ABB MEASUREMENT & ANALYTICS | APPLICATION NOTE

LEL monitoring of process stream

PIR3502 Multiwave process photometer

Reliable monitoring of the LEL of process streams where several components can affect the LEL.

Measurement made easy

PIR3502
IR process photometer

Industry
General

Introduction
A common method for safe plant operation is to monitor the Lower Explosion Limit (LEL) for gas streams and the headspace above liquids in a closed vessel. The traditional method for LEL monitoring is to use a catalytic combustion type monitor. Although this technique has worked well for ambient monitoring for leaks, it has inherent difficulties when applied to a process or a head space above a mixture. One problem encountered is the compatibility of the catalytic combustion cell to the process chemicals. Another problem is the inability of this type of analyzer to be selective if more than one component contributes to the LEL of the gas mix. If the ratio of the components changes from what the instrument was calibrated on, then the accuracy of the LEL analysis is lost. The ABB PIR3502 IR Multiwave process photometer provides a better alternative to the catalytic combustion analyzer for process LEL monitoring. One common compound that contributes to the LEL that cannot be measured with an IR analyzer is hydrogen.

The analyzer
The ABB PIR3502 IR process photometer is a multiple channel filter photometer that can accommodate up to eight different optical filters on its filter wheel. It works by ratioing the energy from a measure wavelength filter (where the component of interest absorbs energy) to a reference wavelength filter (where none of the components absorbs energy). This photometer has established itself as a reliable and stable analyzer for process control.

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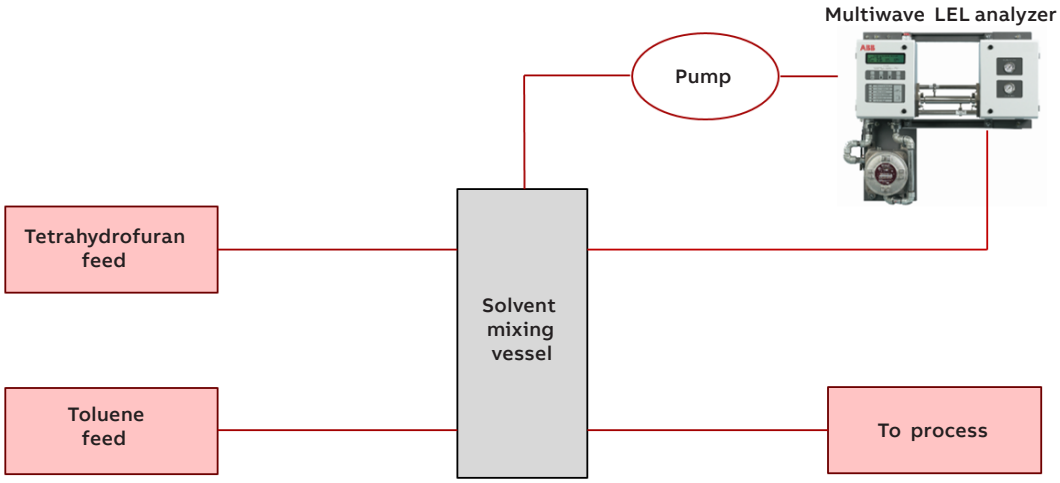

Discussion

It was necessary to monitor the LEL of the head-space of a batch-process vessel. There were two components in the process, Toluene and Tetrahydrofuran (THF), which affected the LEL of the headspace. The ratio of the Toluene and THF were constantly changing during most of the process. A PIR3502 process photometer was used to measure the LEL of the gas mix, as well as to report the actual Toluene and THF concentrations. Since this photometer was able to differentiate between the Toluene and THF, the changing ratio had no effect on the accuracy of the LEL measurement

The following results were obtained:

Sample	Component LEL reading on front panel
2.0 % THF and 0.0 % Toluene	100 %
1.0 % THF and 0.0 % Toluene	50 %
1.2 % Toluene and 0.0 % THF	100 %
0.6 % Toluene and 0.0 % THF	50 %
0.6 % Toluene, 1.0 % THF	100 %

The benefit provided by the process photometer on this application is the ability to add a control feature to the measurements. Since it also reported the THF and Toluene concentrations, the operator would know which component to cut back on when a high LEL was achieved, rather than having to shut down the process. This results in more efficient operation of the THF/Toluene solvent process.

Conclusion

The PIR3502 IR process photometer provides reliable monitoring of the LEL of process streams where several components (other than hydrogen) can affect the LEL.

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ABB Inc.
3567 Jefferson Street North
Lewisburg, WV 24901
USA
Tel: +1 304 647 4358
Email: analyzeit@us.abb.com

abb.com/measurement

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