

level south drift at the start of the day shift, April 12, 1971.

4. The failure of mine management and workers to realize that, until the fans had been operated for a length of time sufficient to assure removal of concentrations of the gas, the entire 800 South drift was hazardous.

Characteristics of Hydrogen Sulfide Gas

Hydrogen Sulfide

Hydrogen sulfide, H₂S, (sulfureted hydrogen, hydrogen monosulfide, referred to as "stink damp" by miners) is a colorless, highly toxic, and irritant gas which has an extremely unpleasant, rotten-egg odor at low concentrations and a sweetish odor at higher concentrations. Since its specific gravity (1.19) is somewhat higher than that of air (1.00), it tends to accumulate in deep cavities such as vats, tanks, ditches, ravines, and cellars. Hydrogen sulfide forms explosive mixtures with air or oxygen and is dangerously flammable upon ignition. Water at room temperature absorbs approximately three times its own volume of the gas. It is also soluble in petroleum solvents, crude petroleum, and carbon disulfide.

Briefly, the principal sources of hydrogen sulfide that are of importance from the viewpoint of hazards are: gypsum mines, sulfur mines and wells, caissons and tunnels, natural gas production and refining of high-sulfur petroleum, sewers and other places where organic matter decomposes in confined spaces, blasting with black powder and blasting with other explosives in heavy sulfide ore, gas manufacture, low temperature carbonization of coal, manufacture of chemicals, dyes, and pigments, vulcanization of rubber, glue manufacture, tanning, spinning of viscous rayon, and treatment of sewage.

In addition to these places of primary importance, the gas occurs in the water of some mineral springs, rock-fissure gases, volcanic gases, and from bacterial action in brackish waters. Some of these, however, are associated with the important sources of hazards mentioned above, as the occurrence of hydrogen sulfide bearing water in gypsum mines, rock strata gases in mines and tunnels, and bacterial action or decomposition of organic matter in sewers.

The gas may be liberated to the air directly from the original source or place where it is generated or, due to its solubility in water and oil, it may be transported in solution great distances from its original

source and then escape and create dangerous atmospheres at unsuspected places. In mines, tunnels, and caissons the presence of the gas may be due entirely to the inflow of hydrogen sulfide bearing water and its escape therefrom into the air.

Hydrogen sulfide does not always present a health hazard in the situations cited, but the possible occurrence of a health hazard is worthy of consideration when investigating injury or accident from exposure to gas at such places, and in the planning and designing of industrial and engineering equipment and projects where the gas might jeopardize the health and safety of persons.

Hydrogen sulfide has a distinctive, unpleasant odor in low concentrations. However, the sense of smell is not a reliable indicator of the presence of hydrogen sulfide because the gas has a tendency to numb the olfactory receptors and this can occur very rapidly at higher concentrations. The gas has two apparent physiological actions – subacute and acute poisoning. The former is a direct irritating action of the gas on the moist body tissues of the eyes and the lining of the respiratory tract. On the other hand, acute poisoning is the result of a toxic action on the nervous system produced by the absorption and presence of hydrogen sulfide in the blood. Unconsciousness and respiratory failure usually occurs within a few seconds after exposure and the important reaction is paralysis of respiration followed in 5 to 10 minutes by cardiac failure. There are no warning symptoms and no pain. Death from acute poisoning is due primarily to asphyxia. Death is as rapid as in poisoning by cyanide.

Experience has repeatedly shown that if rescue is effected and artificial respiration applied within a few minutes after the victim is overcome, life can be saved almost invariably. On the other hand, experience has also shown that a delay of 10 to 15 minutes jeopardizes the chances of recovery, though this should not be taken as an excuse for laxity in carrying out the prescribed treatment.

The importance of self-protection of those attempting to effect rescue should be emphasized. Cases are on record where the first, second, and even the third person coming to the rescue of fellow workmen have all been overcome.