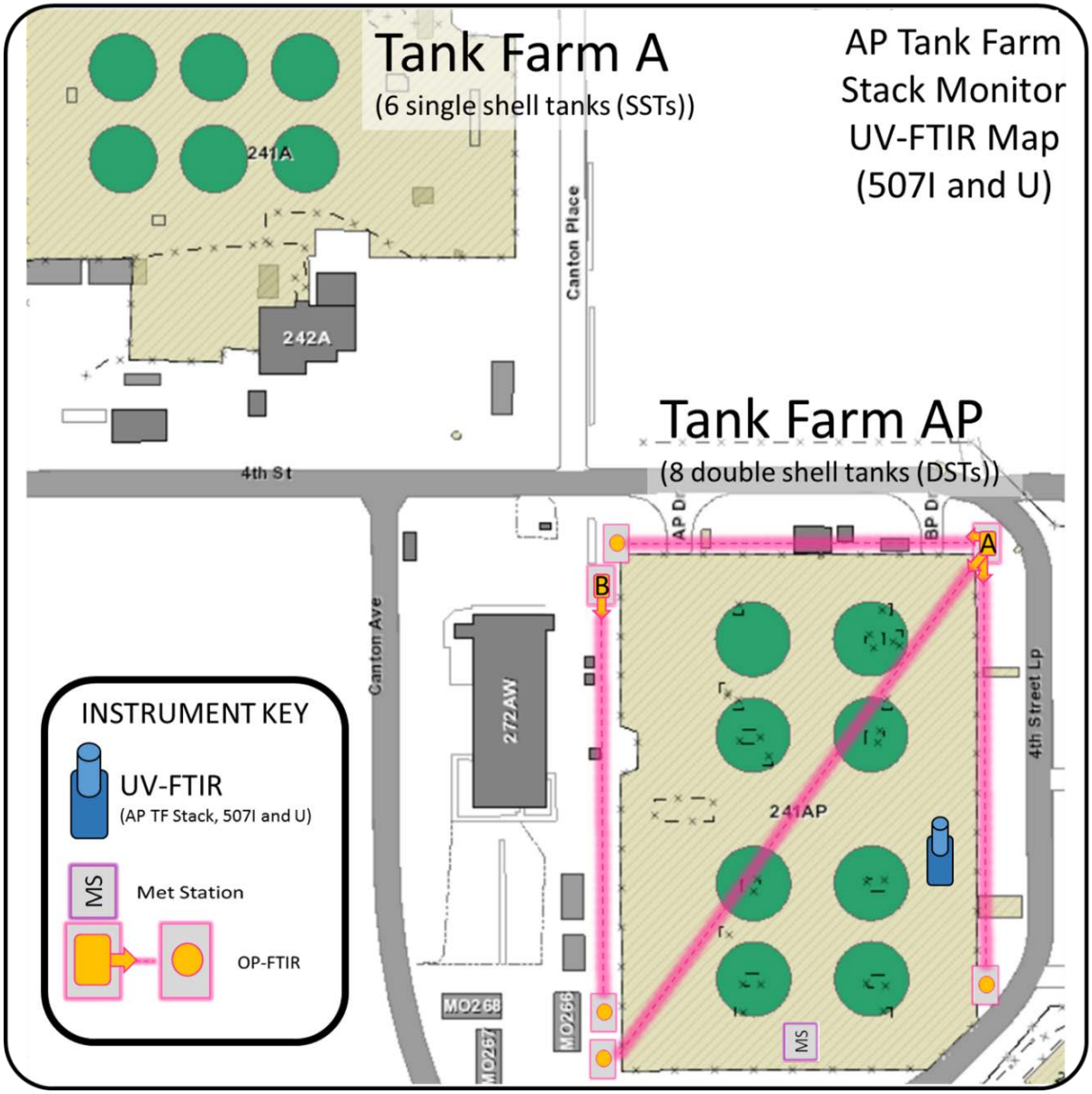
Vapor Monitoring Detection System Weekly Report – AP Tank Farm Stack Monitoring

2/1/2017 6:00 – 2/8/2017 6:00

AP-Tank Farm Stack Monitor (north is up)



Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

Abbreviations and Units

CH_4	=	methane
CO	=	carbon monoxide
CO_2	=	carbon dioxide
COPC	=	chemicals of potential concern
LEL	=	lower explosive limit
ND	=	not detected
NH_3	=	ammonia
NO	=	nitric oxide
N_2O	=	nitrous oxide
NO_2	=	nitrogen dioxide
O_3	=	ozone
OEL	=	occupational exposure limit
OP-FTIR	=	open path Fourier transform infrared spectrometer
OSHA	=	Occupational Safety and Health Administration
PEL	=	permissible exposure limit
ppb	=	parts per billion
ppm	=	parts per million
UV-DOAS	=	ultraviolet differential optical absorption spectrometer
VMDS	=	vapor monitoring detection system

VMDS Instruments

507I	=	FTIR AP Farm Stack
507U	=	UV-DOAS AP Farm Stack

Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

Introduction

This summary contains Vapor Monitoring and Detection System (VMDS) pilot-scale data collected over one week (2/1/2017 at 6:00 a.m. through 2/8/2017 at 6:00 a.m.) using the AP-Farm stack monitor[1]. This instrument is a dual channel FTIR/UV-DOAS spectrometer that provides real-time multi-gas measurement (qualitative and quantitative) of gases. The implementation method for this instrument allows for very accurate identification and quantification of compounds found in the AP-Farm exhauster stack.

