Control Instruments® Corporation

Application Note

PrevEx® Flammability Analyzers versus Infrared Sensors for process applications

The National Fire Protection Association's NFPA-86 Standard for Safe Operation of Class A Ovens and Furnaces, has concluded that, "…Infrared calibration can vary considerably for various solvent types. Its area of application is for single solvent systems…" (Annex E.1).

The same document (Annex E.1) describes Flame Temperature systems, "…calibration is relatively constant for various solvents…"

Calibration and response
Most flammable vapor analyzers share a common trait—they respond differently to different vapors. For example, you would expect an analyzer calibrated for Toluene to accurately measure any Toluene vapors present in the sample. You may also expect that whenever the process solvent is changed, the analyzer must be either recalibrated or reprogrammed to ensure that it's measurement of the new solvent vapor is still accurate.

Multiple vapors
The challenge of measuring a mixture of solvent vapors now becomes clear: if more than one vapor is present, and the analyzer responds differently to different vapors, how can it accurately measure a mixture of vapors?

Some believe that a compromise calibration based on the ratio of multiple solvents is possible; that given even a simple mixture of 50% solvent A and 50% solvent B, a common calibration factor can be calculated.

Change and the unexpected cause accidents
It must not be assumed that all solvents vaporize at the same rate nor that their ratios will remain constant. Process changes or upsets will dramatically alter the vapor mixture. The illustrations below show what can happen to the relative concentration of mixed vapors in a two-zone dryer when the process is upset by changes in speed, coating weight, ventilation rates, dryer temperature, etc.

Even when calibrated to code, infrared sensors can generate false alarms or, more importantly, fail to generate alarms and initiate safety actions when these process variations occur.

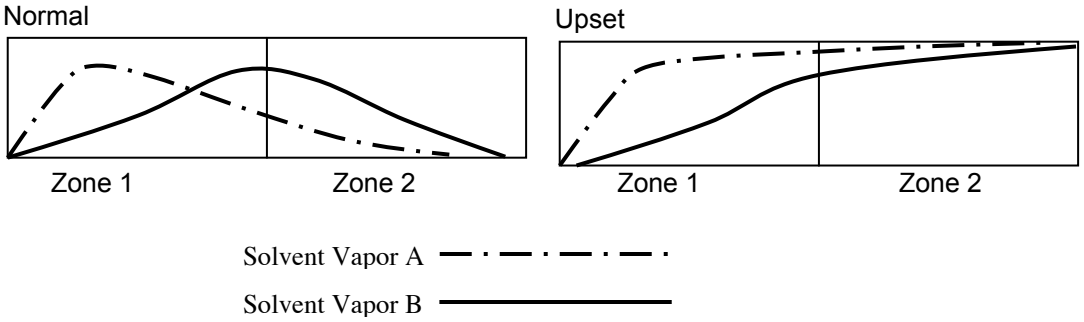
Note how the ratio of vapors in zone 1 changes during an upset. An infrared analyzer, calibrated to measure the normal 50/50 mixture, will now apply that logic to the measurement of a 70/30 mixture of solvents which require different response factors.

Note also that zone 2 which was not being monitored because, under normal conditions, it had been considered safe, is now more dangerous than zone 1. Even if an analyzer had been installed on zone 2, it would have been calibrated for the normal mixture. That's much different than the mixtures and concentrations which are present during an upset.

The need for "Universal Calibration"
The ideal process analyzer would not require response factors or recalibration—it would be able to instantly measure all flammable vapors, at any concentration, with perfect accuracy. As far as we know, that analyzer does not exist.

But, unlike narrow-banded infrared sensors, PrevEx® Flammability Analyzers have the unique ability to measure most common process solvent vapors, including mixtures, to within a few percent of their lower flammable limit—without the need for recalibration.

The proprietary technique used to accomplish this was developed by Control Instruments Corporation in the 1970's and has been continuously refined ever since. The performance, accuracy, and fail-safe reliability of Control Instruments' Flammability Analyzers have been successfully proven in thousands of installations around the world.



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