

The Impact of Gasoline VOCs on Indoor Air Quality

There have been several posts in this group over the past few years regarding VOC contributions from attached garages. Gasoline is the most common intruder into the home from the garage. A closer look at the composition of a typical blend of gasoline can help show why gasoline vapors can be such a detriment to indoor air quality. Gasoline is a refined fraction from the distillation of crude oil and is a complex mixture of hydrocarbons. The composition of gasoline is typically 30-50 volume % alkanes (e.g., hexane, octane), alkenes (e.g., octene); isoalkanes (e.g., 2-methylbutane, isooctane), and cyclic hydrocarbons (e.g., cyclohexane) and 50-70 volume % total aromatics (e.g., toluene, xylenes, benzene) (<http://www.atsdr.cdc.gov/toxprofiles/tp72-c3.pdf>).

The ability of a VOC to migrate depends on the vapor pressure of the material, i.e., how readily it evaporates under typical indoor conditions. Indoor air quality is most affected by materials with high vapor pressures. The VOCs listed above are all highly volatile. If you have ever spilled a small amount of gasoline on the ground while filling a lawn mower, you immediately smell the gasoline and the small puddle evaporates very quickly (compared to a similar size puddle of water). In the garage, these VOCs quickly disperse and migrate into the home through an open door, unfinished garage wall seams, or on clothing.

Many of the gasoline VOCs have alternative sources so it is often difficult to assess the actual source of alkanes, alkenes, etc. However, the signature “fingerprint” of gasoline is the aromatic content. When a mixture of benzene, toluene, and xylene isomers are observed in an indoor air sample at certain ratios, one can ascertain that gasoline vapors are present in the indoor air. Because of its high volatility, some indoor air samples have had as high as a 50% contribution from gasoline vapors. Considering that benzene is carcinogenic, storage of gasoline is critical in order to eliminate it from the home’s air. Gasoline sources should be stored in secondary air tight containers or in an outdoor storage facility.

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