Safety control of raw materials

Melamin's use of Raman analysis for identification of chemicals

Melamin

Melamin d.d. Kočevje, established in 1954 in Kočevje, Slovenia, is a recognized European chemical manufacturer with a long tradition in amino resin production. The company is known for consistent quality, technological innovation, and a skilled workforce.

Melamin is committed to customer satisfaction and environmental responsibility, focusing on the development of low-formaldehyde and low-VOC resins.

Emphasizing strict safety and quality control of raw materials, Melamin ensures high product reliability through systematic supplier evaluation and rigorous incoming inspections. This approach has established Melamin as a trusted partner in amino resin technology worldwide.

Each year, approximately 1,500 trucks carrying solvents with varying physico-chemical compositions are delivered to the Melamin production plant, averaging 5 to 6 trucks per day. Automating the processes to identify incoming materials has become essential to ensure safe operations.

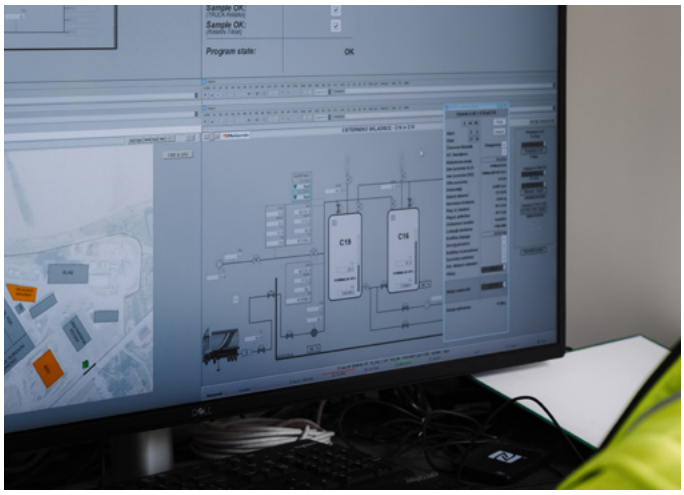
Melamin is a chemical manufacturer specializing in the production of melamine-based resins. The company consistently invests in new technologies to meet the evolving demands of customers in the paper, construction, wood, paint, and tire industries. In recent years, Melamin has invested in automation technologies to improve plant efficiency and streamline safe operations. This commitment to operational excellence began with the full automation of solvent identification control for truck deliveries, reducing the risk of human error.

Peter Maležič
Production Engineer
Melamin

"Endress+Hauser's process analytical control instrumentation has significantly enhanced our plant performance, beginning with the safe supply control of incoming materials. Raman spectroscopy technology ensures the secure and accurate transfer of solvents from trucks to the correct tanks, utilizing process automation that is fundamental for our production."

Endress+Hauser
People for Process Automation

Left to right: Endress+Hauser Raman Rxn-40 probe, Liquiphant FTL50 point level switch, and iTHERM ModuLine TM131 thermometer



If the Raman spectra match, the supervisor electronically releases a mechanical lock securing the assembly. The second component can then be manually detached and reconnected to the truck.

Supply management

For the manufacturing of the resins with specific market demand, up to 29 separate solvents are considered. Depending on daily production needs, the required materials are delivered to the plant by trucks. At the unloading station, a Melamin operator connects the truck to the appropriate tank for resupply.

The challenge

Mixing different kinds of chemicals could cause contamination or exothermal reactions due to incompatibility, potentially leading to an explosion. Therefore, it is crucial to automate the identification of incoming materials to prevent the mixing of immiscible chemicals.

Our solution

Melamin partnered with Endress+Hauser to screen solvents fed into raw material tanks for resin production. The temperature of the chemical is monitored using an iTHERM ModuLine TM131 sensor. A Liquiphant FTL50 point level switch then triggers the Raman spectroscopy analysis once the pipe is confirmed to be filled with the chemical.

A Raman Rxn2-785 nm analyzer with four channels was installed in a control room for ATEX areas. Depending on the chemical's hazard level, unloading occurs in either a general-purpose or explosion-proof zone. Raman Rxn-40 probes, suited for both environments, are installed inline at the truck unloading station.

Inline process control

Every incoming material is measured inline by Raman spectroscopy for identification (see Figure 1). Each solvent has a unique Raman spectrum, making its fingerprint distinct. Raman spectroscopic measurement eliminates the risk of compound misidentification. An automated valve control system regulates the feed of the solvent to the correct tank based on its identification. This process control prevents any human errors in the misidentification of chemicals or tanks.

