

APPLICATION NOTE



Analysis of Acetonitrile in Ambient Air

Introduction

Acetonitrile (synonyms methyl cyanide, cyanomethane, ethyl nitrile, ACN) is a colorless liquid used as a solvent in many industrial and laboratory applications. The pharmaceutical industry heavily utilizes acetonitrile as a solvent in drug development, manufacturing, and analysis. Although acetonitrile is versatile in its uses, prolonged human exposure can be moderately toxic due to metabolic conversion to hydrogen cyanide which may result in cyanide poisoning.

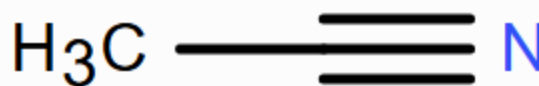


Figure 1. Chemical structure of acetonitrile.

Workplace Monitoring

Life safety monitoring within pharmaceutical facilities permits for early, fast detection of potentially life-threatening acetonitrile releases. Potential exposures are mitigated with monitoring which ensures immediate identification of health and safety concerns in the workplace and allows for immediate action to reduce worker health and safety risks.

Global, national, and state organizations, such as the Occupation Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH) and the Division of Occupational Safety and Health of California (CAL OSHA) offer guidance on exposure limits for hazardous chemicals. Table 1 shows the OSHA and CAL/OSHA permissible exposure limits (PELs), along with the NIOSH recommended exposure limit (REL), for acetonitrile.

Chemical	OSHA PEL (USA)	NIOSH REL (USA)	CAL/OSHA PEL (USA)	OEL (EU)	WEL (UK)	MAK (Germany)	MAX300™ - TGM Detection Limit
Acetonitrile	40 ppm	20 ppm	40 ppm	40 ppm	40 ppm	10 ppm	0.25 ppm

Table 1. Actionable levels by chemical compared to the lower detection limit of the MAX300™ - TGM

Mass spectrometry has several technical advantages for continuous monitoring of acetonitrile in ambient air. The large diameter quadrupole used in the MAX300-TGM provides excellent sensitivity enabling the detection of acetonitrile down to approximately 0.25 ppm. This detection limit allows measurement well below the published occupational exposure limits shown in Table 1.

In addition, the MAX300-TGM is quick to respond to acetonitrile at low (ppm) levels enabling for fast response before hazardous levels are reached. The quick response times of the MAX300-TGM are demonstrated in Figure 2 for the introductions of approximately 20 ppm (~1/2 PEL) of acetonitrile.

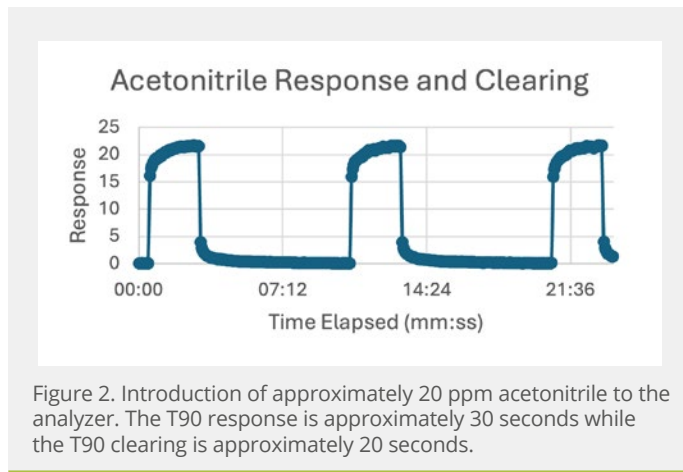
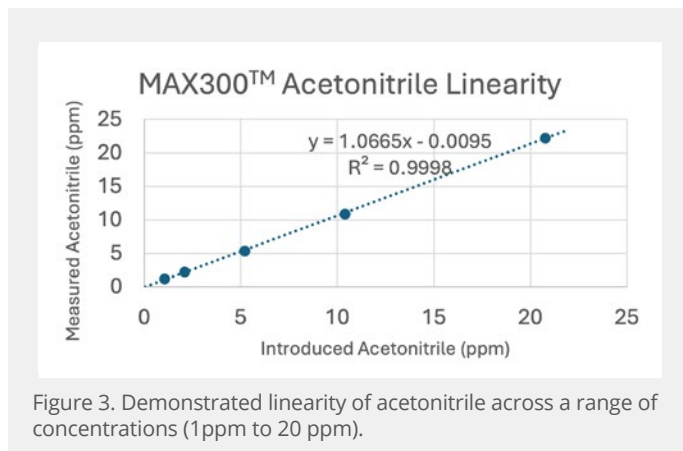


Figure 3 shows the linearity of acetonitrile readings from approximately 1 ppm to 20 ppm. Linearity across this range ensures concentrations are not reported artificially low or high, providing confidence in readings in the event of an alarm and allowing for accurate incident reporting.



Optimized for Toxic Gas Monitoring

The MAX300-TGM mass spectrometer, from Process Insights, offers streamlined operation with a centralized analyzer; capable of analyzing 16 to 46 sample points. Additional hazardous chemicals can also be added to meet additional monitoring needs while still maintaining chemical selectivity.

The analyzer can easily be updated in the field to increase the number of sample points or chemicals if monitoring requirements change. While keeping analytical performance in mind, Process Insights' MAX300 Questor5™ software was designed for flexible and configurable ambient air monitoring. The software allows for user defined alarm levels to be specified for each chemical. Figure 4 shows the configurable results display, which allows for an at-a-glance overview of active alarms. These alarms are also easily output to plant control for immediate action when safety is at risk. The software can also be programmed to "revisit" sample points triggering an alarm for confirmation while still cycling through additional sample points.



Summary

Ambient air monitoring for acetonitrile using the MAX300-TGM provides fast and accurate measurements to help meet the recommendations of Environmental, Health and Safety initiatives. In addition to site safety, the versatile and flexible analyzer platform allows for multiple sample points on a single analyzer and avoidance of costly false alarms. For additional information on how our products meet these and other application needs, check out the MAX300-TGM product notes or visit www.process-insights.com.

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Process Insights delivers premium analytical sensors, analyzers, instrumentation, software and solutions that are mission-critical to keep your operations, personnel, and the environment safe. Our commitment to customer satisfaction is evident through our diverse range of products, programs, and services, designed to accommodate various budgets and application needs.

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