

PID Information

VOCs and PID

VOCs are organic compounds characterized by a tendency to evaporate easily at room temperature with the potential of forming a toxic gas concentration. While some volatile organic compounds (VOCs) are acutely toxic at low concentrations, the harmful effects of most VOCs are delayed. Negative effects may occur long after the primary exposure thus many people ignore the potential danger. Long-term effects can include leukemia, memory problems, loss of hand-eye coordination, cancer, and a range of other physiological affects. Many personnel throughout the world are unprotected from VOCs in their daily work either because they are unaware of the toxic hazards, or because they are without a detector that detects for these gas concentrations.

Most VOCs have surprisingly low occupational exposure limits. An increased awareness has resulted in several newly revised VOC exposure limits, including TLVs for diesel vapor, kerosene, and gasoline. Photoionization detectors (PIDs) are able to detect VOCs and large hydrocarbon molecules that are undetectable by catalytic and electrochemical sensors.

PID equipped instruments are generally the best choice for measurement of VOCs at exposure limit concentrations.

This table lists ten common VOCs, their lower explosive limit (LEL) concentration and their exposure limits per the UK OEL, NIOSH REL and ACGIH TLV. The table also identifies those contaminants (highlighted in dark gray) with toxic exposure limits lower than 5% LEL.

Substance	Ionization Energy	Detectable by
carbon monoxide	14.01	electrochemical sensor
hydrogen cyanide	13.60	electrochemical sensor
methane	12.98	combustible sensor
sulfur dioxide	12.32	electrochemical sensor
oxygen	12.08	O ₂ sensor
chlorine	11.48	electrochemical sensor
chlorine dioxide	10.57	electrochemical sensor
hydrogen sulfide	10.46	electrochemical sensor
n-hexane	10.18	electrochemical sensor
ammonia	10.16	electrochemical sensor
phosphine	9.87	electrochemical sensor
nitrogen dioxide	9.75	electrochemical sensor
acetone	9.69	—
MEK	9.51	—
butadiene	9.07	—
toluene	8.82	—

↑ detectable by 10.6 PID ↓

Contaminant	LEL (Vol%)	OSHA PEL	NIOSH REL	TLV	5% LEL in ppm
Acetone	2.5	1,000 ppm TWA	250 ppm TWA	500 ppm TWA 750 ppm STEL	1250 ppm
Diesel (No. 2) vapor	0.6	None Listed	None Listed	15 ppm	300 ppm
Ethanol	3.3	1,000 ppm TWA	1000 ppm TWA	1000 ppm TWA	1,650 ppm
Gasoline	1.3	None Listed	None Listed	300 ppm TWA 500 ppm STEL	650 ppm
Hexane	1.1	500 ppm TWA	50 ppm TWA	50 ppm TWA	550 ppm
Isopropyl alcohol	2.0	400 ppm TWA	400 ppm TWA 500 ppm STEL	200 ppm TWA 400 ppm STEL	1000 ppm
Kerosene/Jet Fuels	0.7	None Listed	100 mg/M3 TWA (approx. 14.4 ppm)	200 mg/M3 TWA (approx. 29 ppm)	350 ppm
MEK	1.4	200 ppm TWA	200 ppm TWA 300 ppm STEL	200 ppm TWA 300 ppm STEL	700 ppm
Turpentine	0.8	100 ppm TWA	100 ppm TWA	20 ppm TWA	400 ppm
Xylenes (o, m and p isomers)	0.9-1.1	100 ppm TWA	100 ppm TWA 150 ppm STEL	100 ppm TWA 150 ppm STEL	450–550 ppm

Toxic limits that exceed lower explosive limits (LEL)

