

# Composite Vapor Pressure (For Handwipe Cleaning Solvents)

Example: Your shop uses a wipe cleaning solvent that contains 10% MEK, 20% MIBK, 10% methanol, 10% acetone, and 50% water. Does this solvent (mixture) comply with the NESHAP requirement of having a composite vapor pressure  $\leq 45$  mm Hg at 20°C?

# Example Calculations (Composite Vapor Pressure)

Starting with the MSDS and product data sheets, you can get the density of each solvent which will allow you to calculate the weight of each (solvent) component in a given volume of the solvent mixture [you could also measure (weigh) each component]. Using a chemical reference book, you find the molecular weight of each individual (solvent) component and its vapor pressure at 20°C. You now have all the information you need to calculate the VOC composite vapor pressure,  $PP_c$ .

# Example Calculations (cont'd)

MEK, MIBK, and methanol are VOCs → "i" = 1, 2, and 3

Acetone is exempt → "e" = 1

(In 1 liter of the solvent mixture)

Term	Description	Value
$W_i = 1$	Weight of MEK (10%)	80.5 g
$W_i = 2$	Weight of MIBK (20%)	160.2 g
$W_i = 3$	Weight of methanol (10%)	79.2 g
$W_w$	Weight of water (50%)	500 g
$MW_i = 1$	Molecular weight of MEK	72.1 g/g mole
$MW_i = 2$	Molecular weight of MIBK	100.2 g/g mole
$MW_i = 3$	Molecular weight of methanol	32.0 g/g mole
$MW_w$	Molecular weight of water	18.0 g/g mole
$W_e = 1$	Weight of acetone (10%)	79.2 g
$MW_e = 1$	Molecular weight of acetone	58.1 g/g mole
$VP_i = 1$	Vapor pressure of MEK @ 20°C	70.6 mm Hg
$VP_i = 2$	Vapor pressure of MIBK @ 20°C	14.4 mm Hg

$VP_i = 3$	Vapor pressure of methanol @ 20°C	95.5 mm Hg
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## Example Calculations (cont'd)

$$PP_c = \frac{(W_{l=1})(VP_{l=1})/MW_{l=1} + (W_{l=2})(VP_{l=2})/MW_{l=2} + (W_{l=3})(VP_{l=3})/MW_{l=3}}{\frac{M_w}{MW_w} + \left[ \frac{W_{e=1}}{MW_{e=1}} \right] + \left[ \frac{W_{l=1}}{MW_{l=1}} + \frac{W_{l=2}}{MW_{l=2}} + \frac{W_{l=3}}{MW_{l=3}} \right]}$$

$$PP_c = \frac{(80.5)(70.6)/(72.1) + (160.2)(14.4)/(100.2) + (79.2)(95.5)/(32)}{\frac{500.0}{18.0} + \left[ \frac{79.2}{58.1} \right] + \left[ \frac{80.5}{72.1} + \frac{160.2}{100.2} + \frac{79.2}{32.0} \right]}$$

$$PP_c = \frac{[78.8] + [23.0] + [236.4]}{27.8 + [1.4] + [5.2]} = 9.8 \text{ mm Hg (@ 20°C)}$$

# Example Calculations for (Depainting) Spot Stripping Allowance

Plane	Date(s)	Volume of Chemical Stripper Used
1	1/98	43.5 gal
2	1/98	55 gal
3	3/98	22.5 gal
4	3/98	110 gal
5	3/98	5.5 gal
6	4/98	12.5 gal
7	6/98	20 gal
8	8/98	5.5 gal
9	11/98	18 gal
10	11/98	15.5 gal

TOTAL = 308 gal  
Average (annual) = 30.8 gal/plane