

# THE ABC'S OF GASES IN THE INDUSTRY

Ammonia: $\text{NH}_3$	n-Butane*: $\text{C}_4\text{H}_{10}$
<p><b>Colorless gas with a pungent suffocating odor</b></p> <p><b>STEL:</b> 35 ppm  <b>TWA:</b> 50 ppm  <b>IDLH:</b> 300 ppm  <b>LEL:</b> 15% by volume            Ionization Potential: 10.18 eV</p> <ul style="list-style-type: none"> <li>• Fertilizer Plants</li> <li>• Fish &amp; Meat Packing Plants</li> <li>• Industrial Refrigeration and Cold Storage</li> <li>• Semiconductor Industry</li> <li>• Water and Wastewater Treatment Plants</li> <li>• Munitions</li> </ul> <p><i>Refer to AP-201 for further information</i></p>	<p><b>Colorless gas with a gasoline-like odor</b></p> <p><b>STEL:</b> 1 ppm  <b>TWA:</b> OSHA 5 ppm  <b>LEL:</b> 1.6% by volume</p> <ul style="list-style-type: none"> <li>• Aerosol Propellant Filling Docks</li> <li>• Feed stock for Chemical Processes</li> <li>• Storage Tanks and Filling Docks</li> </ul>
Benzene: $\text{C}_6\text{H}_6$	Carbon Dioxide: $\text{CO}_2$
<p><b>Colorless liquid with aromatic odor</b></p> <p><b>STEL:</b> 2.5 ppm  <b>TWA:</b> 0.5 ppm  <b>LEL:</b> 1.2%</p> <ul style="list-style-type: none"> <li>• Refineries</li> <li>• Oil &amp; Gas Distribution</li> <li>• Feed Stock for Chemical Production</li> <li>• Solvent Distribution Centers</li> <li>• Gas Stations</li> </ul>	<p><b>Colorless, odorless gas</b></p> <p><b>STEL:</b> 30,000 ppm  <b>TWA:</b> OSHA 5000 ppm  <b>IDLH:</b> 40,000 ppm</p> <ul style="list-style-type: none"> <li>• Breweries and Wineries</li> <li>• Carbonated Beverage Bottling Plants</li> <li>• Dry Ice Plants, Food Processing Plants, Fruit Storage and Ripening Chambers</li> <li>• Greenhouses, Indoor Air Quality Studies, and Ventilation Control</li> <li>• Mushroom Farms Stack Gas</li> <li>• Oil Well Injection</li> </ul>

<p style="text-align: center;"><b>Carbon Monoxide: CO</b></p> <p><b>Colorless, odorless gas - most abundant toxic gas</b></p> <p><b>STEL:</b> ppm  <b>TWA:</b> OSHA 50 ppm  <b>LEL:</b> 12.5%  <b>IDLH:</b> 1200 ppm</p> <ul style="list-style-type: none"> <li>• Furnaces</li> <li>• Gasoline Generators/Engines</li> <li>• Grain Storage Silos</li> <li>• Lumber Drying Kilns</li> <li>• Mining and Metals</li> <li>• Parking Garages</li> </ul>	<p style="text-align: center;"><b>Chlorine: Cl<sub>2</sub></b></p> <p><b>Green-yellow gas with a pungent, irritating odor</b></p> <p><b>STEL:</b> 0.3 ppm  <b>TWA:</b> OSHA 0.1 ppm  <b>IDLH:</b> 5 ppm</p> <ul style="list-style-type: none"> <li>• Mining &amp; Metals Industry</li> <li>• Nuclear Reactors</li> <li>• Pulp &amp; Paper Mills</li> <li>• PVC Plastics Manufacturing</li> <li>• Semiconductor Water Etching Facilities</li> <li>• Swimming Pool Chlorinization Plants</li> <li>• Water Treatment Plants</li> <li>• Chlorine Gas Manufacturing</li> </ul>
<p style="text-align: center;"><b>n-Hexane*: C<sub>6</sub>H<sub>14</sub></b></p> <p><b>Colorless liquid with a gasoline-like odor</b></p> <p><b>TWA:</b> OSHA 500 ppm  <b>LEL:</b> 1.1%  <b>IDLH:</b> 1100 ppm</p> <ul style="list-style-type: none"> <li>• Electric Generation</li> <li>• Gas Stations</li> <li>• Peanut Oil Extraction Plants</li> <li>• Solvent Distribution Centers</li> </ul>	<p style="text-align: center;"><b>Hydrogen*: H<sub>2</sub></b></p> <p><b>Colorless gas</b>  <b>No exposure limits – Simple asphyxiant</b></p> <ul style="list-style-type: none"> <li>• Battery Charging Stations</li> <li>• Semiconductor Plants for Water Furnaces</li> <li>• Underground Vaults Containing Transformers</li> <li>• Vegetable Oil Hydrogenation Plants</li> </ul>
<p style="text-align: center;"><b>Hydrogen Cyanide: HCN</b></p> <p><b>Colorless gas with a bitter, almond-like odor</b></p> <p><b>TWA:</b> OSHA 10 ppm  <b>LEL:</b> 5.6%  <b>IDLH:</b> 50 ppm</p> <ul style="list-style-type: none"> <li>• Plating and Mining</li> <li>• Nylon Manufacturing</li> </ul>	<p style="text-align: center;"><b>Hydrogen Sulfide: H<sub>2</sub>S</b></p> <p><b>Colorless gas with a strong odor of rotten eggs</b></p> <p><b>TWA:</b> OSHA 20 ppm  <b>LEL:</b> 4.0%  <b>IDLH:</b> 100 ppm</p> <ul style="list-style-type: none"> <li>• Leather Tanneries and Paper Mills</li> <li>• Mining and Metals Industry</li> <li>• Oil Fields and Refineries</li> <li>• Sewage Treatment Plants</li> <li>• Sewer Maintenance</li> </ul>
<p style="text-align: center;"><b>Methane: CH<sub>4</sub></b></p> <p><b>Colorless, odorless gas – odorized with mercaptans</b>  <b>Primary component of natural gas</b>  <b>No exposure limits – Simple asphyxiant</b></p> <p><b>LEL:</b> 5%</p> <ul style="list-style-type: none"> <li>• Oil &amp; Gas Distribution &amp; Refining</li> <li>• Mining Industry</li> </ul>	<p style="text-align: center;"><b>Nitric Oxide: NO</b></p> <p><b>Colorless gas</b></p> <p><b>TWA:</b> NIOSH/OSHA 25 ppm  <b>IDLH:</b> 100 ppm</p> <ul style="list-style-type: none"> <li>• Semiconductor Plants</li> <li>• Mining</li> </ul>

