

Application Note AN-PAN-1027

Online monitoring of TBC in styrene storage tanks according to ASTM D4590

In the production of styrene, butadiene, and vinyl acetate, the stabilizer 4-*tert*-butylcatechol (TBC) plays a crucial role in preventing premature polymerization during storage and transport.

In order to guarantee product quality, the TBC concentration in styrene must be maintained above

10–15 mg/L. Close monitoring of the concentration is necessary to control TBC levels.

This Process Application Note presents a solution for online colorimetric determination of TBC in styrene (as per ASTM D4590) with the **2060 TI Ex Proof Process Analyzer** from Metrohm Process Analytics.

A photometric process analyzer accurately tracks TBC reduction at the styrene storage tank inlet to maintain optimal conditions around the clock. Metrohm

Process Analytics offers the **2060 TI Ex Proof Process Analyzer** for monitoring TBC concentration in styrene (Figure 2).

APPLICATION

The method used is based on ASTM D4590 for the colorimetric analysis of 4-*tert*-butylcatechol (TBC) in

styrene. The results are calculated based on a photometric determination at 490 nm.

Table 1. Parameter to monitor in styrene storage.

Parameter	Concentration [mg/L]
4- <i>tert</i> -butylcatechol (TBC)	0–50

REMARKS



Due to styrene's sensitivity to light and heat, storage conditions can quickly become hazardous. Continuous monitoring is essential. In hazardous environments, only explosion-proof analyzers like the **2060 TI Ex Proof Process Analyzer** (Figure 2) ensure safe, real-time TBC control.

Figure 2. 2060 TI Ex Proof Process Analyzer for monitoring TBC in styrene.

CONCLUSION

Online monitoring of TBC, as defined in accordance with ASTM D4590, is essential for maintaining product quality and safety during the production and storage of styrene, butadiene, and vinyl acetate. The presence of TBC prevents early polymerization, thereby avoiding potential hazards associated with unwanted polymerization reactions. Maintaining TBC concentrations above the critical

threshold of 10–15 mg/L is crucial. This requires close and continuous monitoring. Online process analyzers, such as the **2060 TI Ex Proof Process Analyzer** from Metrohm Process Analytics (configured for photometric analysis), offer a reliable solution for real-time TBC concentration monitoring. This ensures optimal storage conditions and product quality.

RELATED APPLICATION NOTES

[AN-PAN-1007](#) Online analysis of peroxide in the HP-PO process

[AN-PAN-1041](#) Inline monitoring of free isocyanate

[\(%NCO\) content in polyurethane](#)

[AN-PAN-1053](#) Monitoring of DOTP production via esterification with inline analysis

OTHER RELATED DOCUMENTS

[WP-048](#) Utilizing online chemical analysis to optimize

[propylene oxide production](#)

BENEFITS FOR ONLINE PROCESS ANALYSIS

- Optimize product quality and increase profit with fast response times to variation in process conditions.
- Fully automated diagnostics—automatic alarms for when TBC concentrations are outside of the specified parameters.
- Safe working environment and automated sampling.



REFERENCE

1. Falcke, H.; Holbrook, S.; Clenahan, I.; et al. *Best Available Techniques (BAT) Reference Document for the Production of Large Volume Organic Chemicals. Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)*. JRC Publications Repository.
<https://publications.jrc.ec.europa.eu/repository/handle/JRC109279> (accessed 2024-03-06).
<https://doi.org/10.2760/77304>

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CONFIGURATION



2060 TI Ex Proof Process Analyzer

The 2060 TI Ex Proof Process Analyzer is an intrinsically safe wet chemistry process analyzer for process monitoring in gas or dust zoned hazardous environments rated as zone 0, 1 and 2, or 20, 21, and 22. It complies with EU Directives 94/9/EC (ATEX95) and is certified for Zone 1 and Zone 2 areas. Its design combines a purge and pressurization system with intrinsically safe electronic devices. The air purging phase and permanent overpressure prevent potentially explosive atmospheres from entering the analyzer enclosure.

The analyzer's design eliminates the need for purging large analyzer shelters, allowing for direct installation at the production line within hazardous zones. It supports various kinds of techniques, including titration, Karl Fischer titration, photometry, ion-selective electrode measurements, and direct measurements.