
ENVIRONMENTAL AND HEALTH ISSUES FOR *Stat-X* AEROSOL GENERATORS

ENVIRONMENTAL ISSUES

There are no environmental issues associated with the use of *Stat-X* aerosol generators. Both the Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) are zero.

TOXICITY AND HEALTH ISSUES

Aerosol generators do not present a health hazard in their benign state - as the constituent chemicals are pressed into a solid form that is extremely stable - even at elevated operating temperatures. There are no environmental or health hazards from the chemical in storage.

Unlike gaseous agents, the aerosol does not decompose in the presence of fire nor does it extinguish by oxygen deprivation. *Stat-X* suppresses fire (primarily) by chemical interference with the "Fire Propagation" radicals (OH, H, and O) that are essential elements in the expansion of the fire. *Stat-X* interacts rapidly with these free radicals within the fire zone - thus interrupting the on-going fire reaction.

The aerosol, itself, consists of solid and gas combustion products. The solid phase is composed of highly dispersed particles of salts and oxides of alkaline metals that present insignificant health hazards for humans at normal design concentrations. The gas phase may contain small amounts of carbon monoxide CO, carbon dioxide CO₂, nitrogen oxides NO_x, and ammonia NH₃. Production of these gases is minimal in the case of *Stat-X* due to its patented construction, chemical formulation, and its manufacture in the United States using only technical and reagent grade chemicals. In tests conducted by a certified, accredited testing facility in the United States, *Stat-X* generators were shown to produce gas levels several orders of magnitude less than the standard allowed for automobile airbag systems for passenger vehicles (See Figure 1).

Tests have shown no long-term negative effects from exposure to the aerosol. While the components of the aerosol are not considered toxic at normal concentration levels, ingestion of the ultra-fine particulate may cause short-term discomfort and unnecessary exposure should be avoided. Studies conducted to date, indicate that any potential toxicological issues with the aerosols in general are related to possible elevated levels of potentially harmful products that may be produced in the gas phase - such as, CO, NO_x, etc. - and not due to the influence of the solid particulate.^{1,2} In the case of

¹ E.A. Smith, E.C. Kimmel, et al, "Toxicological Evaluation of Exposure to Two Formulations of a Pyrotechnically-Generated Aerosol: Range Finding and Multiple Dose", HOTWC.96

² "Search of Halon Alternatives in Fire Extinguishing" Safety Problems During Emergency Situations, Issue 1-M, 1992, pages 73-79.



Stat-X, in particular, The effect is negligible due to the extremely low level of gas production (See Figure 1).

In tests conducted by VNIPO (Russian State Fire Protection Institute), the aerosol was considered to have the same acute toxicity as Halon 1301³. The Toxicology Institute of the Public Health and Medical Department of the Russian Federation and tests conducted by the Institute of Biophysics (Department of Public Health and Medicine Russian Federation), as well as others, have shown that the aerosol does not present a health hazard due to limited accidental exposure at normal design concentrations. Exposure to the aerosol is generally of less concern than is exposure to the decomposition products of a fire. Accidental exposures under five minutes are normally considered safe. Certain safety restrictions, however, should always be observed. Exposure to the aerosol should be avoided as ingestion of the ultra-fine particulate may cause short-term discomfort. The discharge of the aerosol also has a relatively high obscuration factor. As a result, the following system installation requirements must be observed.

SYSTEM INSTALLATION REQUIREMENTS

***Stat-X* total flood systems shall only be applied in occupied areas in conjunction with a 30 second time delay and system isolate switch to insure egress of personnel prior to system discharge and manual only activation whenever personnel may be present in the protected volume.**

³ *Andreev V.A., et al, "Replacement of Halon in Fire Extinguishing Systems", Proceedings of the Halon Alternatives Technical Working Conference, 1993.



**Stat-X Aerosol Physical Properties
Average Values @ 100 gram/m³ Concentration**

Gas Products: (ppm)	<i>Stat-X</i> 15 minute TWA*	Automobile- Airbag Emission Standard 20 minute TWA*	<u>NIOSH IDLH</u>
NO ₂	1.08	9.90	20.00
NO	0.97	50.10	100.00
NO _x = NO + NO ₂	2.05	60.00	120.00
CO	84.20	445.00	1,200.00
CO ₂	756.00	40,000.00	40,000.00
NH ₃	58.30	151.50	300.00
Solid Particulate:			Percent
K ₂ CO ₃			55.2%
KHCO ₃			8.2%
KNO ₂			7.9%
Other Potassium Compounds			5.5%
NH ₄ HCO ₃			23.2%
pH in solution = 8.6			
Particle Size Distribution:			Percent
< 1μm			3%
< 2μm			76%
< 5μm			97%
> 5μm			3%
Operating and Storage Conditions:			
Humidity			Up to 98% @ +35°C
Temperature			- 54°C to + 54°C
Shelf Life			10 years +

* TWA = Time Weighted Average

Figure 1.0



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