Since chemical compounds found in the stack are not representative of what is found in the work environment, their concentrations will not be reviewed against Occupational Exposure Limits (OELs) or other limits implemented in work environments. The review here will focus on chemicals present, patterns, and what is observed during waste disturbing activities.

Pilot-scale testing is focused on evaluating component integration and functionality. Data shown may include results for calibration and calibration check (bump test) tests performed to verify sensors are functioning; these tests are visible in the data as spikes. Any alarms occurring during pilot-scale testing are taken to be actual events and the appropriate actions/notifications are undertaken.

For the stack monitor, each analyte has a specific reference spectrum, which represents the absorption characteristics for that chemical in the IR or UV spectral regions. Reference spectra for each analyte are stored in a library that specifies which absorption features are analyzed, how that analysis is performed, and reporting threshold values. Revisions to the library are periodically performed to improve accuracy of analysis for analytes; spectrographic instruments reporting for the VMDS project are still in the iterative optimization process and periodic changes to the library are being performed. Revisions to the library may result in the identification of a compound not previously thought to be present, or conversely determine that a previously reported analyte was not actually present. Identification of an analyte is dependent on the analytical method (UV or IR), library used, concentration, other chemical compounds present [chemicals present can interfere/overlap with each other at key locations; typically those having the same functional groups (e.g., methane or ketone groups) – the library is optimized to minimize these interferences], and many other factors.

[1] AP-Farm Stack Monitor Fact Sheet: https://hanfordvapors.com/wp-content/uploads/2016/11/UV-FTIR-Fact-Sheet.pdf

Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

2/1/2017 through 2/8/2017 Summary

There were no retrieval or waste disturbing activities during the reporting period. The FTIR 507I data were collected during the reporting period but the library was not re-installed after the replacement of the IR module, so data are suspect. No reporting of the FTIR 507I data will be presented in this report. The UV-DOAS 507U data were collected during the reporting period. Table 1 shows that ammonia concentrations ranged from 36 to 61 ppm, and ethylamine shows concentrations ranged from non-detect to 0.062 ppm and ethyl benzene from non-detect to 0.045 ppm. These are typical ranges observed when no waste disturbing activities have occurred. Figure 1 shows ethyl benzene, ethylamine, and ammonia concentrations measured with the UV-DOAS 507U. As shown in Figure 1, ethyl benzene was detected twice at very low levels and well below OEL levels. Table 2 shows the reporting time of the stack monitors. Both the FTIR 507I and the UV-DOAS 507U monitored for 100% of the reporting period as the instruments were still reading data, although the data from FTIR 507I is suspect.

Table 1. Chemical Species Detected in the AP Tank Farm Stack by Method (2 Pages)

Chemical	FTIR[a] (507I) ppm
Nitrous Oxide*	NR
Ammonia*	NR
Methane	NR
1-3-Butadiene*	NR
1-Butanol*	NR
2-Hexanone*	NR
3-Buten-2-one*	NR
Acetaldehyde*	NR
Acetonitrile*	NR
Benzene*	NR
Butanal*	NR
Butyl Nitrite*	NR
Ethylamine*	NR
Formaldehyde*	NR
Furan*	NR
Methanol*	NR
Methyl Isocyanate*	NR
Methyl Nitrite*	NR

Chemical	UV-DOAS (507U) ppm
Ammonia*	36 – 61
Nitric Oxide	ND
Oxygen	ND
Ozone	ND
1-3 Butadiene*	ND
2-Methyl-2-butenal*	ND
2-Methylfuran*	ND
Acetaldehyde*	ND
Benzene*	ND
Butanal*	ND
Ethylamine*	ND - 0.062
Formaldehyde*	ND
Furan*	ND
Mercury*	ND
Methyl Nitrite*	ND
Pyridine*	ND
1-2-4 Trimethylbenzene	ND
1-3-5 Trimethylbenzene	ND

Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

Table 1. Chemical Species Detected in the AP Tank Farm Stack by Method (2 Pages)