PID Detectable Gases

Acetaldehyde	Cyclohexene	Ethyl acrylate	2-methoxy-1-methylethyl acetate (PGMEA thinners)	Phenylenediamine, p-
Acetic Anhydride	Cyclohexylamine	Ethyl amine	Methoxypropan-2-ol	Picoline, 3-
Acetone	Cyclopentane	Ethyl benzene	Methoxypropyl acetate	Picric acid
Acrylic Acid	Decane, n-	Ethyl butyrate	Methyl acetate	Pinene, alpha
Allyl chloride	Diacetone alcohol	Ethyl hexyl acrylate, 2-	Methyl acrylate	Pinene, beta
Ammonia	Dibromochloromethane	Ethylene	Methyl ethyl ketone (MEK)	Piperidine
Ammonium chloride	Dibromoethane 1,2-	Ethylene glycol	Methyl isobutyl ketone (MIBK)	Piperylene
Amyl acetate, n-	Dichloro-1-propene, 2,3-	Ferrocene	Methyl isothiocyanate	Prop-2-yn-1-ol
Amyl alcohol	Dichloroacetylene	Formamide	Methyl methacrylate	Propan-1-ol
Aniline	Dichlorobenzene o-	Furfural	Methyl oxirane	Propan-2-ol
Anisole	Dichloroethene, 1,1-	Furfuryl alcohol	4-Methyl pentan-2-one	Propane-1,2-diol, total
Asphalt, petroleum fumes	Dichloroethene, cis-1,2-	Gasoline vapors	1-Methyl-prop-2-ene	Propene
Benzaldehyde	Dichloroethene, trans-1,2-	Gasoline vapors 92 octane	Methyl n-propyl ketone (MPK)	Propionaldehyde
Benzenamene	Dichloroethylene, 1,1-	Heptan-2-one	Methyl salicylate	Propionic acid
Benzenethiol	Dichloroethylene 1,2-	Heptan-3-one	Methyl sulphide	Propyl acetate, n-
Benzonitrile	Dicyclopentadiene	Heptane n-	Methyl t-butyl ether (MTBE)	Propylene
Benzyl alcohol	Diesel Fuel	Hexamethyldisilazane, 1,1,1,3,3,3-	Methyl-2-propen-1-ol, 2-	Propylene oxide
Benzyl formate	Diethyl ether	Hexan-1-ol	Methyl-2-pyrrolidinone, N-	Propyleneimine
Biphenyl	Diethyl sulphide	Hexan-2-one	Methyl-5-hepten-2-one, 6-	Pyridine
Bis (2,3-epoxypropyl) ether	Diethylamine	Hexane n-	Methylamine	Pyridylamine 2-
Bitumen, petroleum fumes	Diethylaminopropylamine, 3-	Hexene, 1-	Methylbutan-1-ol, 3-	Pyrocatechol
Bromobenzene	Dihydrogen selenide	Hydrogen sulfide	Methylcyclohexane	Resorcinol
Bromoethane	Diisobutylene	Hydroquinone	Methylcyclohexanol, 4-	Safrole
Bromoethyl methyl ether, 2-	Diisopropyl ether	Hydroxypropyl acrylate 2-	Methylcyclohexanone 2-	Styrene
Bromopropane, 1-	Diisopropylamine	Iminodi(ethylamine) 2,2-	Methylheptan-3-one, 5-	Terpinolene
Butadiene	Dimethoxymethane	Iminodiethanol 2,2'-	Methylhexan-2-one, 5-	Tert-butanol
Butadiene diepoxide, 1,3-	Dimethyl benzene	Indene	Methylhydrazine	Tetrabromoethane, 1,1,2,2-
Butan-2-one	Dimethyl disulphide	Iodoform	Methyl-N-2,4,6-tetranitroaniline, N-	Tetracarbonylnickel
Butanol, 1-	Dimethyl ether	Iodomethane	Methylpent-3-en-2-one, 4-	Tetrachloroethylene
Buten-3-ol, 1-	Dimethyl formamide, N,N-	Isoamyl acetate	Methylpentane-2,4-diol, 2-	Tetrachloronaphthalenes, all isomers
Butene, 1-	Dimethyl phthalate	Isobutane	Methylpropan-2-ol, 2-	Tetraethyl orthosilicate
Butoxyethanol, 2-	Dimethyl sulphide	Isobutanol	Methylstyrene	Tetrafluoroethylene
2-butoxyethyl acetate	Dimethylacetamide N,N-	Isobutyl acetate	Mineral spirits	Tetrahydrofuran
Butyl acetate, n-	Dimethylamine	Isobutyl acrylate	Monochlorobenzene	Tetrahydrothiophene
Butyl acrylate, n-	Dimethylaminoethanol	Isobutylene	Naphtha (iso-octane)	Thiophane
Butyl lactate	Dimethylaniline, NN-	Isobutyraldehyde	Naphthalene	Toluene
t-Butyl methyl ether (MTBE)	Dimethylbutyl acetate	Isooctane (Naphtha)	Nitric oxide	Tributylamine
Butylamine, 2-	Dimethylethylamine, NN-	Isooctyl alcohol	Nitroaniline 4-	Trichlorobenzene 1,2,4-
Butylamine, n-	Dimethylformamide	Isopentane	Nitrogen trichloride	Trichloroethylene
Camphene	Dimethylheptan-4-one, 2,6-	Isophorone	Nonane, n-	Trimethylamine
Carbon disulfide	Dinitrobenzene, m-	Isoprene	Octane, n-	Trimethylbenzene mixtures
Carbon tetrabromide	Dinitrobenzene, p-	Isopropanol	Octene, 1-	Trimethylbenzene, 1,3,5-
Chloro-1,3-butadiene, 2-	Dinonyl phthalate	Isopropyl acetate	Oxydiethanol 2,2-	Turpentine
Chlorobenzene	Dioxane 1,2-	Isopropyl alcohol	Pentan-2-one	TVOC
Chloroethyl methyl ether, 2-	Dioxane 1,4-	Isopropyl chloroformate	Pentan-3-one	Undecane, n-
Chlorotoluene, o-	Diphenyl ether	Isosafrole	Pentandione, 2,4-	Vinyl acetate
Chlorotoluene, p-	Diphenylamine	Jet Fuel JP-4	Phenol	Vinyl bromide
Chlorotrifluoroethylene	Divinylbenzene	Jet Fuel JP-5	Phenyl-2-propanone	Vinyl chloride
Cresol, m-	Epoxypropyl isopropyl ether, 2,3-	Jet Fuel JP-8, Jet A1	Phenyl propene, 2-	Vinylethylene
Cresol, o-	Ethanal	Kerosene	Phenyl-2,3-epoxypropyl ether	Vinyl-2-pyrrolidinone, 1-
Cresol, p-	Ethanol	Ketene		Xylene mixed isomers
Crotonaldehyde	Ethanolamine	n-Limonene		Xylene, m-
Cumene	Ethoxyethanol, 2-	Mesitylene		Xylene, o-
Cyclohexane	Ethyl (S)-(-)-lactate	Methacrylic acid		Xylene, p-
Cyclohexanol	Ethyl acetate	Methacrylonitrile		Xylidine, all
Cyclohexanone	Ethyl alcohol	Methoxyethanol, 2-		
		Methoxyethoxyethanol, 2-		
		Methoxymethylethoxy-2-propanol		

Note: This list is not all-inclusive. For a complete list of PID-detectable gases, please consult your RSM or a factory location. As PID is a non-specific sensing technology, it is recommended you verify detection capabilities for any specific compounds.