# Online FT-NIR analysis of propylene oxide during polyether polyol production process



Detection of ppm levels of propylene oxide for safe polyether polyol production process.

—
01 FTPA200-260CH FT-NIR multichannel chemical process analyzer

**Overview**

Polyether polyol is a key component used in the producing of polyurethane; it is synthesized through the reaction of a glycol and an organic oxide. The reaction process often involves a special double metal cyanide catalyst (DMC), which renders the process virtually wasteless and eliminates the use of highly reactive and toxic isocyanate compounds. The most common type of organic oxide used in the DMC catalyst production process of polyether polyol is propylene oxide.

Despite being less toxic and dangerous than iso-cyanate compounds, propylene oxide still remains an extremely flammable substance with acute toxicity and carcinogenic effects. Thereby, detection of propylene oxide at ppm levels becomes crucial to ensure a safe polyether polyol product at the reactor outlet.

The typical detection method of propylene oxide in polyether polyol product uses gas chromatography, which requires off-line sampling and extraction of the product prior to measurement. Aside from incurring a long detection response time due to the inherent laboratory method, this approach also presents a health risk to personnel.

For such applications, using Fourier transform near-infrared (FT-NIR) spectroscopy with an insertion measuring probe or flow-through cell becomes advantageous because it allows fast and reliable online or inline monitoring of low concentration levels of propylene oxide, thus reducing operators' health risk during the polyol production process.

**Method**

Instrument: FTPA2000-260CH multichannel chemical process analyzer
Detector: Room temperature InGaAs 2.6 μm
Sampling technique: PSD series 500 single pass transmission probe
Analysis temperature: 150°C
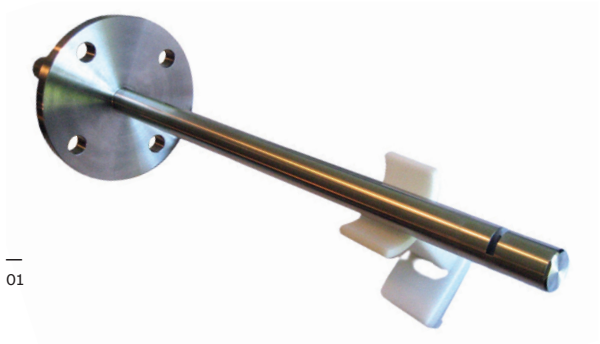Resolution: 16 cm$^{-1}$
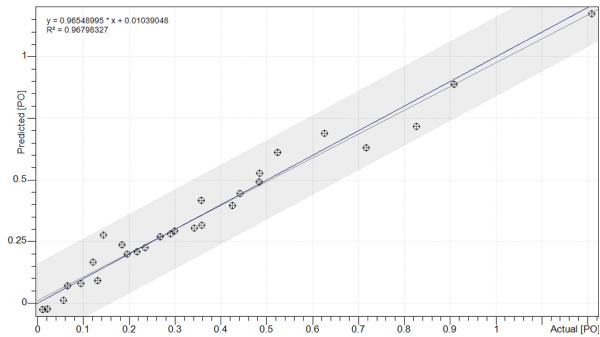Number of scans: 64 to 128



—
01

—
01 PSD series 500 single pass transmission probe schematic

—
02 Propylene oxide concentration calibration results (FT-NIR predicted values against actual values)



—
01

## Calibration results

| Property | Range (ppm) | $r^2$ | SECV (ppm) |
|---|---|---|---|
| Propylene oxide | 0.012 – 1.208 | 0.986 | 0.032 |

## Conclusion

Concentrations of propylene oxide measured with FT-NIR process analyzer are in agreement with the laboratory reference values. This study demonstrates that FT-NIR process analysis can be successfully and reliably used to quantify and monitor in real-time the concentration of propylene oxide in the DMC-catalyzed production process of polyether polyol.

## Results



y = 0.96548995 * x + 0.01039048
R² = 0.96798327

—
02

—
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.