FIRE SUPPRESSION SYSTEMS
PATENTED

Electrically Operated Units

Features

- Significantly more effective than alternative extinguishing agents
- Environmentally friendly -Ozone depletion potential (ODP) = 0 - No global warming potential
- Ease of installation – no pressure vessels, piping, or expensive installation manpower
- Very low maintenance
- Provides reliable, cost effective protection for a wide range of fire hazards
- Listed for Class A, B, C fires by UL, ULC, CSIRO, ECB, and many others
- Favorably reviewed by EPA for SNAP listing
- Suitable for enclosed facilities and local applications
- Safe for personnel - non-harmful to personnel at design application rates
- Safe for valuable equipment -will not harm electronic equipment or magnetic media
- Post fire cleanup is minimal - aerosol suspends in air for quick and easy venting after discharge
- Compact – up to a 90% reduction in space and weight requirements

Applications

Due to their fast response time, low fire extinguishing concentration, and environmental safety, Stat-X fire suppression systems may be used in critical applications across a wide range of industries. Aerosol generators are currently protecting and are suitable for use in:

- Telecommunications facilities
- Process control rooms
- PABX rooms
- High value mobile equipment
- Cellular sites and relay towers
- Data processing facilities
- Flammable liquid storage areas
- Turbine and generator enclosures
- Marine engine rooms and machinery spaces
- Power plants
- Small boats
- General industrial hazards

Operation / Description

Upon detection of a fire, Stat-X generators can be activated either manually or automatically from a suitable listed releasing device. All auxiliary system components (release panel, detection, remote pull stations, etc.) are listed/approved by UL, ULC, FM, New York City MEA, and California State Fire Marshall. Upon activation, the generators produce an exceptionally effective, ultra-fine, potassium based aerosol. Unlike gaseous systems, Stat-X aerosol generators are very cost effective to install and maintain - as they do not require the pressure vessels, piping or expensive installation costs associated with other extinguishing systems. Space and weight requirements are minimal. On an agent weight basis, Stat-X aerosol is ten times more effective than gaseous agent alternatives. The Stat-X generator's effectiveness is a function of its patented design, aerosol composition, and ultra-fine particle size. Fire suppression is rapidly achieved through interference between the ultra-fine aerosol particulate and the flame's free radicals – terminating propagation of the fire. Stat-X aerosol generators are virtually maintenance free and have a service life of over 10 years. This, coupled to their very low installation cost, makes them an extremely cost effective fire protection solution.

Stat-X®

FIRE SUPPRESSION AEROSOL GENERATORS

General Specifications:

Parameter		30 E		60 E		100 E		250 E		500 E		1000 E		1500 E		2500 E	
Aerosol Mass (kg), (lbs)		.03	.07	.06	.13	.10	.22	.25	.55	.50	1.10	1.00	2.20	1.50	3.3	2.50	5.50
Ship. Wt./unit packaging (kg), (lbs)		0.36	0.8	0.48	1.1	1.44	3.2	2.72	6.0	3.63	8.0	7.05	15.5	8.6	19.0	11.3	25.0
Length (mm), (in)		74	2.9	107	4.2	121	4.8	132	5.2	180	7.1	170	6.7	203	8.0	267	10.5
Diameter (mm), (in)		51	2.0	51	2.0	76	3.0	127	5.0	127	5.0	203	8.0	203	8.0	203	8.0
Discharge Time (sec)		8.0		8.5		11.5		12.0		21.0		16.0		23.0		37.0	
Initiation Current (Amp)	Parallel	0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5	
	Series	1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
Pulse Duration (millisecond)		50		50		50		50		50		50		50		50	
Max. Supervisory Current (Amp)		≤.005		≤.005		≤.005		≤.005		≤.005		≤.005		≤.005		≤.005	

Coverage parameters:

Model	Part Number	Maximum Volume Coverage		Maximum Area Coverage		Maximum Mounting Height	
		(m^3)	(ft^3)	(m)	(ft)	(m)	(ft)
30 E	15100	0.45	15.89	1.20 X 1.20	3.95 X 3.95	1.22	4.0
60 E	15110	0.90	31.78	1.70 X 1.70	5.60 X 5.60	2.00	6.6
100 E	15120	1.49	52.71	2.18 X 2.18	7.20 X 7.20	2.50	8.2
250 E	15130	3.73	131.8	3.45 X 3.45	11.3 X 11.3	2.75	9.0
500 E	15140	7.46	263.5	4.88 X 4.88	16.0 X 16.0	3.50	11.5
1000 E	15150	14.9	527.1	4.88 X 4.88	16.0 X 16.0	5.00	16.0
1500 E	15160	22.4	790.6	4.88 X 4.88	16.0 X 16.0	5.00	16.0
2500 E	15170	37.3	1317.7	4.88 X 4.88	16.0 X 16.0	5.00	16.0

For additional information on use of Stat-X systems, please contact your local Distributor or Fireaway LLC.

