Application Article 231

Version 1.0 4 August 2011

Building on a legacy of PID development

Summary

From the 1970s to the present day, photo- ionisation detectors (PIDs) have been at the front line of efforts to detect volatile organic compounds. As industrial hygiene has become ever more important and exposure limits for VOCs have reduced, PID technology has continued to develop, providing reliable detection under challenging environmental conditions at concentrations right down to below 10 parts per billion.

NHU PI101 – the first photoionisation detector, developed in 1974.

Introduction

When in the early 1970s it was realised that vinyl chloride, the precursor to PVC, was responsible for an elevated incidence of liver cancer among employees at vinyl chloride plants, exposure levels that had been set at 500 ppm were quickly reduced in response to the threat. Finding a reliable detector for the compound was paramount.

PID Helps Address The Vinyl Chloride Crisis

The process to produce vinyl chloride starts with either natural gas (predominantly methane) or acetylene. In the 1970s the technology available to detect and measure vinyl chloride was the Century OVA 128, a portable FID (flame ionisation detector), but this also responded to natural gas and acetylene, making reliable detection of vinyl chloride a challenge at the more stringent levels proposed. A detector was needed that exhibited no light hydrocarbon interference.

Around the same time, Jack Driscoll of fledgling HNU systems was developing a continuous PID for the detection of NO in the ambient environment. A key benefit of Driscoll's development was its non- response to methane and acetylene.

A simple test with a vinyl chloride source demonstrated the instrument's capability as a detector of this hazardous compound with little or no response to methane. A hand-held prototype was produced and adopted almost immediately as the standard for vinyl chloride detection. The HNU PI101 became required technology for the BF Goodrich PVC process licensed by most manufacturers. Exposure limits were dropped to 1ppm, and an industry was born. By 1974 HNU was shipping units around the world and soon PID was challenging FID for the leading role in VOC detection.

It was immediately apparent that PID could detect many other VOCs and so the concept of response factors was developed. The first table of PID response factors soon appeared in the PI101 manual. Improvements to early PIDs included the use of a Teflon screen to minimise the photo-electron effect that introduced spurious background signals, the development of lamps with differing energy outputs, and the use of isobutylene as the universal calibration gas. Later, the microprocessor added greatly to the functionality of PID, allowing for data logging and TWA and STEL calculations.

Tiger handheld photoionisation detector developed in 2010 detects VOCs to 20,000 ppm

Latest Developments In PID Instruments

Since its foundation in 1989, Ion Science has driven the development of PID technology, and now offers industry the widest range of products and the most effective solutions. Most recently Ion Science has introduced Fence Electrode Technology to minimise the impact of humidity, and Anti-Contamination Technology for extended performance under difficult field conditions. This technology allows for the detection of VOCs from just a few parts per billion right up to 20,000 ppm in a single unit. ION's PIDs are now acknowledged to perform better than any in the industry

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