# THE ABC'S OF GASES IN THE INDUSTRY

| Ammonia: $NH_3$ | n-Butane*: $C_4H_{10}$ |
|---|---|
| **Colorless gas with a pungent suffocating odor**<br><br>**STEL:** 35 ppm<br>**TWA:** 50 ppm<br>**IDLH:** 300 ppm<br>**LEL:** 15% by volume<br>Ionization Potential: 10.18 eV<br><br>• Fertilizer Plants<br>• Fish & Meat Packing Plants<br>• Industrial Refrigeration and Cold Storage<br>• Semiconductor Industry<br>• Water and Wastewater Treatment Plants<br>• Munitions<br><br>*Refer to AP-201 for further information* | **Colorless gas with a gasoline-like odor**<br><br>**STEL:** 1 ppm<br>**TWA:** OSHA 5 ppm<br>**LEL:** 1.6% by volume<br><br>• Aerosol Propellant Filling Docks<br>• Feed stock for Chemical Processes<br>• Storage Tanks and Filling Docks |
| **Benzene: $C_6H_6$** | **Carbon Dioxide: $CO_2$** |
| **Colorless liquid with aromatic odor**<br><br>**STEL:** 2.5 ppm<br>**TWA:** 0.5 ppm<br>**LEL:** 1.2%<br><br>• Refineries<br>• Oil & Gas Distribution<br>• Feed Stock for Chemical Production<br>• Solvent Distribution Centers<br>• Gas Stations | **Colorless, odorless gas**<br><br>**STEL:** 30,000 ppm<br>**TWA:** OSHA 5000 ppm<br>**IDLH:** 40,000 ppm<br><br>• Breweries and Wineries<br>• Carbonated Beverage Bottling Plants<br>• Dry Ice Plants, Food Processing Plants, Fruit Storage and Ripening Chambers<br>• Greenhouses, Indoor Air Quality Studies, and Ventilation Control<br>• Mushroom Farms Stack Gas<br>• Oil Well Injection |

| Carbon Monoxide: CO | Chlorine: $Cl_2$ |
|---|---|
| **Colorless, odorless gas - most abundant toxic gas**<br><br>**STEL:** ppm<br>**TWA:** OSHA 50 ppm<br>**LEL:** 12.5%<br>**IDLH:** 1200 ppm<br><br>• Furnaces<br>• Gasoline Generators/Engines<br>• Grain Storage Silos<br>• Lumber Drying Kilns<br>• Mining and Metals<br>• Parking Garages | **Green-yellow gas with a pungent, irritating odor**<br><br>**STEL:** 0.3 ppm<br>**TWA:** OSHA 0.1 ppm<br>**IDLH:** 5 ppm<br><br>• Mining & Metals Industry<br>• Nuclear Reactors<br>• Pulp & Paper Mills<br>• PVC Plastics Manufacturing<br>• Semiconductor Water Etching Facilities<br>• Swimming Pool Chlorinization Plants<br>• Water Treatment Plants<br>• Chlorine Gas Manufacturing |
| **n-Hexane*: $C_6H_{14}$** | **Hydrogen*: $H_2$** |
| **Colorless liquid with a gasoline-like odor**<br><br>**TWA:** OSHA 500 ppm<br>**LEL:** 1.1%<br>**IDLH:** 1100 ppm<br><br>• Electric Generation<br>• Gas Stations<br>• Peanut Oil Extraction Plants<br>• Solvent Distribution Centers | **Colorless gas**<br>**No exposure limits – Simple asphyxiant**<br><br>• Battery Charging Stations<br>• Semiconductor Plants for Water Furnaces<br>• Underground Vaults Containing Transformers<br>• Vegetable Oil Hydrogenation Plants |
| **Hydrogen Cyanide: HCN** | **Hydrogen Sulfide: $H_2S$** |
| **Colorless gas with a bitter, almond-like odor**<br><br>**TWA:** OSHA 10 ppm<br>**LEL:** 5.6%<br>**IDLH:** 50 ppm<br><br>• Plating and Mining<br>• Nylon Manufacturing | **Colorless gas with a strong odor of rotten eggs**<br><br>**TWA:** OSHA 20 ppm<br>**LEL:** 4.0%<br>**IDLH:** 100 ppm<br><br>• Leather Tanneries and Paper Mills<br>• Mining and Metals Industry<br>• Oil Fields and Refineries<br>• Sewage Treatment Plants<br>• Sewer Maintenance |
| **Methane: $CH_4$** | **Nitric Oxide: NO** |
| **Colorless, odorless gas – odorized with mercaptans**<br>**Primary component of natural gas**<br>**No exposure limits – Simple asphyxiant**<br><br>**LEL:** 5%<br><br>• Oil & Gas Distribution & Refining<br>• Mining Industry | **Colorless gas**<br><br>**TWA:** NIOSH/OSHA 25 ppm<br>**IDLH:** 100 ppm<br><br>• Semiconductor Plants<br>• Mining |

