AIR QUALITY SURVEY
AT SELECTED SITES
ON THE HANFORD PROJECT

G. J. Alkire and C. R. Wyss

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By

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Environmental and Radiological
Sciences Department

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ABSTRACT

The concentration of five potentially significant air pollutants (SO_2 , NO , NO_2 , HCHO , and H_2S) was measured at selected sites on the Hanford Project during the period May 17, 1967, through July 14, 1967. The observed concentration of these gases was below the detection limit most of the time, but significant levels of nitrogen oxides and sulfur dioxide were observed at some sites part of the time. Downwind of a chemical separations plant, nitrogen oxides ($\text{NO} + \text{NO}_2$) were above detection limits (0.01 ppm) about 30% of the time. Peak $\text{NO} + \text{NO}_2$ concentrations ranged to 0.36 ppm, and hourly averages ranged to 0.12 ppm. Average sulfur dioxide concentrations were less than or equal to background 96% of the time at two sites, and 89% of the time at a third site. Aldehydes and hydrogen sulfide were not detected above background during the survey.

INTRODUCTION

A limited air-quality survey was conducted at four sites on the Hanford Project to measure, in ambient air, the concentrations of gaseous sulfur dioxide (SO_2), nitric oxide (NO), nitrogen dioxide (NO_2), aldehydes as formaldehyde (HCHO), and hydrogen sulfide (H_2S). These gaseous compounds are representative of potentially significant air pollutants which arise from coal burning (SO_2), industrial processes ($\text{NO} + \text{NO}_2$), a secondary product from auto exhaust emissions (HCHO), and a possible local air pollutant (H_2S). The sites selected for continuous monitoring represent a laboratory-processing area (300 Area), a semirural area (Meteorology Tower), a steam power plant and reactor area (100 D), and a chemical processing area (SE of 200E). The locations of the sampling sites are shown in Figure 1. Previous

studies on emissions from Redox and Purex include an evaluation of the oxides of nitrogen in the environs of the plant stacks,⁽¹⁾ and an evaluation of meteorological factors in appraisal and control of exposures.⁽²⁾

SUMMARY AND CONCLUSION

An air-quality survey was conducted on the Hanford Project to assess the present burden of five gaseous chemicals that are potentially significant air pollutants. Air was sampled at the 325 Building, 300 Area; and at a trailer-based station which was located successively at the meteorological tower (near 200 W), at 100 D, and about 1 mile SE of Purex. Analyses were made continuously for sulfur dioxide, nitric oxide, nitrogen dioxide, aldehydes as formaldehyde, and hydrogen sulfide.

General conclusions from the results of the survey are:

- Most of the time during the survey, the ambient air at all four sampling sites contained insignificant levels of the constituents measured.
- The levels of sulfur dioxide are considerably less than those reported by most large urban areas.⁽³⁾
- The peak NO-NO₂ concentrations sampled near the chemical separations plants are significantly above the general background level for NO-NO₂, yet considerably less than the values reported earlier.⁽¹⁾
- Aldehydes and H₂S concentrations were less than the detection limits of the method used.
- Simultaneous and continuous monitoring over an extended time period at several locations is necessary to obtain more definitive synoptic information on the ambient air quality.

SURVEY METHODS AND LOCATIONS

Sulfur dioxide and aldehydes were determined colorimetrically by the method of West and Gaeke.⁽⁴⁾ Nitrogen dioxide and nitric oxide-after oxidation to nitrogen dioxide-were determined colorimetrically by use of the Griess reaction as adapted by Saltzman.^(5,6,7) Hydrogen sulfide was monitored with the well known AISI tape sampler. In the colorimetric methods, air and aqueous absorbing reagents flowed concurrently through columns packed with glass beads. The air-liquid mixture was then separated. Additional reagents were added if necessary for proper color development. The light absorbance of the aqueous phase was then measured at a preselected wave length and recorded

versus time. In the tape sampler, air was drawn through paper tape impregnated with lead acetate, and the sulfide concentration was determined by measuring the light absorbance of the exposed tape.

