

Precise measurement technology for innovative plastic recycling

enespa ag works with Endress+Hauser to implement sustainable pyrolysis processes



enespa ag is a Swiss technology company based in Appenzell that specializes in sustainable recycling solutions. With subsidiaries in Germany, Liechtenstein and the USA, enespa ag develops and operates plants worldwide for chemical recycling and implements technologies for tire pyrolysis and the refinement of waste oil. With over 50 employees and more than 3,000 shareholders, enespa ag is contributing to a sustainable circular economy.

"We have some extreme process conditions in our plant. This means that we place extreme demands on our process components. The measurement technology from Endress+Hauser has enabled us to achieve a high degree of automation. We have now reached the point where the plant can be operated remotely."

Julian Herrmann,
Project Manager enespa ag



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enespa ag develops solutions for the chemical-recycling of polyolefin-containing plastic waste using pyrolysis. In this process, certain plastics are converted into pyrolysis oil in a thermochemical process, which can be reused in the petrochemical industry for new plastic production. This closes the loop in the circular economy of plastic products that would otherwise not be reused and helps prevent unnecessary greenhouse gas emissions.

The Challenge

A key challenge is the heterogeneous composition of the raw material. Different polymers, additives, and impurities result in varying melting and decomposition points, complicating process control and increasing the risk of malfunctions. For pyrolysis oil to be used industrially, it must meet strict specifications. Precise control of the process parameters is therefore essential to ensure consistent product quality and safe plant operation.

Summary of results

With Endress+Hauser, enespa ag has an experienced partner at its side. Reliable and accurate measurement technology enables stable monitoring and continuous optimization of the entire pyrolysis process. Endress+Hauser supplies high-precision sensors for recording process parameters—even under demanding conditions such as temperatures up to 400 °C. The sensors can be flush-mounted and feature a long service life, which prevents the raw material from hardening. Real-time recording and processing of the measurement data enables automated process control, which optimizes efficiency and guarantees safe, trouble-free and scalable operation of the pyrolysis plants.

The result:

- **Maximum plant availability** thanks to fewer malfunctions and reduced downtime
- **Seamless real-time process control** with continuous monitoring of all critical parameters
- **Consistent end-product quality** that meets required standards



Pyrolysis converts plastic waste into pyrolysis oil, an important raw material for the chemical industry and a key step toward a closed-loop economy

The pyrolysis process

During the pyrolysis of plastics, selected types of plastic are heated to several hundred degrees in the absence of oxygen. This process breaks down long polymer chains into smaller molecules, which are then liquefied to form pyrolysis oil. Pyrolysis oil is a high-quality raw material for the chemical industry and can be reused to produce new plastics. This creates a closed-loop cycle where waste is transformed into a valuable resource instead of being discarded, while also helping to prevent greenhouse gas emissions.

The process conditions place special demands on the measurement technology:

- **Temperature gradients and extreme heat** in the reactor
- **Pressure fluctuations** in pipes and containers
- **Different states of aggregation** (liquid, gaseous)
- **High requirements for continuous monitoring** to detect reaction disturbances at an early stage

Improvements in pyrolysis process analysis

For enespa ag, avoiding plant downtime is crucial, as interruptions in the recycling process lead to financial losses and jeopardize profitability. At the same time, the pyrolysis oil produced must consistently meet defined specifications to remain marketable.

Endress+Hauser's measurement technology supports the following objectives:

- **Increasing production efficiency** through stable, trouble-free processes
- **Improving product quality** through precise control of critical parameters
- **Reducing unplanned downtime** through early detection of deviations
- **Advancing sustainability goals** by enabling a resource-efficient circular economy



Accurate pressure control with Cerabar PMP71B for optimal process stability

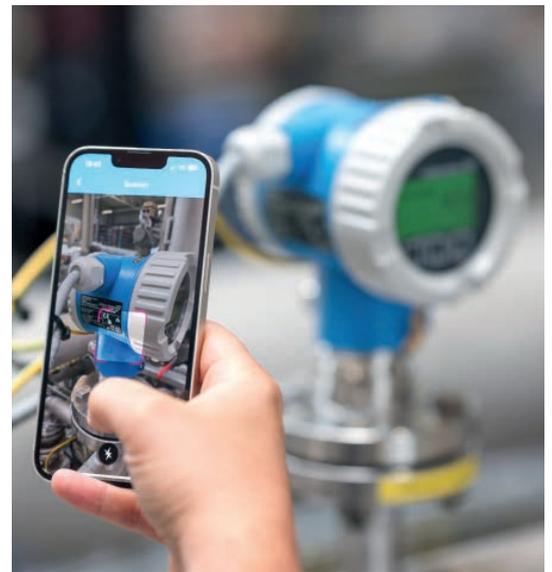


Our solution

Endress+Hauser works closely with enespa ag. It supports the recycling plant manufacturer as a full-service provider for process measurement technology from planning and selection to implementation. At the heart of the solution is comprehensive monitoring of all process parameters, enabled by the seamless interaction of robust and reliable measuring devices:

- **Pressure measurement (Cerabar PMP71B):** Precise monitoring even under extreme process pressures—indispensable for safety and plant stability
- **Temperature measurement (iTHERM TM131):** Stable readings at high temperatures—crucial for accurate process control
- **Level measurement (Liquiphant FTL51B):** Reliable detection of levels in tanks and reactors for smooth operations
- **Flow measurement (Proline Prowirl F 200):** Precise measurement of material flows to ensure process control and optimization

Endress+Hauser's measurement technology is precisely tailored to the customer's process requirements. This enables the use of individual measurement parameters to analyze flow diagrams and tank drawings, for example.



Wireless control of the device in the process area with the SmartBlue app

Conclusion

At enespa ag, pioneering recycling processes are becoming a reality. Endress+Hauser not only provides precise measurement technology but also offers expertise and partnership-based cooperation to make processes safe, efficient and sustainable.

The result is a scalable solution that ensures continuous operation with a high degree of automation and stable product quality. This closes the plastics cycle, conserves resources and supports a sustainable circular economy. Together, enespa ag and Endress+Hauser are making an important contribution to a greener future.



Alexander Hermann,
Portfolio Manager
Endress+Hauser
Germany

“By monitoring their processes thoroughly and reliably, our customers prevent plant downtime. This enables them to make their operations more efficient. Ultimately, it always contributes to sustainability when everything we consume is produced more efficiently to conserve resources. enespa ag is the best example of this, because with pyrolysis, the cycle is truly closed.”

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