Operation / Storage Parameters:

Temperature	-40^0 C to $+54^0$ C (-40^0 F to $+130^0$ F)
Relative Humidity	up to 98% at $+35^0$ C ($+95^0$ F)

Transportation Classification:

- Classification code: 4.1
- UN Identification #: UN 3178
- Packaging group: PGIII
- Shipping limitation:
  - Ground: None
  - Max. Weight per unit packaging – Cargo Air 100 kgs (220lbs)
  - Max. Weight per unit packaging – Passenger Air 25 kgs (55lbs)

Fireaway LLC

Made in the USA

5852 Baker Road. Minnetonka. Minnesota 55345 USA
Tel: 952.935.9745 • Fax: 952.935.9757
www.statx.com

Call to discuss your specific requirements with one of our professionals.

Fireaway LLC

Stat-X®

ELECTRICAL UNITS

SPECIFICATION DETAILS:

Agent Container. The generator housing shall be constructed of exterior and interior stainless steel shells separated by an insulating material. Top and bottom of housing shall be stainless steel and (for electrically activated units) incorporate a ¾" NPT fitting to enable direct connection to conduit. Housing shall be sealed with a non-permeable membrane and shall incorporate a mechanical means to insure rupture of the membrane upon activation. Housing shall be non-pressurized prior to system activation.

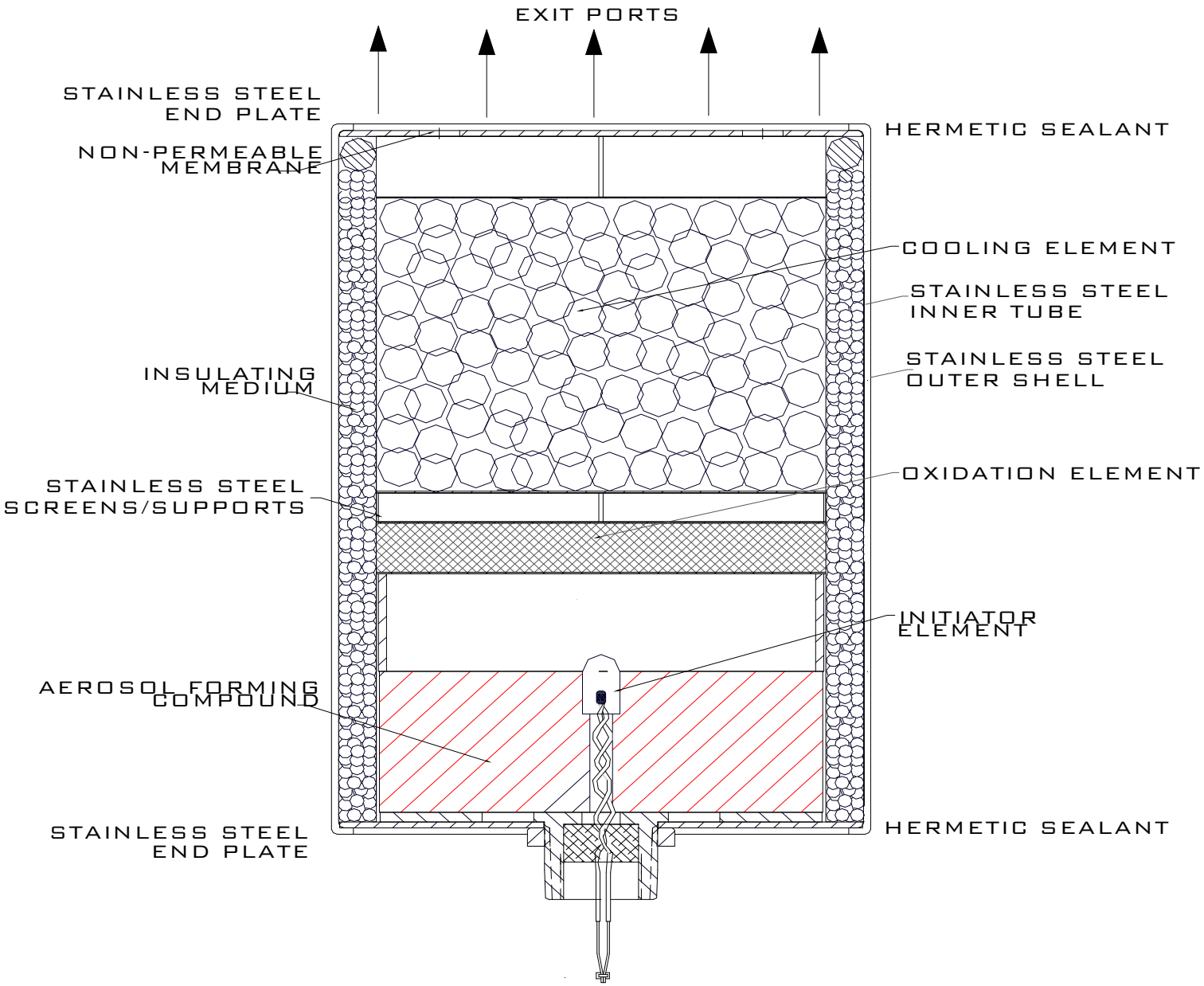
Finish. Brushed Stainless Steel. Units shall have passed salt spray corrosion testing per UL Standard 2127 as part of their listing.

