NAF S - III: "A TRANSITIONAL SUBSTITUTE FOR HALON 1301"

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Today it's ozone depletion. Tomorrow global warming. Next year who knows. But one thing is certain, the Clean Air Act gives the EPA ultimate power to deal with environmental issues. This includes the classification and potential banning of products such as halons which contain bromine and are extremely damaging to the environment. The EPA is now poised to use this power ... later this year they will be proposing changes to the Montreal Protocol that will see the total banning of CFCs by 1995 and HCFC's by 2005-2020. But they need not wait for agreement from any other nation. They have the power to dictate U.S. policy today and if they choose to do so, there is no question that counmes such as Canada will merely follow their lead.

Equipment manufactures and end users can no longer sit back and take a wait-and-see attitude. They must act rather than react and, with products such as NAF S-III on the market today, they cannot afford to continue to sit back and stock-pile halons and wait for the "ultimate" product to come onto the market ... because one, the ultimate product may never be developed and two, the EPA may move their banning program forward and leave them stranded with tons of halon product, whose destruction they will have to pay for at some future date.

The reality is that the industry is not even close to developing the "ultimate" product ... one that is clean, has effective fire suppression capabilities, low toxicity, no ozone depletion or global warming potential as well as safe. Nor do we anticipate we will develop an ultimate product in the immediate future, and certainly not before halons are totally banned.

So what are our alternatives? Well, we can take two approaches. One, we can continue to work on fire prevention and the development of materials, such as woods, cloth, fibres and plastics, that will not burn. After all, if materials can't bum, then there is no fire hazard. But this is far from realistic.

What can we do in the interim? What choices do we have until such time as a completely safe product is developed, if ever? Well, we can reduce the damage to our environment by moving to transitional products, such as NAF S-III; products that are less damaging to the environment. And we can continue to work on the mechanics in order to minimize unnecessary discharge. This means developing the most sophisticated early warning systems possible.

We must act responsibly NOW. We must move to support transitional products such as NAF S-III, thereby proving to the EPA that we are taking this problem seriously and working towards a possible solution. Otherwise the EPA may close the door on the industry forever. What I mean by this is, that if equipment manufacturers and end users continue to delay the move to safer products in the hope of finding the ultimate product, the EPA may not only move up the deadline for banning halons, but the deadline for HCFCs as well. Once that door is closed we will never be able to open it again.

The major concern of equipment manufactures and end users has been the longevity of any transitional product. They are concerned about two things: One, that if they move NOW to a transitional product such as NAF it will only be for a limited period of time (13 to 18 years if the Montreal Protocol is revised). And two, that a better product may come along in the meantime and they will be forced to change horses again. What we seem to have forgotten is that only 16 years passed from the time Halon 1301's standard was published until its use was restricted. Nothing, and I mean nothing, is forever.

The fire suppression effectiveness of halon has been based on a single component ... bromine. However, as effective as bromine is, it has been proven to be the single most environmentally damaging compound known to man -- 30 to 120 times more damaging to the ozone than chlorine. This was our motivation in creating NAF extinguishants.

There is no questions that our NAF products are not perfect. Even NAF S-111, our most successful extinguishing agent, has an Ozone Depletion Potential of 0.044, a Global Warming Potential of 0.1, and acute toxicity of between 320-640,000 ppm for 15 minutes to 1 hour. Although these numbers are low, they are not zero.

But regardless of these imperfections, our NAF products are becoming more and more attractive to equipment manufacturers and end users as the realization sets in that Halon 1211 and 1301 will certainly be banned in the next year. Partially because our NAF products are environmentally safer than 1211 and 1301 and partially because they have been designed as virtual "drop-in" replacements for halons. You need only 360 grams of NAF S-III per cubic meter as compared to 331 grams for Halon 1301. What this means is that NAF can be used in existing 1211 or 1301 fixed systems with few hardware changes; generally just nozzles and, depending on the filling density of the system, a slightly larger container may be required. The results ... no costly refitting is required and the life of the system can be extended for another 13 to 18 years. You wouldn't get off so easy with some of the other alternatives.

NAF S-111 (more recently referred to as HCFC 595 or R 595) is a blend of HFCs and HCFCs. This means that the ozone depletion potential of the product is considerably lower than Halon 1301. However, in solving one problem we have added to another --- acute toxicity.

What makes NAF S-111 unique is its detoxifying agent called NAF XX. When we originally developed the basic NAF formula a great deal of time and effort was spent on developing a compound capable of reducing and/or controlling "toxic byproduct". The end result was NAF XX, a mixture of chemicals capable of producing scavengers, thereby controlling the F_2, CL_2, HF, HCL, COF_2, and $COCL_2$.