Nitrogen Dioxide: NO <sub>2</sub>	Oxygen Deficiency: O <sub>2</sub>
<p><b>Reddish-brown with a pungent odor</b></p> <p><b>STEL:</b> 1 ppm  <b>TWA:</b> OSHA 5 ppm  <b>IDLH:</b> 20 ppm</p> <ul style="list-style-type: none"> <li>Boilers and Furnaces</li> <li>Diesel Emissions</li> <li>Semiconductor Plants</li> <li>Mining Industry</li> </ul>	<p><b>Colorless, odorless gas</b></p> <ul style="list-style-type: none"> <li>Cargo Holds and Storage Tanks</li> <li>Grain Storage Silos With Inerted Atmospheres</li> <li>Liquid Nitrogen Storage</li> <li>LN2 Cooled Laser Facilities</li> <li>LN2 Cooled Telescope</li> <li>Sewer Maintenance</li> <li>Sewer Treatment Facilities</li> <li>Underground Vaults (Utilities)</li> </ul>
Propane*: C <sub>3</sub> H <sub>8</sub>	Sulfur Dioxide: SO <sub>2</sub>
<p><b>Colorless, odorless gas</b></p> <p><b>TWA:</b> OSHA 1000 ppm  <b>LEL:</b> 2.1%  <b>IDLH:</b> 2100 ppm (LEL)</p> <ul style="list-style-type: none"> <li>Aerosol Propellant Filling Lines</li> <li>Feed stock for various Chemical Processes</li> <li>Propane-powered Forklifts</li> <li>Storage Tanks &amp; Filling Docks</li> </ul>	<p><b>Colorless gas with a pungent odor</b></p> <p><b>STEL:</b> 5 ppm  <b>TWA:</b> NIOSH 2 ppm  <b>IDLH:</b> 100 ppm</p> <ul style="list-style-type: none"> <li>Circuit Board Etching</li> <li>Diesel Emissions</li> <li>Paper Mills</li> <li>Sulfur Processing Plants (SO<sub>2</sub>)</li> <li>Water Treatment</li> </ul>
<p align="center"><b>Volatile Organic Compounds (VOCs)</b>  <b>Refer to the NIOSH Pocket Guide for specific chemical hazards</b></p>	
<ul style="list-style-type: none"> <li>Airline Maintenance Facilities (Jet fuel - refer to AP-200)</li> <li>Consultant Engineering</li> <li>Leaking Underground Storage Tanks</li> <li>Petrochemical Manufacturing</li> <li>Aerospace Manufacturing</li> <li>Automotive Manufacturing (paint booths—refer to AP-204)</li> <li>High Tech Electronics Manufacturing</li> <li>Pharmaceutical Manufacturing</li> <li>Chemical Printed Circuit Board Fabrication Transportation (spills from tankers, cars)</li> <li>Printing (lithography and flexography)</li> <li>Fiberglass reinforced plastics (refer to AP-205)</li> <li>Hazardous Waste Facilities</li> </ul>	<ul style="list-style-type: none"> <li>Coating (cans, coils, and fabrics)</li> <li>Forest products</li> <li>Component manufacturing (parts spray-painting, resin components, adhesive components, misc. metalworking)</li> <li>Regulatory agencies (OSHA, EPA, DOT)</li> <li>Military (base closures)</li> <li>Marine Chemists (ships and barges)</li> <li>Emergency Response/HazMat teams (refer to AP-203)</li> <li>Fire Departments: Arson Investigation</li> <li>TSD (Treatment, Storage &amp; Disposal)</li> <li>Municipal/Public Works</li> <li>Federal, State and Municipalities</li> <li>Coke oven off gases (refer to AP-206)</li> </ul>

\*Denotes Combustible Gas