Measuring H2S in CO Feed to Phosgene Production

Applied Analytics Application Note No. AN-047

Application Summary

Analytes: **H_2S (hydrogen sulfide), CO (carbon monoxide)**

Detector: **OMA-300 Process Analyzer, Microspec MCP-200 Infrared Analyzer**

Process Stream: **CO feed to Phosgene Production**

Typical Measurement Range: **0-5% H_2S (OMA-300), 0-100% CO (MCP-200)**

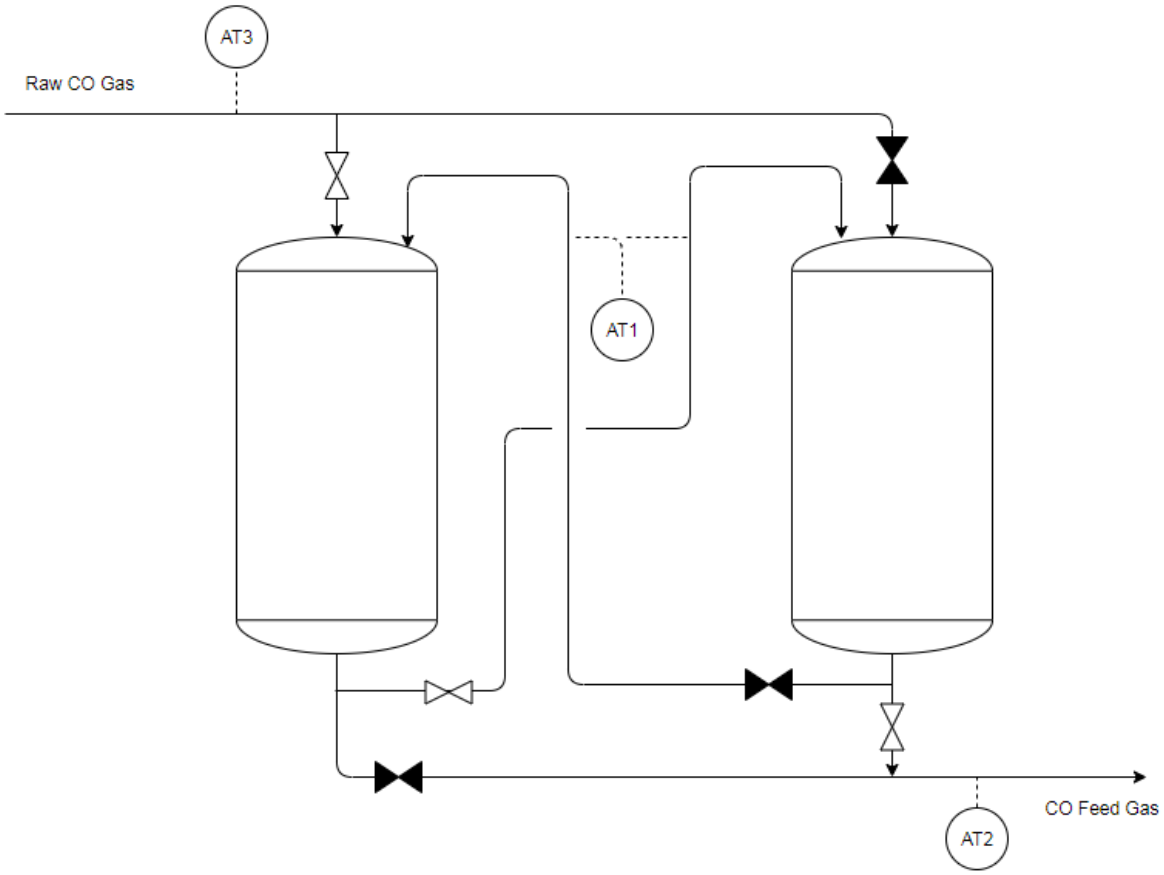
Introduction

Phosgene is a toxic gas which has an OSHA permissible exposure limit of 0.1 ppm. It is considered dangerous to humans at 25 ppm for 30-60 minutes of exposure and is rapidly fatal at 50 ppm. Phosgene is primarily used as an intermediate product to make isocyante polymers, polycarbonates, pharmaceuticals, dyes, pesticides and herbicides. Most phosgene is generated at these manufacturing plants as opposed to outsourcing it as a feedstock due to the toxicity of the compound.

Phosgene is produced commercially by reacting carbon monoxide and chlorine in a tube and shell reactor using activated carbon as a catalyst. The carbon monoxide is produced from reducing carbon dioxide, which is often produced onsite from burning coke with excess air. This burning process followed by carbon dioxide reduction produces carbon monoxide effectively, but can also release impurities from the coke. One of the components that is released is hydrogen sulfide. Hydrogen sulfide is an extremely dangerous and corrosive gas and it is beneficial to remove this impurity from the carbon monoxide feed stream before the production of phosgene in the tube and shell reactor. This impurity (H_2S) can also go through side reactions with chlorine producing undesirable sulfur chlorides. The hydrogen sulfide is removed prior to the phosgene reactor typically using lead-lag adsorption beds, but other methods of sulphur removal may be utilized.

Lead-Lag Adsorption Analyzer Placement

In the lead-lag adsorption configuration, it is critical that an analyzer is installed in between the two columns to know when the breakthrough of hydrogen sulfide occurs (AT1). Two other analyzers are needed before both adsorption beds (AT3) as well as on the outlet (AT2). Utilizing analyzer models OMA-300 and MCP-200 to measure hydrogen sulfide and carbon monoxide, respectively, before the beds allows for the quality of coke to be ensured, as well as the conversion rate of carbon dioxide to carbon monoxide to be determined. It is very critical to confirm that no hydrogen sulfide is passing from the adsorption bed outlet into the phosgene production phase in which the OMA-300 model can be utilized.



Lead-lag Adsorption Configuration

System Benefits

» Continuously measures H_2S and CO levels in the phosgene feed gas

» Totally solid-state build with no moving parts — modern design for low maintenance

» Additional software benches for up to 4 chemical analytes

» Ultra-safe fiber optic design with no sample gas inside analyzer unit (OMA-300) — world's safest solution for this application

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

For technical details about the OMA-300 Process Analyzer, see the data sheet:
https://aai.solutions/documents/AA_DS001A_OMA300.pdf

For technical details about the MicroSpec MCP-200 IR Modular Analyzer, see the data sheet:
https://aai.solutions/documents/AA_DS003A_MCP200.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.

Application Data		
Performance Specifications		
Accuracy	*Custom measurement ranges available; example ranges below.*	
	OMA-300 (UV-Vis)	H_2S 0-5%: ±1% full scale
	MCP-200 (NDIR)	CO 0-100%: ±2% full scale
		*Whichever is larger.

Further Reading

Subject	Location
OMA-300 H2S Analyzer Data sheet	https://aai.solutions/documents/OMAH2S.pdf
OMA-300 Process Analyzer Data sheet	https://aai.solutions/documents/AA_DS001A_OMA300.pdf
Advantage of Collateral Data Technical Note	https://aai.solutions/documents/AA_TN-202_CollateralData.pdf
Multi-Component Analysis Technical Note	https://aai.solutions/documents/AA_TN-203_MultiComponentAnalysis.pdf

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