

Factors that Promote Gas and Vapor Desorption from Filters and Recommendations for Proper Change-Out Management

Michael Parham, Sean Cornelious, Amy Quiring and Yuqing Ding

Scott Health and Safety, Research and Development

Several standards under development have proposed specific testing to assess the level of desorption under certification test conditions. Cartridge use conditions depart significantly from those used for certification testing. This study seeks to determine if the proposed desorption testing adequately verifies the risk of a cartridge to desorb contaminants under normal use. A three stage sequential process for desorption testing is used: exposure to the contaminant, storage, and exposure to clean purge air. In this study we baseline the performance of a representative PAPR cartridge under these conditions for isobutane, cyclohexane, and ammonia. Over the range of conditions evaluated the average percent mass desorption measured for isobutane, cyclohexane and ammonia was measured. Initial mass loading, storage, and exposure relative humidity were the most significant factors. Of interest was that desorption at levels above short term exposure limits occurred after what would be considered the normal service life at the exposure conditions. Based on this understanding of desorption behaviors, recommendations are given for cartridge change out management to reduce the risk of desorption. A set of data collected to support cartridge change out management for low level aldehyde and organic vapor exposures during wildland fire fighting is used as an example for setting cartridge change out procedures given the potential for desorption.