FE-13™ Clean Agent

Kidde Fire Systems
A UTC Fire & Security Company

Effective: June 2008
K-96-1300

DESCRIPTION

In response to the production phaseout of Halon fire extinguishants, Kidde is now offering FE-13 (trifluoromethane) for applications requiring immediate availability of a clean, environmentally acceptable, and human compatible fire extinguishing agent. FE-13 has a higher vapor pressure than Halon 1301 and must be used in systems designed for these pressures. Since FE-13 contains no chlorine or bromine, its ozone depletion potential is zero. FE-13 is an existing DuPont product that currently is being used as a chemical intermediate, refrigerant and etchant.

PERFORMANCE

FE-13 extinguishes fires by both physical and chemical means. Primarily, it raises the total heat capacity of the environment to the point that the atmosphere will not support combustion. In practice, however, extinguishment occurs at concentrations less then the theoretical heat capacity value. This is explained by assuming that the agent also removes the free radicals which serve to maintain the combustion process.

The FE-13 extinguishing concentration for normal heptane (cup burner method) is approximately 12.9% by volume versus 3.5% for Halon 1301. However, on a weight basis, when compared to Halon 1301, only 1.68 times as many pounds of FE-13 are needed for extinguishment.

Table 1: Properties of FE-13

		Total Flooding Agents	
		Halon 1301	**FE-13**
Chemical Formula		CF_3Cr	CHF_3
Ozone Depletion Potential		16	0
Molecular Weight		148.9	70.01
Boiling Point (°F/°C)		-72.0/-57.8	-115.7/-82.0
Critical Temperature (°F/°C)		152.6/67.0	78.6/25.9
Liquid Density	at 77°F (lb./ft.^{3})	96.01	41.82
	at 25°C (g/cm^3)	1.54	0.67
Vapor Pressure	at 77°F (psia)	234.8	686
	at 25°C (kPa absolute)	1620	4729
Heat of Vaporization	at 70°F (Btu/lb.)	35.5	31.4
	at 21.1°C (cal/g)	19.7	17.5
Extinguishing Concentration, heptane cup burner (% by volume)		3.5	12.9
Acute Toxicity (ALC or LC30 Rats; 4 hrs-ppm)		400,000	>650,000

TOXICITY

Short term and extended inhalation studies on animals, including histologic examination, indicates that FE-13 is chemically and biologically unreactive. Although it has not been evaluated as extensively as Halon 1301, where there are comparable studies, FE-13 exhibits lesser effects. In April of 1992 DuPont sponsored a study to evaluate the cardiac sensitization potential of FE-13 in dogs. No serious arrhythmias were evoked after a five minute exposure to 30% FE-13 (and 70% air), followed by an epinephrine challenge. It is not likely that higher concentrations of FE-13 would be used for fire protection in normally occupied spaces because of excessive oxygen depletion. Nevertheless, one additional test was performed with added oxygen at 50% FE-13. Again, no serious arrhythmias were elicited. Other researchers report that 80% by volume of FE-13 did not produce cardiac sensitization in animals.

FE-13 is not a mutagen in the Ames Test.

When exposed to open flames, FE-13 will decompose and produce hydrofluoric acid (HF). The amount of HF will depend upon the size of the fire and the speed of the extinguishment. Even at low levels, these decomposition products have a very acrid odor and are easily detected by the human senses. The natural tendency to escape exposure should be heeded.

COMPATIBILITY

FE-13 is a very stable compound and in the absence of excessive moisture is not expected to react with common materials of construction such as steel, aluminum and brass. Likewise, many elastomers and plastics are expected to be suitable for use with FE-13.

AVAILABILITY

FE-13 is now on commercial production. FE-13 is listed as acceptable for use by the U.S. Environmental Protection Agency “wherever technical or market conditions warrant.” FE-13 is included in National Fire Protection Standard 2001 where it is identified as HFC-23.

SPECIFICATIONS

DuPont quality specifications for FE-13 guarantee a very pure and essentially residue-free product.

Purity,% by weight minimum:	99.7
Moisture, ppm by weight, maximum:	10
Acidity, ppm by weight, expressed as HCl maximum:	0.1
Residue, % by volume, maximum:	0.01

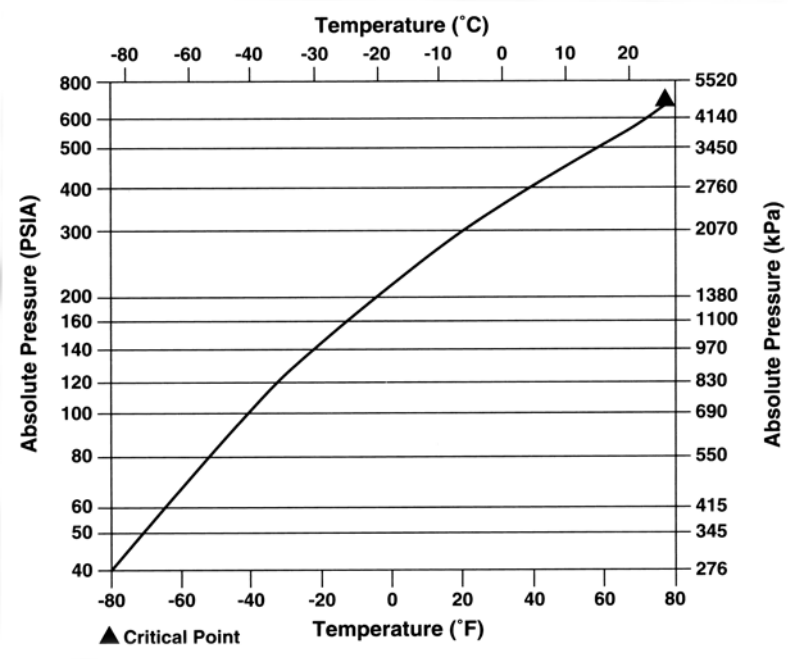

Figure 1. Saturated Vapor Pressure of FE-13

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