem. There is now a move under foot to ban HCFCs in the not too distant future. We, along with the United States Environmental Protection Agency, Environment Canada and leading environmentalists, such as Dr. Watson of United Nations Environmental Protection, strongly believe that HCFCs are important transitional substitutes for halons and carry far less risk for our environment and human life than halons and other chemical compounds being posed as alternatives to halons. In fact, in certain medical and fire related applications, no safer alternatives to HCFCs are available now and for the foreseeable future.

In addition, using HCFCs as replacements for halons could save between *$6* and $9 billion **(US)** in hardware costs alone. Hardware includes piping, valves, bottles, etc., but excludes electronics and installation costs. The total savings has been estimated to be as much as three times greater than this.

We must not lose sight of the fact that overuse of any chemical compound in the long-term will invariably damage the environment, whether by way of ozone depletion, global warming or some other means we have yet to discover. When Halon 1301 came onto the marketplace years ago we thought it was the ultimate product. But we soon learned that their were side effects we had never contemplated, and the same may very well prove to be true of the alternatives entering the marketplace today.

But it is not only chemical compounds in which we will find some solutions at least in the short term. Current technology can help prevent overuse to some degree. Working together with equipment manufacturing companies, chemical companies can achieve better performance in their products and their systems. Better results at lower concentration levels means that less product will be required. If less product is required, less product will he discharged into the environment and, thus, less damage can occur. We gain nothing, if anything, by using a replacement to Halon **1301** that is two or three times less damaging than Halon **1301** if it takes two or three times the quantity of product to put out the same fire.

In summary how do NAF agents stack up?

Well,

- NAF agents are proven effective fire suppressing agents;
- NAF agents are, overall, the environmentally safest alternatives to **Halon** 1211 and **1301** on the market today with low ODP and **GWP** values, short atmospheric lif times. and low toxicity and cardiac sensitization levels;
- NAF agents are clean and non-corrosive;
- NAF agents are non-conductive and stable; and
- NAF agents are compatible with the halons they are intended to replace.

But what makes NAF agents unique are their virtual drop-in capabilities which make them very cost effective and thus very attractive to the end user.

C24-38b.naf/sdb