Aerosol Agent. Aerosol generated shall be potassium based and manufacturer shall provide fifteen (15) minute time weighted average data from an independent United States laboratory demonstrating that the aerosol does not produce (at normal design concentrations) harmful levels of CO, CO2, and NOx based on NIOSH standards. Agent shall have no ozone depletion potential and no global warming potential. Agent shall be listed by the US EPA under the SNAP program.

Listing. Aerosol generators shall be listed by Underwriter's Laboratories (UL) to UL Subject 2775 covering Fixed Condensed Aerosol Systems per NFPA 2010 and shall be cross listed with UL approved panel. Aerosol generators shall also be listed by ULC, CSIRO/ActivFire and ECB.

System. Extinguishing system shall be accomplished by means of distributed generating devices to insure distribution of extinguishing aerosol throughout the protected volume. Devices shall be capable of being supervised.

Mounting. Generator devices shall be mounted by means of stainless steel UL Listed bracketing that allows for directional adjustment through both vertical and horizontal plane.


EXIT PORTS
STAINLESS STEEL END PLATE
NON-PERMEABLE MEMBRANE
HERMETIC SEALANT
COOLING ELEMENT
STAINLESS STEEL INNER TUBE
INSULATING MEDIUM
STAINLESS STEEL OUTER SHELL
STAINLESS STEEL SCREENS/SUPPORTS
OXIDATION ELEMENT
INITIATOR ELEMENT
AEROSOL FORMING COMPOUND
STAINLESS STEEL END PLATE
HERMETIC SEALANT

Stat-X® Aerosol Physical Properties
Average Values @ 100 gram/m^3 Concentration

***Data taken from tests conducted by Certified Accredited Laboratory in USA.**

Gas Products: (ppm)	*Stat-X* 15 minute TWA*	Automobile-Airbag Emission Standard 20 minute TWA	NIOSH IDLH
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_2CO_3	55.2%
$KHCO_3$	8.2%
KNO_2	7.9%
K_2O	
Other Potassium Compounds	5.5%
NH_4HCO_3	23.2%
Average 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 +

Stat-X Generator Output Data

Tests Conducted by Talley Defense Systems (Laboratory Accredited by American Association for Laboratory Accreditation)

PROPRIETARY		Based on 15 Minute TWA Data	%
Mass at Start (grams)		**100.00**	**100.000%**
Solids (70%) (grams)		**70.00**	
Solids Losses in Generator (cooling bed, sidewalls,etc.)		**(30.00)**	**30.000%**
Net Solids Expelled (1-2 micron average size)		**40.00**	
K_2CO_3	55.20%	22.08	**22.080%**
$KHCO_3$	8.20%	3.28	**3.280%**
NH_4HCO_3	23.20%	9.28	**9.280%**
KNO_2	7.90%	3.16	**3.160%**
Other Potassium Comp. (K_2O, KOH)	5.50%	2.20	**2.200%**
Total Particulate Expelled (grams)		**40.00**	
Gas (30%) (grams)		**30.00**	
NH_3	1ppm = 0.70mg/m3	0.041	**0.041%**
CO_2	1ppm = 1.80mg/m3	1.361	**1.361%**
CO	1ppm = 1.15mg/m3	0.097	**0.097%**
HCN	1ppm = 1.10mg/m3	0.006	**0.006%**
CH_4	1ppm = 1.40mg/m3	0.011	**0.011%**
NO	1ppm = 1.23mg/m3	0.001	**0.001%**
NO_2	1ppm = 1.88mg/m3	0.002	**0.002%**
Other:			
N_2		21.930	**21.930%**
H_2O (as vapor)		6.550	**6.550%**
Total Gas (grams)		**30.00**	
Total			**100.00%**

