

## APPLICATION NOTE

### Polymer / Resin Reaction Endpoint Using a NIR-O™ Spectrometer or ClearView® db Photometer

Determining reaction endpoint in polymer/resin reactors is critical to achieve desired product properties, such as molecular weight. Knowing exactly when the reaction is complete saves residence time and batch conversion time, and lowers the overall manufacturing cost. Having real-time information leads to significant improvements in process control because you see activity with continuous readout that less frequent grab sampling may miss. Continuous monitoring allows you to go beyond “in-spec” to “on target”! Online monitoring delivers a number of benefits including:

- No need to increase grab samples near the end of the reaction.
- No need to pressure your analytical lab for faster turnaround of reference method results.

NIR (near-infrared) spectroscopy is effective in providing one of the key parameters used to determine molecular weight, acid value. Another key parameter is viscosity, also measured in the reactor. Both parameters are used together to monitor the path of the reaction and to accurately determine the end point. Different products can be distinguished by these paths, as shown for hypothetical products A and B in Figure 1.



Figure 1

---

## Isocyanate

Isocyanate is commonly added near the end of the reaction to modify the final viscosity and as an end-blocker to achieve certain physical properties, such as wear resistance and electrical properties. Isocyanate may be measured accurately with a low cost GUIDED WAVE™ ClearView® db Photometer.

---

## Color

Color is a good indicator of oxidation where air might be brought into the reactor under vacuum from a leaky seal. Our ClearView db photometer is powerful in that it simultaneously analyzes chemical properties in the NIR range and color in the VIS range.

A fiber optic insertion probe may be directly inserted into the reactor. This is where light interacts with your sample. The GUIDED WAVE Single-Sided Transmission (SST™) Probe is designed to withstand the frequent heating/cooling cycles in batch reactors at temperatures up to 300 °C. Insertion probes can also be placed in transfer pipes in continuous processes.

Insertion probes are not the only means to make continuous measurements. If your polymers/resins are routed through a bypass loop (side stream) at temperatures < 150 °C, you can use one of our many flow cell designs. It is important that your material does not freeze up or solidify and block sample flow. The sample can be valved off from the cell and drained. The flow cell has a cleaning port that provides you with access to the optics for easy cleaning.

Our insertion probes and flow cells can be connected to our analyzers up to 100 meters away using reinforced process-ready optical fiber cables. Fiber optic cables are routed to the analyzer in the control room or to a suitable enclosure that meets your local safety requirements, such as ATEX, CSA, or other.

---

## Analyzer Selection

Process Insights offers two types of analyzer technologies for these measurements; the ClearView db photometer or the NIR-O™ full-spectrum process spectrometer. For simple reaction systems the ClearView db photometer is a lower cost option. The ClearView db may be used when fewer than six wavelengths are required for analysis. Linear calibrations may be developed on the analyzer or absorbances may be output directly to a control system for analysis. For more complex systems requiring full spectrum data or multiple calibration models for significantly different reactions, a NIR-O full-spectrum spectrometer offers more powerful data analysis and greater versatility. Contact a Process Insights technical sales representative or visit our website for product specifications and information on choosing the best analyzer for your application.

---

## Polymer Industry Proven Photometric Measurements

NIR	Visible
Acid Value	Yellowness
Hydroxyl Number	Turbidity / Clarity

---

## GAIN REAL-TIME INSIGHT INTO YOUR PROCESS

Process Insights manufactures and delivers premium sensors, monitors, detectors, analyzers, instrumentation, and software that are mission-critical to keep your operations, personnel, and the environment safe – every day across the globe.

Get the most reliable, precision analytical technologies available on the market today. We will work to match your needs and budget, and provide the optimal, and most stable process analysis solution for your application.

---

## CENTERS OF EXCELLENCE | PROVIDING PROVEN SOLUTIONS

Process Insights is committed to solving our customers' most complex analytical, process, and measurement challenges everyday.

### Process Insights – The Americas

4140 World Houston Parkway Suite 180, Houston, TX 77032, USA +1 713 947 9591

### Process Insights – EMEA

ATRICOM, Lyoner Strasse 15, 60528 Frankfurt, Germany +49 69 20436910

### Process Insights – APAC

Wujiang Economic and Technology, Development Zone, No. 258 Yi He Road, 215200 Suzhou, Jiangsu Province, China +86 400 086 0106

---

For a complete range of products, applications, systems, and service options, please contact us at: [info@process-insights.com](mailto:info@process-insights.com)

For a complete list of sales & manufacturing sites, please visit: <https://www.process-insights.com/about-us/locations/>

COSA Xentaur, Tiger Optics, Extrel, Alpha Omega Instruments, ATOM Instrument, MBW Calibration, MGA, Guided Wave, ANALECT and LAR TOC Leader are trademarks of Process Insights, Inc.



REVOLUTIONIZING MEASUREMENT

**EVERYWHERE**