

From the laboratory to the field

Scalable PAT solution with Endress+Hauser – for greater efficiency, safety, and quality



Evonik Industries AG, headquartered in Essen, Germany, is a global leader in the field of specialty chemicals. Thanks to its passion for innovation and technical excellence, the company goes beyond traditional chemistry to create sustainable solutions for industry and society. Evonik operates production facilities in 27 countries on six continents.

“With Raman spectra, you are often lucky enough to be able to assign isolated peaks to individual substances in the mixture. This significantly reduces the calibration effort and quickly leads to quantitative results. In contrast, with NIR spectra you sometimes cannot distinguish between substrate and product in the reaction mixture with the naked eye.”

Dr. Andreas Ohligschläger
PAT Engineer, Evonik



Raman analysis in the laboratory



Evonik and Endress+Hauser: Successful implementation of a PAT solution.

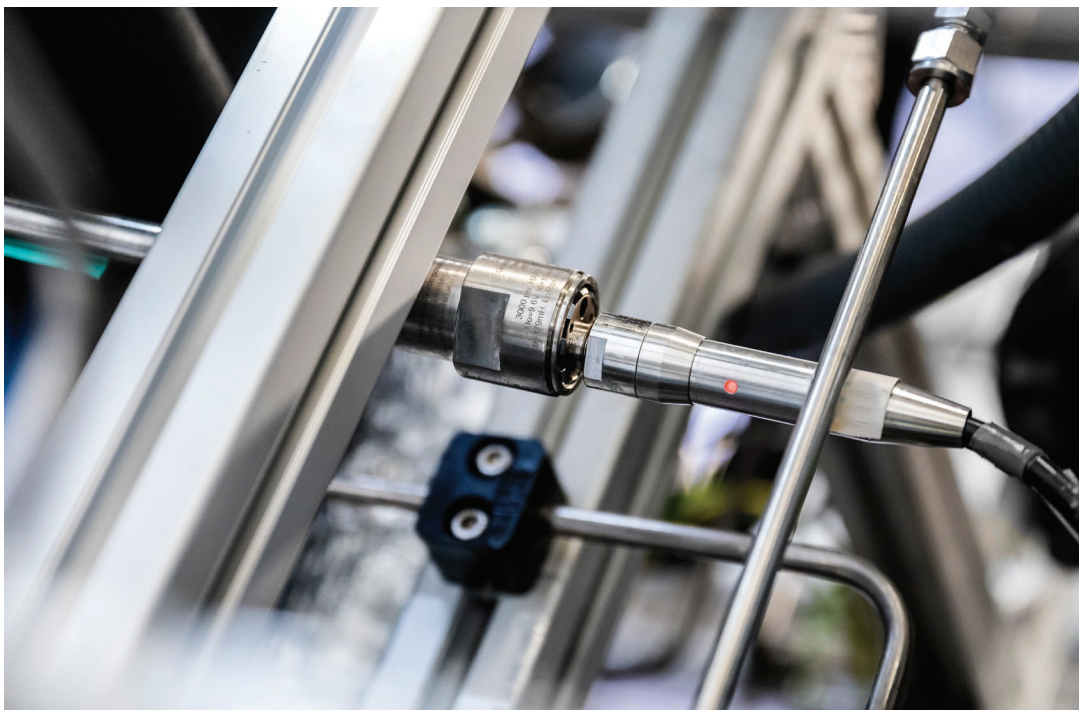
In partnership with Endress+Hauser, Evonik has successfully integrated Raman spectroscopy as a powerful process analysis technology (PAT) from the laboratory to pilot plants, right through to production. This technology delivers real-time data, increases efficiency, reduces costs, and improves product quality. Its flexibility, scalability, and safety make it the key to new savings potential in chemical process development. Customers can benefit directly from this acquired expertise to optimize their own development and production processes in a sustainable manner.

The challenge Back in 2016, Evonik launched its company-wide “Lab to Process” strategy with the aim of embedding PAT technologies early on in process development. Evonik was looking for a process analysis technology that would efficiently support the entire development and optimization process while also helping to reduce costs.

The goal was to find a solution that not only provides accurate real-time data but is also versatile enough to be used in a wide variety of process environments – from the laboratory to production.

The technology should:

- be universally applicable for a wide range of chemicals, states of matter and process conditions
- be flexible and scalable – from the laboratory to production; from the R&D lab to large-scale production facilities
- be quick to integrate in order to shorten development times and reduce time to market
- improve product quality through continuous inline measurements
- function reliably even under demanding conditions such as ATEX zones.