| Nitrogen Dioxide: $NO_2$ | Oxygen Deficiency: $O_2$ |
|---|---|
| **Reddish-brown with a pungent odor**<br><br>**STEL:** 1 ppm<br>**TWA:** OSHA 5 ppm<br>**IDLH:** 20 ppm<br><br>• Boilers and Furnaces<br>• Diesel Emissions<br>• Semiconductor Plants<br>• Mining Industry | **Colorless, odorless gas**<br><br>• Cargo Holds and Storage Tanks<br>• Grain Storage Silos With Inerted Atmospheres<br>• Liquid Nitrogen Storage<br>• LN2 Cooled Laser Facilities<br>• LN2 Cooled Telescope<br>• Sewer Maintenance<br>• Sewer Treatment Facilities<br>• Underground Vaults (Utilities) |
| **Propane*: $C_3H_8$** | **Sulfur Dioxide: $SO_2$** |
| **Colorless, odorless gas**<br><br>**TWA:** OSHA 1000 ppm<br>**LEL:** 2.1%<br>**IDLH:** 2100 ppm (LEL)<br><br>• Aerosol Propellant Filling Lines<br>• Feed stock for various Chemical Processes<br>• Propane-powered Forklifts<br>• Storage Tanks & Filling Docks | **Colorless gas with a pungent odor**<br><br>**STEL:** 5 ppm<br>**TWA:** NIOSH 2 ppm<br>**IDLH:** 100 ppm<br><br>• Circuit Board Etching<br>• Diesel Emissions<br>• Paper Mills<br>• Sulfur Processing Plants ($SO_2$)<br>• Water Treatment |
| **Volatile Organic Compounds (VOCs)**<br>**Refer to the NIOSH Pocket Guide for specific chemical hazards** | |
| • Airline Maintenance Facilities (Jet fuel - refer to AP-200)<br>• Consultant Engineering<br>• Leaking Underground Storage Tanks<br>• Petrochemical Manufacturing<br>• Aerospace Manufacturing<br>• Automotive Manufacturing (paint booths–refer to AP-204)<br>• High Tech Electronics Manufacturing<br>• Pharmaceutical Manufacturing<br>• Chemical Printed Circuit Board Fabrication<br>Transportation (spills from tankers, cars)<br>• Printing (lithography and flexography)<br>• Fiberglass reinforced plastics (refer to AP-205)<br>• Hazardous Waste Facilities | • Coating (cans, coils, and fabrics)<br>• Forest products<br>• Component manufacturing (parts spray-painting, resin components, adhesive components, misc. metalworking)<br>• Regulatory agencies (OSHA, EPA, DOT)<br>• Military (base closures)<br>• Marine Chemists (ships and barges)<br>• Emergency Response/HazMat teams (refer to AP-203)<br>• Fire Departments: Arson Investigation<br>• TSD (Treatment, Storage & Disposal)<br>• Municipal/Public Works<br>• Federal, State and Municipalities<br>• Coke oven off gases (refer to AP-206) |

**Denotes Combustible Gas*