

Measuring Benzene in Pre-Liquefied Natural Gas (LNG)

Applied Analytics Application Note No. AN-024



Application Summary

Analytes: **benzene**

Detector: **OMA-300 Process Analyzer (using UV-Vis dispersive absorbance spectrophotometer)**

Process Stream: **natural gas**

Introduction

With a freezing point of 5.5 °C, benzene readily solidifies at the cold temperatures required for liquefaction of natural gas. Frozen benzene has widely deleterious effects on liquefaction machinery and storage tanks, obliging serious maintenance. To prevent this situation, LNG producers remove benzene from the natural gas prior to liquefaction.

The expense of benzene removal can be all for naught without a reliable method of validating the benzene level in the cleaned natural gas and ensuring that removal is successful.

The OMA system continuously monitors benzene concentration in the natural gas after the benzene removal stage. This provides constant verification that the cleaning process is functioning properly and that there will be no freezing issues in the liquefaction stage. When benzene levels above threshold are detected, the stream can automatically be diverted from the liquefaction process.

Incorporating OMA benzene analysis into a natural gas liquefaction operation reduces costs in various ways. Maintenance events due to frozen benzene are virtually obliterated by diverting high-benzene streams from liquefaction. Additionally, the assurance of clean feed gas allows the LNG plant to run at much colder temperatures and much greater efficiency. Savings on power costs from running the benzene removal system at the minimum power required, as regulated by the OMA feedback loop, are proven to be significant.

OMA Benefits

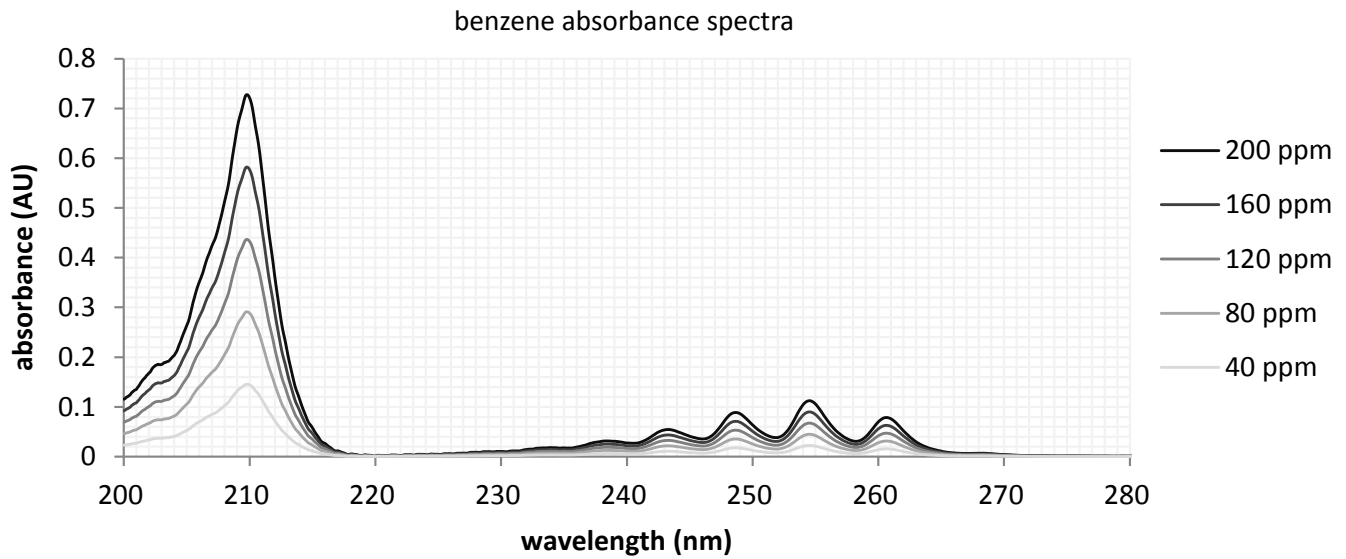
- » Continuously measures benzene concentration using dispersive UV-Vis absorbance spectroscopy
- » Totally solid state build with no moving parts — modern design for low maintenance
- » Ultra-safe fiber optic design with dedicated sample flow cell — no toxic/corrosive sample fluid in analyzer enclosure

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Benzene Absorbance Curves

The OMA system is calibrated on standard samples (known concentrations) of benzene in order to learn the distinctive absorbance curve of benzene and produce an excellent correlation between curve height and chemical concentration.



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Example Installation

The OMA system pictured below measures benzene concentration (0-100 ppm) in an LNG facility.



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The specifications below represent performance of the OMA-300 Process Analyzer in a typical benzene application.

For technical details about the OMA-300 Process Analyzer, see the data sheet:

http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf

All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.

Subject to modifications. Specified product characteristics and technical data do not serve as guarantee declarations.

Application Data			
Performance Specifications			
Accuracy	<i>Custom measurement ranges available; example ranges below.</i>		
	benzene	in gas	0-50 ppm: ± 2 ppm 0-100 ppm: $\pm 1\%$ full scale 0-10,000 ppm: $\pm 1\%$ full scale
		in liquid	0-10 ppm: ± 0.5 ppm 0-100 ppm: $\pm 1\%$ full scale 0-1%: $\pm 1\%$ full scale

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Further Reading

Subject	Location
OMA-300 Process Analyzer Data sheet	http://www.a-a-inc.com/documents/AA_DS001A_OMA300.pdf
Measuring Aromatic Hydrocarbons (BTX) Application Note	http://www.a-a-inc.com/documents/AA_AN007_Measuring-Aromatic-Hydrocarbons-BTX-benzene-toluene-xylene.pdf
Advantage of Collateral Data Technical Note	http://www.a-a-inc.com/documents/AA_TN-202_CollateralData.pdf
Multi-Component Analysis Technical Note	http://www.a-a-inc.com/documents/AA_TN-203_MultiComponentAnalysis.pdf



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