Fireaway LLC

2/13/09

RE: Useful Service Life of ***Stat-X*** aerosol generators

Useful Service Life is determined as part of the Listing process by means of an accelerated aging test. The service life is determined by the duration of the test, temperature at which the test is conducted, and by the mathematical formula employed by the listing or standard setting body for determining service life.

While ***Stat-X*** aerosol generators are Listed by UL for a ten (10) year life based on the calculation utilized by UL, they have, in fact, been tested for a period which yields a considerably longer service life when calculated under the formula used by other internationally recognized standards such as ISO and CEN. A description of the different methods follows below:

UL Formula (UL 2775)**:**

$$t = A \bullet e^{-k \bullet T}$$

Where:

t = Aging duration in days
A = a Constant from table 55.1.
T = Temperature in ^{O}C
k = 0.1 * Ln(2) = 0.6393147…{natural logarithm of 2}
e = the number 'e' {2.718282…}

Table 55.1

Useful life, years	Constant, A
10	40,895
15	59,325
20	77,755
25	96,175

Following are selected values based on the above equation.

Aging temperature T (°C)	Aging duration, t (days), as a function of useful life			
	10 years	15 years	20 years	25 years
80	160	232	304	375

Stat-X was tested by UL/ULC for 160 days at 80°C. The equation values are:

$$t = 40895 \bullet e^{-k \bullet T} \rightarrow 40894 \cdot 0.003906 \rightarrow 159.7 \text{ days}$$

159.7 days = **10 years Service life according to UL 2775**

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Other Internationally Recognized Standards (ISO/CEN)**:**

The final draft CEN Standard prCEN/TR 15276-1 and final draft ISO Standard ISO/DIS 15779 both utilize a different formula, which is also utilized by ULC with some modification of T_2 (ULC Listing is 12 years). The calculation is as follows:

$$\frac{t_2}{t_1} = 2^{\Delta T/10} \qquad (1)$$

where

t_1 = test time, in days

t_2 = expected service life, in days

$\Delta T = T_1 - T_2$

T_1 = test temperature, in degree Kelvin

T_2 = equivalent storage temperature, in degree Kelvin

Using the CEN/ISO calculation method we get the following result for ***Stat-X*** of formula (1) at equivalent storage temperature T_2 = 25°C based on the 160 day test previously conducted as part of the Listing process for UL and ULC.

$T_1 = 80^{O}C + 273.15 \rightarrow 353.15K$
$T_2 = 25^{O}C + 273.15 \rightarrow 298.15K$

Then $\Delta T = 353.15\text{-}298.15 \rightarrow 55$

Service Life Days = $160 \bullet 2^{55/10} \rightarrow 7240.78$

7240.78 / 365.25 days/year = **19.82 years Service life according to the CEN/ISO Draft Standards.**

Summary

Therefore, <u>where UL or ULC Listing is not a requirement</u>, we can provide the following guidelines for useful service life where a regular schedule of routine inspection and maintenance is conducted over the installed life:

Normal Commercial Environments – 15 years

Normal Industrial Environments – 12 years

Aggressive Environments* – ≤ 10 years

*Each aggressive environment must be addressed individually and time to replacement adjusted according to any special circumstances dictated by the environment or anticipated usage.

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 CO_2, nitrogen oxides NO_x, and ammonia NH_3. 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, "Toxological 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 VNIIPO (Russian State Fire Protection Institute), the aerosol was considered to have the same acute toxicity as Halon 1301[3]. 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/m^3 Concentration

Gas Products: (ppm)	***Stat-X* 15 minute TWA***	**Automobile-Airbag Emission Standard 20 minute TWA***	**NIOSH IDLH**
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_2CO_3			55.2%
$KHCO_3$			8.2%
KNO_2			7.9%
Other Potassium Compounds			5.5%
NH_4HCO_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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Phone: 952.935.9745 • Fax: 952.935.9757 • www.statx.com

EQUIPMENT EXPOSURE ISSUES FOR *Stat-X* AEROSOL GENERATORS

Stat-X aerosol has been tested on a wide range of materials including structural, aviation composites, and materials commonly used in electronics, and circuit boards. In all cases it has been shown that ***Stat-X*** has no deleterious effect on the operating capability of equipment.[1][2][3]

EXTINGUISHING MECHANISM

"Fire propagation" radicals (OH, H, and O) are essential elements in the propagation of the fire. ***Stat-X*** suppresses the fire (primarily) by chemical interference with these free radicals within the fire zone – thus interrupting the on-going fire reaction.