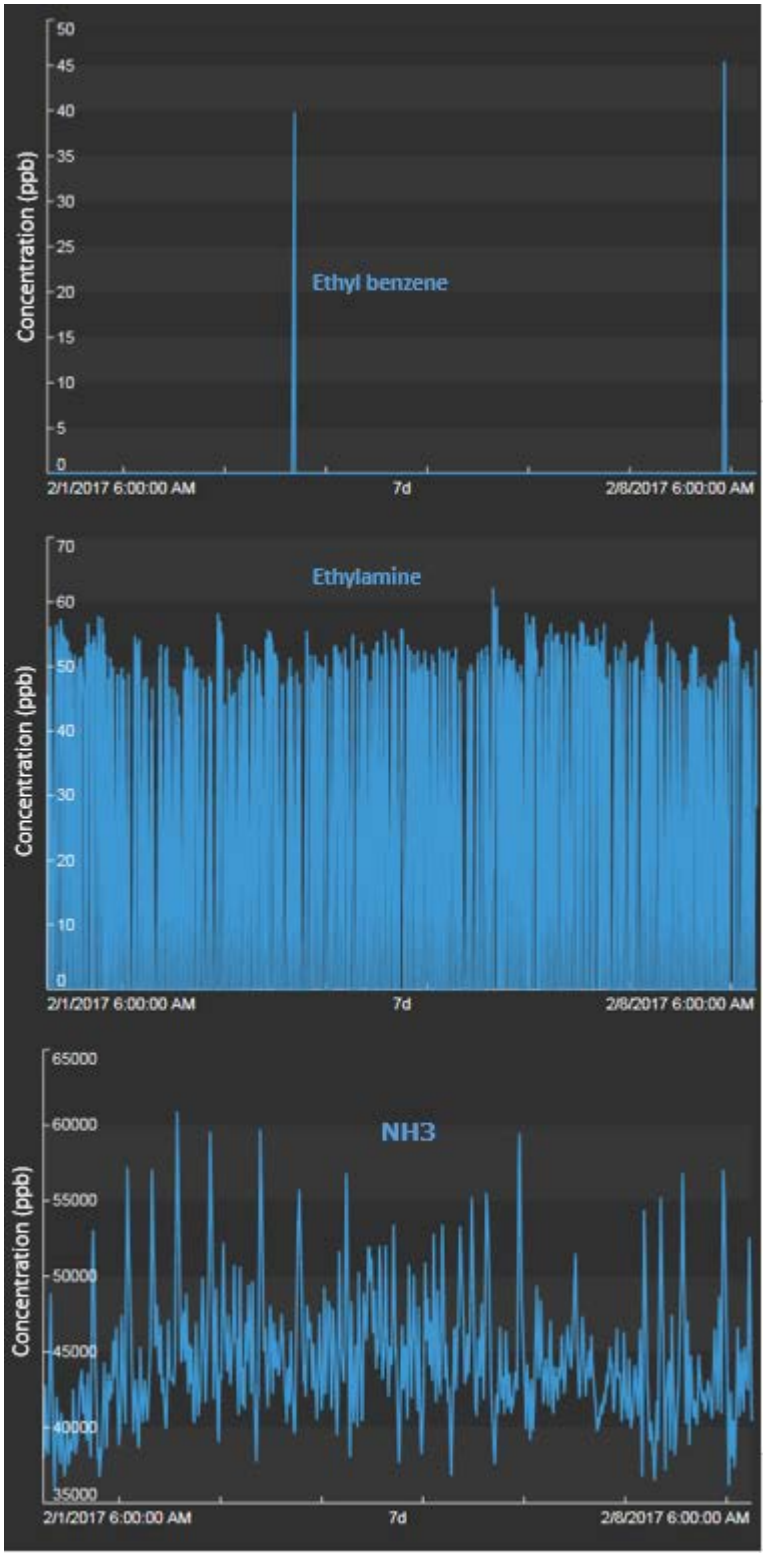
Chemical	FTIR[a] (507I) ppm		Chemical	UV-DOAS (507U) ppm
N-Nitrosodiethylamine*	NR		Ethylbenzene	ND – 0.045
N-Nitrosodimethylamine*	NR		m-Xylene	ND
N-Nitrosomorpholine*	NR		Nitrogen Dioxide	ND
Propanenitrile*	NR		o-Xylene	ND
Pyridine*	NR		p-Xylene	ND
Tributyl Phosphate*	NR		Styrene	ND
			Sulfur dioxide	ND
			Toluene	ND

Notes: *Chemical is on COPC list
NR – Not reported
ND – Not detected
a – Data read from FTIR 507I is suspect

Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

Figure 1. UV-DOAS (507U) Data Review.
(Note that concentration units are ppb)



Vapor Monitoring Detection System Weekly Report

2/1/2017 6:00 – 2/8/2017 6:00

Table 2. Stack Monitor Time Reporting.

Instrument	% Time Reporting
507I	100%[a]
507U	100%

a Data read from 507I is suspect

Notes: % time reporting is based on data reported to OSI PI System[2]

[2] OSI PI System is a data visualization software package from OSIsoft.