

# White Paper: Use of Glycol Vs. Glycerin In Fog / Smoke Fluids

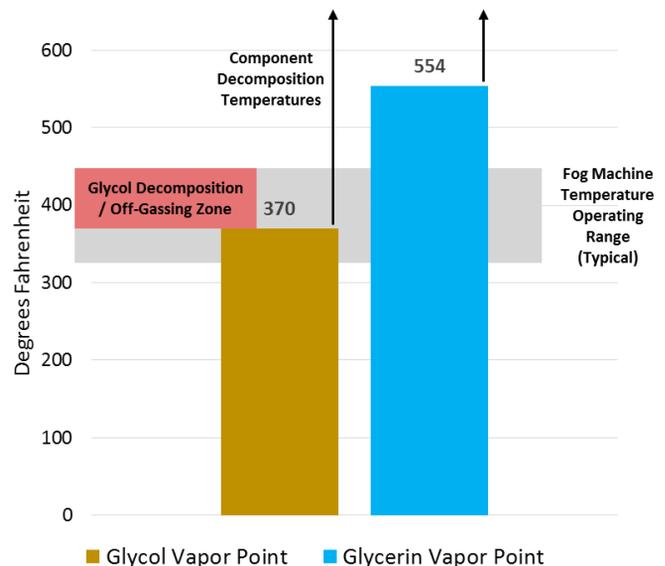
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## Known issues with glycol-based fog / smoke fluid:

- Glycols boil and create a vapor at 370F degrees<sup>1</sup>. At the operating temperature of fog machines, glycols can break down and generate formaldehyde<sup>2</sup>, a known carcinogen<sup>3</sup>.
- Glycols are known cell membrane inhibitors<sup>4</sup>, which are used to deliver compounds into the bloodstream. (This is why glycols are often used to deliver nicotine into the bloodstream via vaping devices.) If formaldehyde or other chemicals are present, glycols can readily deliver those foreign elements to the body.
- Given these risks, all the major producers of glycols, including Dow and Shell Chemical, explicitly recommend that glycols NOT be used in theatrical / training fog<sup>5</sup>.
- As reported through the National Institutes of Health, theatrical fogs featuring glycols were studied with the result "Acute cough and dry throat were associated with acute exposure to glycol-based fogs; increased acute upper airway symptoms were associated with increased fog aerosol overall. Lung function was significantly lower among those working closest to the fog source."<sup>6</sup>

## Facts regarding glycerin-based fog / smoke fluid:

- Glycerin is a natural ingredient often sourced from the leaves of plants.
- Glycerin has a boiling point of 554F degrees, well above the temperature at which fog is created<sup>7</sup>. Thus, glycerin will not break down during normal fogging operations.
- Glycerin has been tested for safety at least 56 times by the National Institutes for Occupational Safety and Health (NIOSH)<sup>8</sup>. These tests include toxicity testing, eye irritation, skin irritation and several others.
- The use of glycerin in the production of theatrical / training fog has never been dissuaded by NIOSH or by glycerin manufacturers.
- Due to its chemical composition, a glycerin-based fog fluid generates approximately 33% more fog per unit of fluid (vs. glycol)<sup>9</sup>.



## Conclusion:

A glycerin-based fog fluid, such as SimplyFog™, is a safer and more productive option for any entertainment or training situation, versus glycol-based fog fluids.

### Sources & Footnotes:

- 1 [https://www.osha.gov/dts/chemicalsampling/data/CH\\_264480.html](https://www.osha.gov/dts/chemicalsampling/data/CH_264480.html)
- 2 Glycols have a carbon atom that when released during heating above the boiling point, can combine with hydrogen and oxygen to form formaldehyde. Glycerin has no carbon atom present.
- 3 <https://www.cancer.org/cancer/cancer-causes/formaldehyde.html>
- 4 [http://jpharmsci.org/article/S0022-3549\(16\)31072-3/fulltext](http://jpharmsci.org/article/S0022-3549(16)31072-3/fulltext)
- 5 These warnings are readily available in the chemical manufacturer Materials Safety Data Sheets (MSDS) or websites.
- 6 <https://www.ncbi.nlm.nih.gov/pubmed/15828073>
- 7 <https://www.cdc.gov/niosh/npg/npgd0302.html>
- 8 Test results at <https://pubchem.ncbi.nlm.nih.gov/compound/glycerol#section=NIOSH-Toxicity-Data&fullscreen=true>
- 9 Glycerin exhibits three hydroxyl groups vs. two present in glycols