

OXYFUME® 2000 *Sterilant Gas*

Oxyfume 2000 is a non-flammable sterilizing gas containing 8.6% ethylene oxide by weight. The product also contains hydrochloro-

rofluorocarbons (HCFC-124) which acts as a carrier gas and flame suppressant. The composition of the mix is defined in *Table 1*.

HCFC-124 is relatively inert, and exhibits very low acute and sub-chronic inhalation toxicity (TWA - 8 = 1,000 ppm).

Table 1: Composition of Oxyfume 2000

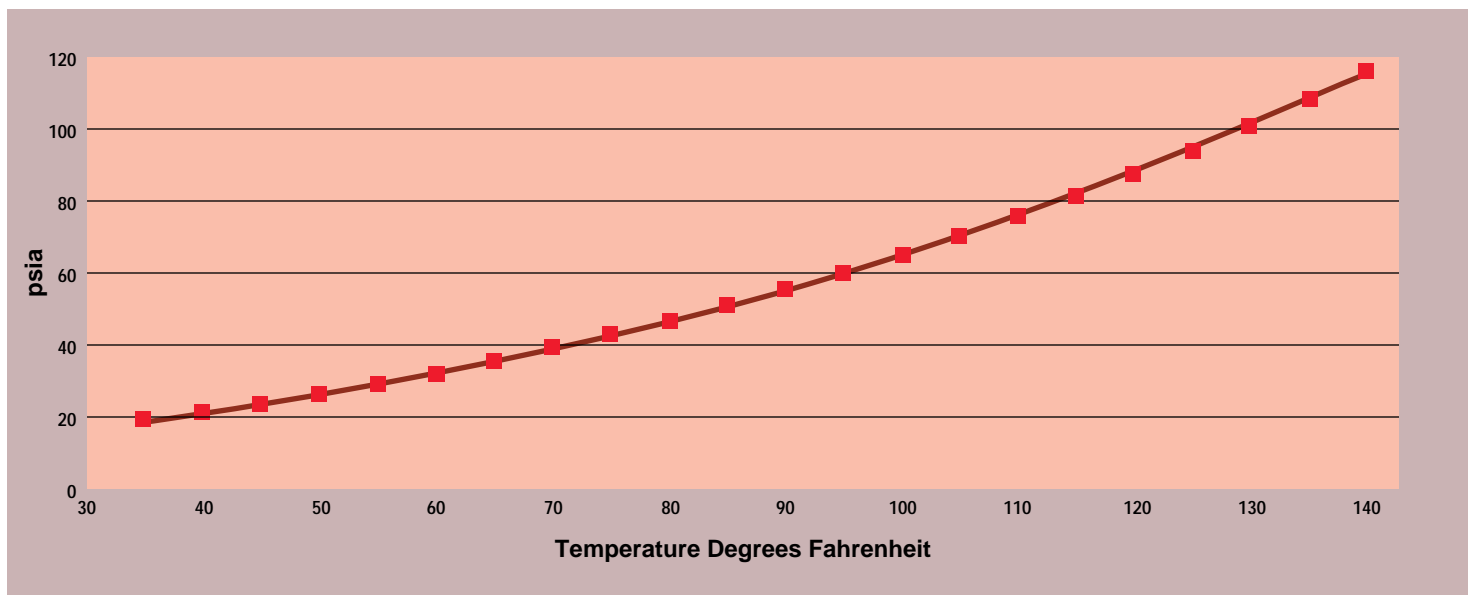
COMPONENT	MOLECULAR WEIGHT	WEIGHT PERCENT	MOLE PERCENT
Ethylene Oxide	44.05	8.6%	22.58%
HCFC-124	136.5	91.4%	77.42%
TOTAL		100%	100%

Thus, for every 100 molecules of gas mixture used, 22.6 molecules are EO. The average molecular weight of the Oxyfume 2000 mixture is 115.6.

Oxyfume 2000 is a liquefied compressed gas at it's own vapor pressure. The normal vapor pressure of Oxyfume 2000 at 70° F is 26 psig. The vapor

pressure varies with temperature as shown in *Figure 1*.

Figure 1: Oxyfume 2000 Vapor Pressure



Over the range of temperature shown, the vapor pressure can be estimated from the equation:
 $\ln(P) = 70.091 - 8693/T - 0.1819T + .00019237T^2$ where P is in psia, and T is in degrees Kelvin.

Vapor pressure is the pressure exerted by a material at a given

temperature when pure liquid and pure vapor are both present in a container. Knowing the product's vapor pressure will not help you determine the pressure in a sterilization chamber during the exposure phase of a sterilization cycle. The pressure in a

sterilization chamber will depend on the amount of gas compressed into the chamber to reach the desired concentration of ethylene oxide (see reverse side).