Benefits

By implementing advanced process analytical technology, Melamin can achieve its primary business objective: increased operational safety while enabling high plant performance. Raman inline measurement is replacing offline lab identification of chemicals before the material is transferred from the truck to storage tanks, eliminating time-consuming handling and potential human error.

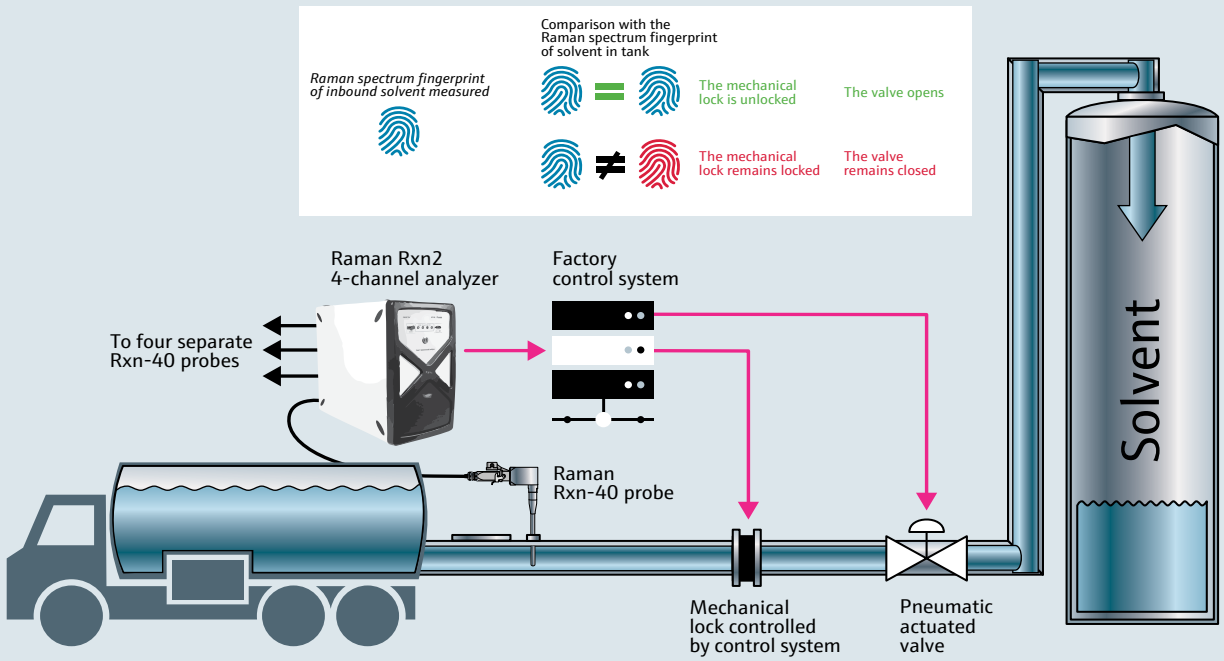


Figure 1: Automated inline solvent identification: a Raman analyzer and a probe work in tandem with a mechanical lock and a pneumatic actuated valve in the control system to ensure safe, accurate routing of solvents to the correct tanks. With a single Raman analyzer, four separate truck unloading stations get equipped with a measurement assembly, each of them with a Raman probe.

Operational process details

When the truck arrives, the operator connects it to a specially designed assembly where the measurement devices are inserted.The valve on the truck's tank outlet is then opened, allowing the assembly to fill up with solvent. Once filled, the iTHERM ModuLine TM131 temperature sensor from Endress+Hauser monitors the temperature of the material. Simultaneously, a Liquiphant FTL50 point level switch detects the liquid level and triggers the start of the Raman measurement.

The Raman Rxn-40 probe, connected to the Raman Rxn2 analyzer located in the control room, captures the spectral fingerprint of the solvent. The data is compared in real time with the reference spectrum stored in the factory's control system. If the spectra match, the system releases a mechanical lock that secures the second part of the assembly. Only then can the operator manually complete the connection between the truck and the receiving line, ensuring a verified and secure transfer. Before the transfer begins, the supervisor performs a final check to confirm: the truck is correctly grounded, it is parked at the designated location, the required safety time has elapsed, the receiving tank has sufficient capacity, and the material identification is correct.

"Endress+Hauser products meet high industry standards, which are essential for our safe operations. Thanks to the combined expertise and dedication of both teams, we now benefit from comprehensive Endress+Hauser instrumentation, which is crucial for maintaining our plant operations."

Dr. Igor Mihelič
Technical Manager
Melamin

Want to see this case study in action?

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