



## VOC COMPOUNDS

**VOCs** - Volatile Organic Compounds

**They are:**

- ▶ a **volatile** sub-group of the larger family of organic compounds
- ▶ generated from natural sources such as:
  - forest fires
  - decomposition of organic materials
- ▶ generated from human sources such as:
  - incinerators
  - industrial processes
  - the distribution, marketing, and use of gasoline
  - operation of motor vehicles
  - evaporation of liquid fuels, solvents, and organic chemicals
- ▶ potentially present as pollutants in water, air, soil, and industrial products

**Chemical Characteristics:**

- ▶ considered "volatile" organic compounds, readily evaporating into air
- ▶ generally have a low solubility in water
- ▶ the regulated VOCs refer to several distinct classes of organic compounds
- ▶ contribute to air pollution

**Primary Human Health Concerns:**

- ▶ varies from known carcinogens to unknown health effects
- ▶ some are known human carcinogens (benzene, vinyl chloride)
- ▶ many are listed in 40 CFR as toxic compounds
- ▶ contribute to atmospheric artifact formation, such as ozone, acid rain

**Some common VOC compound series include:**

- ▶ chlorinated hydrocarbons
- ▶ aromatic hydrocarbons
- ▶ trihalomethane compounds

**Chlorinated Hydrocarbons are used in Industrial Operations and include:**

- ▶ trichloroethylene, methylene chloride, vinyl chloride, carbon tetrachloride

**Aromatic Hydrocarbons are present in Fuels and are used in Industrial Operations and include:**

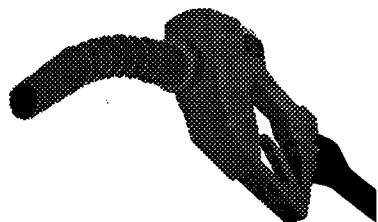
- ▶ gasoline, stoddard solvent, benzene, xylenes, toluene

**Trihalomethane Compounds are common Byproducts of Water Disinfection by Chlorination and include:**

- ▶ chloroform, bromoform, chlorodibromomethane, bromodichloromethane

**Sampling and Analysis:**

- ▶ can be stripped from water by bubbling a gas stream through the water
- ▶ the removal technique used in their analysis is termed "Purge and Trap"
- ▶ typically analyzed by gas chromatography with mass spectrometric detection and identification
- ▶ field analysis possible with direct reading instruments



◆ **Definition**

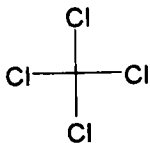
◆ **Characteristics**

◆ **Health Concerns**

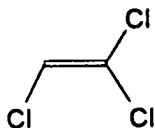
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**Examples of Chemical Formulas and Structures of some VOCs:**

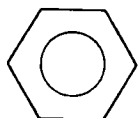
**carbon tetrachloride -  $\text{CCl}_4$  -**



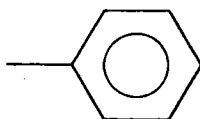
**trichloroethylene -  $\text{C}_2\text{HCl}_3$  -**



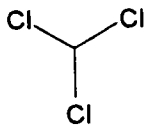
**benzene -  $\text{C}_6\text{H}_6$  -**



**toluene -  $\text{C}_7\text{H}_8$  -**



**chloroform -  $\text{CHCl}_3$  -**



**bromoform -  $\text{CHBr}_3$  -**

