Monitoring Worker Exposures to Hydrogen Sulfide

Traditionally, the Department of Government Services, Occupational Health and Safety Branch, automatically adopted as occupational exposure limits the annual American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). In Newfoundland and Labrador, the regulatory excerpt for this authority is found in Section 42(7)(6) of the Occupational Health and Safety Regulations, 2009, which states:

> An employer shall ensure that except as otherwise determined by the division, a worker is not exposed to a substance that exceeds the ceiling limit, short-term exposure limit or 8-hour TWA (time weighted average) limit prescribed by ACGIH ;

Since the 1970s, the exposure limit for hydrogen sulfide (H_2S) was **10 ppm** (8-hour TWA - time weighted average) and **15 ppm** (STEL - short term exposure limit). In 2010, the ACGIH revised the exposure limits for H_2S to **1 ppm** (TWA) and **5 ppm** (STEL). The basis and rationale for the changes can be found in the 2010 ACGIH Documentation for H_2S.

With the adoption of the new 2010 H_2S exposure limits, there has been concern within some industries regarding the practicality of these limits. Currently, the majority of intrinsically safe personal gas detectors on the market do not have the capabilities to accurately measure in the parts per billion (ppb) range. While there are some detectors available which do have these capabilities these instruments have not been adequately validated for reliability and accuracy. The only validated methods currently available involve the use of sampling pumps and collection devices. This method of personal sampling is not always appropriate for the detection of H_2S due to the wait times for analysis, the ability for concentrations to vary in a short period of time and the serious effects related to elevated exposures.

The ACGIH has documented the following information relating to the effects of H_2S:

1000-2000 ppm	Loss of consciousness and possible death
100 – 1000 ppm	Serious respiratory, central nervous, and cardiovascular system effects
150-200 ppm	Olfactory fatigue
100 ppm	Immediately Dangerous to Life and Health (IDLH) concentration
5-30 ppm	Moderate irritation of the eyes
5-10 ppm	Relatively minor metabolic changes in exercising individuals during short-term exposures.
< 5 ppm	Metabolic changes observed in exercising individuals, but not clinically significant
5 ppm	Increase in anxiety symptoms (single exposure)
5 ppm	Start of the dose-response curve (short term exposure)

All ACGIH TLVs are health-based values. They do not consider economic feasibility, technical feasibility or the availability of valid and reliable methods to

measure workplace exposures to determine compliance with the TLVs. In the case of H_2S, the exposure limits have advanced beyond the current industry's detection capabilities in many applications.

The Occupational Health and Safety Division will not issue orders where the violation is based on the 2010 ACGIH TLVs for H_2S **and there are technical limitations in the sampling equipment currently available on the market**. OHS Officers and Industrial Hygienists will continue to enforce the 2009 TLVs for H_2S until further information becomes available.

The Department will continue to monitor (1) research and development relating to H_2S gas detection equipment, (2) the availability of acceptable methods and equipment to determine compliance with the new 2010 ACGIH exposure limits, and (3) other Canadian jurisdictions adopting ACGIH guidelines as regulatory standards for occupational health and safety.

In the interim, industry is encouraged to consider using the 2010 ACGIH H_2S guidelines when evaluating specific workplace situations and conditions and making risk management decisions.