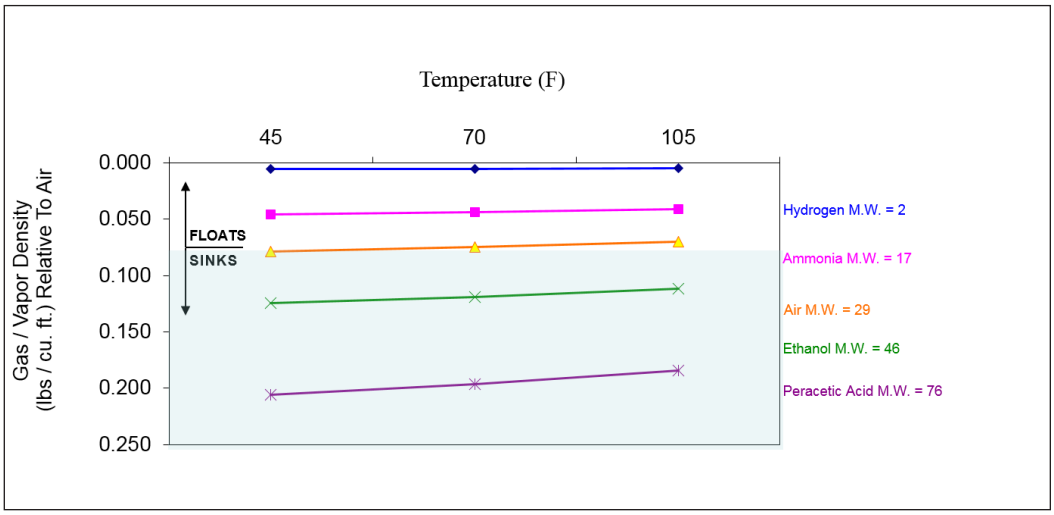
from experience

Will It Float? Calculating Gas/Vapor Densities

Food production facilities require the management of a host of hazardous materials, from ammonia in refrigeration systems to the sanitation/sterilants found in CIP/SIP systems. To mitigate the hazards posed by the potential release of vapors from these materials into the facility, room air changes, electrical classifications, and concentrations and rate of a potential release of the hazardous vapor must be considered when designing affected rooms. Each of these designs must also take into account whether the released gases or vapors will "float" to the ceiling or sink to the floor to find an unsuspecting operator or ignition point.

While buoyancy is traditionally thought of as occurring in water, the same principle applies to gas and vapor. Density, relative to air, governs whether a gas or vapor is buoyant and therefore, if it will float or sink. Because the density of a gas or vapor is directly proportional to the Molecular Weight (MW) of the material and indirectly proportional to temperature, both must be known in order to calculate density and to determine buoyancy.

The graph below compares the densities of common vapors and gases (relative to air) found in many facilities, particularly within engine rooms, chemical storage areas and in production with secondary refrigeration loops. For gases or vapors not listed, densities can be calculated using the MWs found in the Safety Data Sheets located at your facility.



Within the typical temperature found in facilities, ammonia and hydrogen can be expected to float, while ethanol and peracetic acid will typically sink toward the floor.

experience in brief

Gas Density

Gas Density (lbs/cf)=MW(P+14.7)/(10.73)(T+460)

Where:

- MW=Molecular Weight (lb/mole).
- P=gas pressure (psig): Typically P equals (0) psig. Assume gas pressure is the room pressure at equilibrium, after release from the vessel or piping.
- T=gas temperature (^{0}F): Gas temperature upon release from the piping. Gas temperature will gradually warm to room temperature, but should be checked at operating temperature and room temperature.

Air Density

0.075 lb/cf at 70^{0}F

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