Potassium radicals (K) are the main active component of ***Stat-X*** aerosol. They are very active and react with these "propagation radicals" – much like the bromine radicals did in Halons. The chemical reaction may be represented as follows, for example:

$$K + OH = KOH$$
$$KOH + H = K + H_2O$$
$$K + OH, \text{ etc…}$$

In addition, the flame propagation radicals recombine on the surface area of the ultra-fine aerosol particulate to further interfere with flame propagation:

$$O + H = OH$$
$$H + OH = H_2O$$

AEROSOL CHARACTERISTICS

Due to the ultra-fine particle size and the method of generation, the particulate is quite buoyant and suspends in the gas/air mixture within the protected enclosure. Because of this "buoyant" effect the aerosol does not begin to "settle" for an extended period and, therefore, is extremely easy to vent from the protected area. Only very minor amounts of particulate may be deposited on equipment and, generally, there is no need to do anything beyond extraction of the air within the protected volume through a fan or air handling system – followed by a blow down with compressed air. Any

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[1] Findings, Study of Gas Aerosol Fire Extinguishing Compounds on Structural Materials, Maximov, Babkin, Samokhvalova, Report of Metall Company 1991.

[2] Findings, Corrosive Effect of Gas Aerosol Fire Extinguishing Compounds on Structural Materials in Aviation Technology, Leonova G.P., Usankova L.A., Report of All Union Scientific Research Institute for Aviation Materials 1991

[3] Findings, Effect of Gas Aerosol Fire Extinguishing Compounds on Electronic Equipment, Karelin V.G., Antonov, B.I., Scientific Industrial Organization Energia, 1991

particulate deposited on horizontal surfaces will be ≤ 2µm and will not form a continuous layer. Large gaps will exist between particles - leaving no potential for electrical conductivity issues to develop.

As a precautionary measure, however, it is always good practice to inspect and clean the site thoroughly following a discharge. While the aerosol itself is quite "clean", environmental factors are also a consideration. The unknown, and potentially harmful, by-products of an actual fire pose the biggest risk to sensitive electronic equipment. Because unknown products from the fire itself may be present, it is always recommended that equipment be blown down with air or vacuumed following a discharge to insure that no unwanted by-products from the fire itself are present.

Unlike HFC's, which can break down and produce deleterious compounds such as hydrofluoric acid when exposed to the high heat of a fire, ***Stat-X*** does not break down when exposed to a fire and quickly extinguishes by means of chemical interference with the flame's free radicals. ***Stat-X*** has been approved by the United States Environmental Agency (EPA) and approved for use under the EPA's Significant New Alternatives Program (SNAP).[4]

Stat-X AEROSOL COMPOSITION[5]

Stat-X aerosol consists of a gas (30%) and solid particulate (70%) mixture. Mean dimensions of aerosol particulate are in the range of 1-2 µm. The aerosol consists of the following, primarily, potassium compounds (% mass 90 seconds after discharge) and carrier gases:

Compound: (particulate)	**% Original Mass**
Particulate captured within generator housing during discharge/cooling	30.00
K_2CO_3	22.08
$KHCO_3$	3.280
KNO_2	3.160
Other potassium compounds	2.200
NH_4HCO_3	9.280
Compound: (gas carrier)	
N_2	21.93
H_2O	6.550
CO_2	1.361
CO	0.097
NH_3	0.041
NO	0.001
NO_2	0.002
HCN	0.006
Other	Trace
Total	100.00

[4] Authorization letter from US EPA, 2004

[5] 100 ft^3 tank testing of ***Stat-X*** Fire Suppressant Units, Talley Defense Systems, 1999

SUMMARY

Stat-X aerosol has been tested on a wide range of sensitive materials including real world industrial applications. There have been no reports of any negative effects of the aerosol composition on electronic equipment or circuit boards. Properly installed ***Stat-X*** systems will not harm electronic equipment and there will be no detrimental affect to the effective life of equipment exposed to ***Stat-X*** aerosol.

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