

FLAMMABLE AND COMBUSTIBLE LIQUIDS

may at times be overemphasized, it must be recognized

A summary of reports^{*} of experimental evidence and practical experience in the petroleum industry recites that no significant increase in fire safety is gained by the use of spark-resistant tools in the presence of gasoline and other hydrocarbon vapors

However, some materials such as carbon disulfide, and ethyl ether have very low flash points. For these, and similar materials, the use of special tools designed to minimize the danger of sparks in hazardous locations can be recognized as a conservative safety measure

Leather-faced, plastic, and wood tools are free from the friction-spark hazard

Health Hazards

Toxic effects

Flammable liquids and their vapors may create health hazards from both surface contact and inhalation of toxic vapors. Inflammation results from the solvent action of many flammable liquids on the natural skin oils and tissue. A toxic hazard of varying degree exists in practically all cases, depending on the concentration of the vapor. See Chapter 40, "Elements of Industrial Toxicology"

Some flammable vapors are heavier than air and will flow into pits, tank openings, confined areas, and low places in which they contaminate the normal air and thus cause a toxic atmosphere. Oxygen deficiency occurs in closed containers, such as a tank which has been closed for a long time and in which rusting has consumed the oxygen. All containers should be aired and gas-tested before any entry

Combustible gas indicators

Unless tests prove otherwise, flammable and toxic mixtures should be assumed to be present in all tanks which have contained or have been exposed at any time to flammable liquids. Tests for flammable vapor-air mixtures in tanks and other vessels may be made by chemical analysis of samples or with a combustible gas indicator

A combustible gas indicator is an instrument operating on the principle that when a mixture of flammable vapor and air is passed over a heated electric filament, the resistance of the filament will be increased

in direct proportion to the amount of vapor present. When resistance of this filament is balanced against the resistance of a cold filament in a Wheatstone bridge device, resistance can be measured on a galvanometer in terms of the lower flammable limit of the mixture. When combustible gas indicators are used to test for vapors from leaded gasoline sludge, as in the bottom of storage tanks, they should be equipped with special high-temperature filaments to avoid lead contamination of the filament

One type of combustible gas indicator has a meter with readings in parts of 100 per cent, which represent percentages below the lower flammable limit of the vapor-air mixtures being tested. When samples of an atmosphere are drawn through the sample hose by the aspirator bulb, the meter will indicate whether or not the atmosphere is in the flammable range or below the lower flammable limit. In the latter case, the meter will indicate the percentage of flammable vapor present—the lower flammable limit being 100 per cent. It should be remembered that a combustible gas indicator does not indicate to the user if the concentration is within or above the flammable range

A combustible gas indicator should be used only by experienced persons, and the operator should follow the manufacturer's instructions on balancing the unit. The operator can check it by placing several drops of the flammable liquid in a small jar, shaking it a few times to permit evaporation, and then holding the sample hose of the instrument in the mouth of the jar and pressing the aspirator bulb the required number of times. If there is any question as to the indicator's accuracy, it should be returned to the manufacturer for checking

With some combustible gas indicators an atmosphere may be sampled so "rich" in vapor that there is a deficiency of oxygen, so that the indicators will not give readings when samples are taken continuously. The

^{*}U.S. Department of Commerce, Office of Technical Services. *Sparking Characteristics and Safety Hazards of Metallic Materials*. Technical Report No. NGF-T-1-57, PB 131131.