NAF XX has undergone a battery of tests by British Columbia Research Corporation, an independent laboratory. They have proven that it produces favourable results when added to HCFCs by lowering their toxic byproducts. Numerous tests have been carried out with our most recently developed agent, NAF S-III. both with and without NAF XX. The same techniques used in tests carried out by DuPont, ICI and others using annular denuder tubes and impingers were applied. Extractions were analysed by ion chromatography and carbonyl halides were quantified using the detector tube contained in the second sampling train. These tests have proven that NAF XX, in fact, acts as a detoxifier.

There is no disputing that exposure to even relatively low concentrations of breakdown products is unpleasant. When inhaled they produce characteristic effects such as coughing and watering eyes. It is, however, generally accepted that these adverse reactions act as a useful warning to ventilate if the lire is extinguished, and so reduce the risk of exposure to the more dangerous but undetectable gases such as carbon monoxide produced by the fire. Although firefighters remain in the fire area at least until the fire is extinguished, they are equipped with self-contained breathing apparatus.

When looking into the toxicity of a product, toxicologists consider both the short and longer term exposure risks to personnel. NAF S-III's acute toxicity of 320,000 to 640,000 ppm for 15 minutes to 1 hour is well above the level that would be encountered in an emergency situation. Personnel may be exposed to NAF S-III vapours in low concentration for short periods of time without risk to their health. As with Halon 1301, exposure to high concentrations for prolonged periods may produce dizziness, impaired coordination and disturbances in cardiac rhythm.

The majority of deaths during fires are caused not by the heat but by the victim being overcome by toxic smoke from the fire. This is because nearly all fuels produce potentially lethal gases, such as carbon monoxide. Other types of burning material also produce their own unique hazards. Burning wood and paper produce acrolein; burning polyurethane foam gives off cyanide; while PVC creates hydrogen chloride gas. All fires create a highly dangerous atmosphere. The longer the fire bums, the higher the concentration of these gases.

Putting the fire out and putting it out quickly are of prime importance. Early and reliable fire detection, coupled with a rapid discharge of the extinguishing agent and a satisfactory holding time in order to prevent re-ignition of the fire are requirements for any effective fire suppression system.

NAF S-111 offers very fast flame knockdown and fire extinction. The quantity of breakdown products added by the NAF S-III to the already highly toxic atmosphere is insignificant in relation to the whole and to the urgent need to get the fire out as quickly as possible.

NAF S-III is an environmentally safer fire-fighting agent, but as with all chemicals and all fire-fighting agents, overexposure can be harmful. However, tests have shown that under recommended conditions of use, the concentrations encountered either with the agent itself or the breakdown of products will be well below the level at which problems might occur.

For those of you who will be obtaining product from us and undergoing your own testing programs you may want to learn from our experience. Small scale testing alone is not enough as an indicator of toxic decomposition products or effectiveness in fire suppression. The transport of heat and the bulk movement of combustion masses do not scale factor. It is not logical to expect a scaled down fire to react in the same way as a full-fledged fire. What happens at 100 degrees is not a scaled down version of what happens at 500 degrees.

Test fires need to relate to the real world. Too many fire test procedures are designed to give comparative numbers only and conclusions derived from them can often be misleading. For example, if one accepted the numbers from the ASTM Low Oxygen Index, one would have to conclude that wool will not bum in air. Too often test procedures give us numbers rather than the knowledge we need to interpret fire behaviour.

In summary, there is no question that prevention is preferable to reaction. If equipment cannot burn, then there is no fire hazard. If gas accumulation can be avoided, then there is no explosion. If detection equipment were failsafe, we would have no accidental discharges of extinguishant. If there were a device that could warn of a fire early enough so that effective action can be taken before the need for a suppressant, the extinguishant could be held back for critical situations. Today's air monitoring technology can detect the substances given off by overheating materials early enough before any visible evidence of fire. That means: enough time to investigate and ACT. Enough time to shut off power to equipment and evacuate personnel before any damage is done. Enough time before the extinguishant ever has to be used. Nevertheless, we are realistic enough to realize that unforeseen accidents will happen that could lead to fires or explosions, and therefore, we must be prepared for them.

Where does NAF S-III fit into all of this? Well, although NAF S-III is not the perfect alternative it is:

(1) Environmentally safer than Halon 1301 or any halogenated alternative on the market today.

(2) It works. NAF S-111 is an effective fire suppressing agent. It has already gone through ULC testing and is listed with 1 kg. Cease-Fire and Flag units; and

(3) NAF S-111 is the only alternative available in commercial quantities TODAY.

In summary, NAF S-III is the safe alternative.

Clearly as an industry we must support replacement alternative agents such as NAF S-III. Ignoring the need for a safe and more satisfactory product will lower our standard of care for human protection, and this is obviously unacceptable.