Raman probes from Endress+Hauser: Continuous data transfer from the laboratory to the process enables increased efficiency and ensures product quality.

Our solution Endress+Hauser provided Evonik with a customized solution based on Raman spectroscopy – a technology that meets all of the requirements outlined. The systems are characterized by their exceptional modularity and versatility. Thanks to optical fibers and various probe types, they can be easily integrated into a wide variety of installation situations. Up to four independent channels enable simultaneous monitoring of multiple measuring points – a clear advantage for complex processes.

The chemometric analyzability of the spectra offers particular added value: Thanks to compatibility with all common chemometric programs, these can be analyzed directly on the spectrometer in a way that is versatile, intuitive, and achieved in real time. This allows qualitative and quantitative data to be recorded and interpreted immediately during the process – without any time-consuming manual sampling.

Raman spectroscopy was successfully used for the first time in a pilot plant for the development of hydrogenation

processes. The probe was integrated into a 6 mm pipe – significantly smaller than in production facilities. Instead of daily NMR sampling, the technology now enables inline measurements to be taken every single minute, and the process continuously monitored.

This process is efficient, precise, and safe. In pilot plants with low volumes in particular, the system composition remains unchanged because no samples need to be taken. This not only saves time and money but also increases safety for both personnel and plant.

Thanks to its standardized and certified components, it can even be used in ATEX zones at a cost that is reasonable. For use in potentially explosive atmospheres, Evonik also uses the Liquiphant Vibronic level switch. This ensures that no flammable gas mixture can form in the laser beam of the Raman probe – a decisive contribution to process safety.

“The requirements for PAT measurement systems are particularly high, especially in the harsh environment

of process plants and to comply with ATEX regulations. Raman spectroscopy has established itself as a robust and reliable tool in this area,” says Dr. Roland Peschke, PAT expert at Evonik Oxeno.

This has enabled Evonik not only to increase efficiency and quality in process development, but also to successfully transfer technology from the laboratory to production – a real key to new savings potential.

Following successful implementation in Germany, Raman technology is now being rolled out internationally in Evonik’s first production plants – supported by the global expertise of Endress+Hauser.



Raman Rxn2 analyzer



Specific challenge: Endress+Hauser's Raman spectroscopy systems also withstand the harsh environment of process plants and comply with ATEX regulations

The solution components

- 16 Raman Rxn2 analyzers
- More than 50 measuring points with Raman probes (various probe types, modular use)
- Optical fibers for versatile integration
- Liquiphant Vibronic level switch for ATEX safety

Summary Raman spectroscopy from Endress+Hauser has established itself as a key PAT tool at Evonik. It enables significant efficiency gains, cost reductions, and faster market launch of new products.

- End-to-end process analysis from the laboratory to production
- Real-time measurements possible at several measuring points at the same time
- Inline measurements replace manual sampling
- Also suitable for pilot plants with low volumes

- Reliable operation even under difficult conditions (e.g. ATEX zones)
- Reduction in the time to market
- Cost reduction through elimination of laboratory evaluations and reduced personnel costs
- Increased safety
- Internal acceptance and acquisition of expertise

Germany

Endress+Hauser
(Deutschland)
GmbH+Co. KG
Colmarer Straße 6
79576 Weil am Rhein
Fax +49 (0) 800 EHFAXEN
Fax +49 (0) 800 3432936
www.de.endress.com

Sales

Consulting
Information
Commissioning
Ordering

Tel. +49 (0) 800 EHVETRIEB
Tel. +49 (0) 800 3483787
info@uk.endress.com

Service

Technical support
On-site servicing
Spare parts/repairs
Calibration

Tel. +49 (0) 800 EHSERVICE
Tel. +49 (0) 800 3473784
service@de.endress.com

Technical offices

Hamburg
Berlin
Hanover
Ratingen
Frankfurt
Stuttgart
Munich

Austria

Endress+Hauser
GmbH
Lehnergasse 4
1230 Vienna

Tel. +43 1 880 560
Fax +43 1 880 56335
info@at.endress.com
www.at.endress.com

Switzerland

Endress+Hauser
(Schweiz) AG
Kägenstrasse 2
4153 Reinach

Tel. +41 61 715 7575
Fax +41 61 715 2775
info@ch.endress.com
www.ch.endress.com