Abstract Book

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exposures to hydrocarbon vapor from production equipment used to extract shale reserves at well sites. Emissions from storage tanks at well sites have also led to serious exposure risks. Emissions include a bolus or plume of released vapor in the form of pressurized gas and mist when a tank inspection hatch is opened for workers to check volumes of liquid. Reported exposures to massive amounts of the hydrocarbon mixtures in the plume have resulted in lightheadedness, shortness of breath and suffocation (arrhythmia, anoxia and death).

Resolution: Using data contained in environmental, health, marketability and research reports, a case can be made for an occupational exposure limit (OEL) for shale gas hydrocarbon vapors. An OEL-C (ceiling limit) for bolus exposures may be the safest alternative. Anecdotal information suggests the primary compounds are light-end aliphatic compounds including methane, butane, and propane up to hexane (C2-C7). Interim OEL's for controlling exposures exist on the basis of: industry practice API 18.1, interventions from recent governmental evaluations of reports of fatalities, and oil and gas industry requirements. NIOSH Current Intelligence Bulletin (CIB-66) recommends an OEL Ceiling limit (C-OEL) for compounds with health-based IDLH values which are greater than 10% of the lower explosive limit (10% LEL).

Results: Because of the compositional, mixture and toxicological variations in shale gas mixtures, there are many obstacles to providing a single limit, or even multiple provisional limits for worker health. There are hurdles to overcome in estimating what extent of the total amount of the gas vapor in a bolus exposure is potentially inhaled displacing oxygen and how this exposure causes effects to health. This invites controversy as to what portion of the total dose a worker should receive (5%, 10%... 40% of the LEL) before deciding a safe limit. This discussion does not intend to cover the great deal of toxicological research needed or decision making required to arrive at an OEL. This presentation offers relevant data and makes a case for consensus among the industry and scientific community concerned with limiting health effects to workers from exposures to shale gas mixtures.

Lessons learned: Recent reports of exposures suggest that the practice of tank gauging for shale gas warrants intervention. Government evaluations of the fatalities and allied oil and gas industry partners are considering changes to exposures by recommending an OEL. Obviously, across the far reaching shale plays in the U.S. and worldwide the composition of a production mixture could widely vary; so this estimate needs a great deal of research in order to bear out a common toxicological profile. Recent evidence from U.S. fatalities in the Bakken shale and reports of air samples from other locations bears out a commonality, on the basis of reported concentrations of methane, butane, propane up to n-hexane gas mixtures evolved which may be found in concentrations up to 40% of LEL in the bolus. Calculations of exposure limits for shale gas concentration using a method analysis as described by ACGIH® TLV® Appendix H. Reciprocal Calculation Method for Certain Refined Hydrocarbon Solvent Vapor Mixtures and others such as the British Health and Safety Executive Reciprocal calculation procedure for mixtures of hydrocarbon solvents are discussed as a means beyond using 10% of the LEL as an interim control step of worker safety and health.

SR-117-04

Premiering the NIOSH Manual of Analytical Methods, 5th Edition

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Objective: The NIOSH Manual of Analytical Methods (NMAM) is a collection of methods for sampling and analysis of contaminants in workplace air, and in the blood and urine of workers who are occupationally exposed. In 2016, the NMAM will begin publishing the 5th Edition.

Methods: The 1st edition of the NMAM was published in 1975. For this 5th edition, there will not be a printed version of the NMAM. This will be a living document: meaning that as the methods and chapters are reviewed and approved they will be posted on the NMAM Website. The results of a survey of NMAM users helped shape the direction of the 5th edition, with new and updated chapters as well as new methods for air sampling, for biomonitoring and for wipe sampling. A number of the new methods were published in collaboration with our international partners. The webpage has a new look that uses a responsive design format to allow viewing of the NMAM on any electronic device. In addition to access of all the methods for the 5th edition, the "historical" 4th edition will still be available for use.

Results: Methods for assessment of workplace air quality were evaluated by using air samples taken in controlled laboratory atmospheres. These sample results were evaluated using the NIOSH Accuracy Criteria as well as determining the methods' bias and precision. Examples of some of the new methods are wipe methods for methamphetamines, elements using microwave digestion, and measuring such compounds as acetone or toluene in biological matrices such as urine or blood. A new method that combines a great number of the 4th Edition NMAM volatile organic compound (VOC) methods into one method (with all the evaluation data in one place) should allow industrial hygiene labs to be accredited now for just one method while retaining the ability to analyze many VOCs under their accreditation.

Conclusions: Harmonization of NIOSH methods with related voluntary consensus standards is a strategic goal for the 5th edition of NMAM. This 5th Edition NMAM is responsive to the current needs of the industrial hygiene community and the living nature of the document lends itself to adaption to meet any future needs in occupational exposure assessment.

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Assessment and Control of Low Observable Sanding Processes on F-22 Aircraft

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Situation/Problem: US Air Force F-22 aircraft use Chromium VI and silver paints as part of the low observable stealth coatings. As part of the maintenance of the aircraft along with maintenance of the stealth coatings, Low Observables (LO) workers hand and pneumatic sand aircraft to remove coatings to allow for reapplication. The 154 Wing LO shop needed to move to a new building due to renovations of their current facility. A new controls scheme needed to be developed in compliance with OSHA substance specific standards and Air Force Instructions (AFI).

Resolution: The Air Force Bioenvironmental Engineering flight