NOVA SCOTIA ENERGY
R&D CONFERENCE 2014
ENERGY FOR CHANGE

Abstract:

Mark Grady, Dalhousie University
Research Advisor: Jan Haelssig
Category: Environment

Modeling the Dispersion of Hydrogen Sulphide during Instrumentation Blowdown

Strict toxic gas release and exposure limits are required to prevent ecological damage and workplace injury. However, it is usually difficult to predict under which conditions these exposure limits will be exceeded. Specifically, given the release of a certain quantity of gas, it is difficult to accurately predict the exposure time and concentration under a broad range of environmental conditions. A gas of particular concern in the oil and gas industry is hydrogen sulphide (H2S), since it is found at low concentrations in many systems and it has a strict Short Term Exposure Limit (STEL) of 5 ppm in many jurisdictions. Instrumentation blowdown, which is a normal part of the instrument maintenance cycle, often results in the release of finite quantities of gases. The release of these gases poses an exposure hazard, especially when the released gases contain H2S.

In this study, computational fluid dynamics (CFD) was used to study gas dispersion during instrumentation blowdown under a variety of atmospheric and release conditions. The CFD model solved the compressible form of the Navier-Stokes equations to account for gas expansion and buoyancy effects. Turbulence was modeled using the standard *k-epsilon* model, and the transient concentration fields were determined by solving chemical species conservation equations and the continuity equation. The results from a variety of parametric studies showed a strong dependence on the background wind speed, the presence of local obstructions, as well as release quantity and concentration. The primary remaining uncertainties are the validity of the turbulence model assumptions under real atmospheric conditions, the real blowdown dynamics, and real wind characteristics.