Oxyfume 2000 Sterilant Gas Calculations

Simple calculations can be performed to determine approximate EO chamber concentrations, pounds of gas used, change in chamber pressure due to gas addition, and so on. Most sterilizer engineers estimate these values by treating the entire system as if it were ideal. That is, gases are assumed to be at their nominal concentrations, they behave as ideal gases, the steril-

ization chamber is assumed to be empty (so no space is occupied by medical products, and there is no absorption of gas by the load), the chamber considered to be at constant temperature, and the chamber is free of any leaks.

AAMI¹ has detailed a method of performing these calculations using the equation:

C = K x P / (R x T) where:

C = EO concentration

R = Gas constant

K = Constant for a given sterilant gas

T = Absolute temperature of the sterilant gas mixture

P = Difference in total pressure due to gas addition

For Oxyfume 2000 sterilant gas, the value of K is 9.942 mg/gm-mole, or 9.942 lb/lb-mole. The table below displays chamber concentration in mg/liter as a function of chamber temperature and delta P (pressure rise due to gas addition).

Table 2: Theoretical Chamber Concentration

T .Deg. C	CHANGE IN P (PSI)							
	16	18	20	22	24	26	28	30
30	435	490	544	598	653	707	762	816
32	432	486	540	595	649	703	757	811
34	430	483	537	591	644	698	752	805
36	427	480	533	587	640	694	747	800
38	424	477	530	583	636	689	742	795
40	421	474	527	579	632	685	737	790
42	419	471	523	576	628	680	733	785
44	416	468	520	572	624	676	728	780
46	413	465	517	568	620	672	723	775
48	411	462	514	565	616	668	719	770
50	408	459	510	561	612	663	715	766
52	406	457	507	558	609	659	710	761
54	403	454	504	555	605	655	706	756
56	401	451	501	551	601	651	701	752
58	398	448	498	548	598	647	697	747
60	396	446	495	545	594	644	693	743
62	394	443	492	541	591	640	689	738
64	391	440	489	538	587	636	685	734

To estimate the number of pounds Oxyfume 2000 that will be required to attain a certain EO concentration in a chamber of a certain size, use the equation:

Pounds required = C x V x 0.00072599 where, C = the concentration of EO in mg/liter, and V = the chamber volume in cubic feet. The table below illustrates the usefulness of this equation.

Table 3: Pounds of Oxyfume 2000 Sterilant Gas Required

C mg/l	CHAMBER VOLUME, CUBIC FEET									
	100	200	300	400	500	600	700	800	900	1,000
300	21.8	43.6	65.3	87.1	108.9	130.7	152.5	174.2	196.0	217.8
350	25.4	50.8	76.2	101.6	127.0	152.5	177.9	203.3	228.7	254.1
400	29.0	58.1	87.1	116.2	145.2	174.2	203.8	232.3	261.4	290.4
450	32.7	65.3	98.0	130.7	163.3	196.0	228.7	261.4	294.0	326.7
500	36.3	72.6	108.9	145.2	181.5	217.8	254.1	290.4	326.7	363.0
550	39.9	79.9	119.8	159.7	199.6	239.6	279.5	319.4	359.4	399.3
600	43.6	87.1	130.7	174.2	217.8	261.4	304.9	348.5	392.0	435.8
650	47.2	94.4	141.6	188.8	235.9	283.1	330.3	377.5	424.7	471.9
700	50.8	101.6	152.5	203.3	254.1	304.9	355.7	406.6	457.4	508.2
750	54.4	108.9	163.3	217.8	272.2	326.7	381.1	435.6	490.0	544.5
800	58.1	116.2	174.2	232.3	290.4	348.5	406.6	464.6	522.7	580.8
850	61.7	123.4	185.1	246.8	308.5	370.3	432.0	493.7	555.4	617.1
900	65.3	130.7	196.0	261.4	326.7	392.0	457.4	522.7	588.1	653.4
950	69.0	137.9	206.9	275.9	344.8	413.8	482.8	551.8	620.7	689.7
1,000	72.6	145.2	217.8	290.4	363.0	435.6	508.2	580.8	653.4	726.0



Specialty Materials

Honeywell Fluorine Products

101 Columbia Road

Morristown, NJ 07962

Phone: 1-800-631-8138

Fax: 1-973-455-6394

All statements, information, and data given herein are believed to be accurate and reliable but are presented without guaranty, warranty or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement, and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required.

www.honeywell-oxyfume.com