(2 1) $\frac{C_1}{T} + \frac{C_2}{T} + \quad + \frac{C_n}{T} = 1$

By the Law of Partial Pressures,

(3) $C_i = ap_i$

And by Raoult's Law,

(4) $p_i = F_i p_{i^\circ}$

Combine (3) and (4) to obtain

(5) $C_i = aF_i p_{i^\circ}$

Combining (1), (2,1) and (5), we obtain

(6) $\frac{F_1 p_{1^\circ}}{T} + \frac{F_2 p_{2^\circ}}{T} + \quad + \frac{F_n p_{n^\circ}}{T} =$

$\frac{F_1 p_{1^\circ}}{T_1} + \frac{F_2 p_{2^\circ}}{T_2} + \quad + \frac{F_n p_{n^\circ}}{T_n}$

and solving for T,

(6 1) $T = \dfrac{F_1 p_{1^\circ} + F_2 p_{2^\circ} + \quad + F_n p_{n^\circ}}{\frac{F_1 p_{1^\circ}}{T_1} + \frac{F_2 p_{2^\circ}}{T_2} + \quad + \frac{F_n p_{n^\circ}}{T_n}}$

or

(6 2) $T = \dfrac{\sum_{i=1}^{i=n} F_i p_{i^\circ}}{\sum_{i=1}^{i=n} \frac{F_i p_{i^\circ}}{T_i}}$

T = Threshold Limit Value in ppm
C = Vapor concentration in ppm
p = Vapor préssure of component in solution
p° = Vapor pressure of pure component
F = Mol fraction of component in solution
a = A constant of proportionality

Subscripts 1,2, n relate the above quantities to components 1,2, n, respectively
Subscript i refers to an arbitrary component from 1 to n
Absence of subscript relates the quantity to the mixture

Solution to be applied when there is a reservoir of the solvent mixture whose composition does not change appreciably by evaporation

Exact Arithmetic Solution of Specific Mixture

	Mol wt	Density	T	p° at 25 C	Mol fraction in half-and-half solution by volume
Trichloroethylene (1)	131 4	1 46 gm/ml	100	73mm Hg	0 527
Methylchloroform (2)	133 42	1 33 gm/ml	350	125mm Hg	0 473

$F_1 p_{1^\circ} = (0\ 527)\ (73) = 38\ 2$
$F_2 p_{2^\circ} = (0\ 473)(125) = 59\ 2$

$T = \dfrac{38\ 2 + 59\ 2}{\frac{38\ 2}{100} + \frac{59\ 2}{350}} = \dfrac{(97\ 4)\quad(350)}{133\ 8 + 59\ 2}$

$= \dfrac{(97\ 4)\ (350)}{193\ 0} = 177$

T = 177 ppm (Note difference in TLV when account is taken of vapor pressure and mol fraction in comparison with above example where such account is not taken

2 A mixture of one part of (1) parathion (TLV, 0 1) and two parts of (2) EPN (TLV, 0 5)

$\frac{C_1}{0\ 1} + \frac{C_2}{0\ 5} = \frac{C_{m_2}}{T_m}\ C_2 = 2C_1$

$C_m = 3C_1$

$\frac{C_1}{0\ 1} + \frac{2C_1}{0\ 5} = \frac{3C_1}{T_m}$

$\frac{7C_1}{0\ 5} = \frac{3C_1}{T_m}$

$T_m = \frac{1\ 5}{7} = 0\ 21$ mg/cu m

1C TLV for Mixtures of Mineral Dusts

For mixtures of biologically active mineral dusts the general formula for mixtures may be used With the exception of asbestos, pure minerals are assigned TLV of 2 5, 20 or 50

For a mixture containing 80 per cent talc and 20 per cent quartz, the TLV for 100 per cent of the mixture "C" is given by

$TLV = \dfrac{1}{\frac{0\ 8}{20} + \frac{0\ 2}{2\ 5}} = 8\ 4$ mppcf

Essentially the same result will be obtained if the limit of the more (most) toxic component is used provided the effects are