The continuous analyzers* (Technicon Autoanalyzers[®]) were installed in a 15 foot house trailer that functioned as a monitoring station near the main meteorology tower, at the NE corner of 100 D area, and at the old army camp about one mile SE of the Purex Plant. Air was continuously sampled at points about two feet above the trailer roof, and drawn by vacuum (via polyethylene and glass tubing) into the absorption columns. Wind speed and direction were measured at the SE of 200 E site with an anemometer and wind vane. The temperature and relative humidity inside the trailer was also measured at this site. Two views of the trailer exterior are shown in Figures 2 and 3, and two views of the analyzers as installed in the trailer are shown in Figures 4 and 5.

The nitrogen oxides and hydrogen sulfide analyzers were operated in the penthouse on the roof of the 325 Building, 300 Area. Air was sampled at about the three foot level on the outside of the penthouse.

SURVEY DATA

The data obtained in this survey are presented in Tables I through VI. Detection limits, instrument range, and absorption column efficiencies are

* Battelle-Northwest instrumentation for use in support of environmental research programs.

*FIGURE 2. View of Mobile Monitoring
Station Looking N from SE of 200 E
Site*

FIGURE 3. View of Mobile Monitoring Station Looking NW from SE of 200 E Site

FIGURE 4. NO, NO₂ Analyzers and Read-out Instrumentation

FIGURE 5. SO₂ and HCHO Analyzers

shown in Table I. The aldehyde and hydrogen sulfide analyzers were operated most of the time during the survey, however these gases were not positively detected at any time. The most reliable data obtained during the survey were collected at the SE 200 of E site. This is because most of the minor operational problems were resolved at the earlier sites; more hours of valid data were gathered; automatic base line recording for NO and NO₂ was initiated; and wind speed and direction were measured. A strip chart record of NO + NO₂ values versus time as recorded on June 29-30, 1967, is shown in Figure 6 to illustrate the type of output data obtained with the analyzers. The variables on the scan are light absorbance at 550 mμ versus time.

A summary of the data obtained at the four sites is presented in Table II. These data show that the concentrations of the gases measured at the sampling sites are generally very low and that the significant concentrations measured are from local emissions. The concentrations listed in Tables II

through V are given in parts per hundred million (pphm), a unit commonly used for expressing concentrations of gaseous air pollutants.

The data presented in Tables III, IV and V are hourly averages based on instantaneous values recorded by the instrument at 15 min intervals. Values listed that are less than the detection limit are measurable values above background, but are considered only semi-quantitative and are shown primarily for comparative purposes. Values shown as "less than" (<) indicate no measurable value above background. Arrows between "less than" values indicate "less than" for the period shown. The values listed as highest concentration are peak values recorded by the instrument. These peaks are integrated values and, therefore, are not as meaningful as the hourly averages. Wind speed and direction measured at the SE of 200 E site are listed in Table VI. Comparison of these data with those in Tables III and IV shows that winds were generally West to Northwest when significant NO₂

TABLE I. Detection Limits, Concentration Range and Column Efficiencies

<u>Substance</u>	<u>Positive Detection Limit, ppm</u>	<u>Nominal Range XI, ppm</u>	<u>Absorption Column Efficiency</u>
NO ₂	0.010	0-0.30	0.95
NO	0.010	0-0.30	0.95
SO ₂	0.015	0-1.10	0.98 ⁽⁸⁾
HCHO	0.025	0-0.60	0.96 ⁽⁸⁾
H ₂ S	0.010*	0-0.15	----

* *Manufactures stated limit and range*

FIGURE 6. Nitrogen Oxides ($\text{NO} + \text{NO}_2$)
 1500 6/29/67--0400 6/30/67 at SE of
 200 E Site

TABLE II. Summary Data All Sites

<u>Date, Location and Chemical Analyzed</u>	<u>No. of Hours of Valid Data</u>	<u>No. of Hourly Averages Greater Than 1 pphm</u>	<u>Percentage of Time Greater Than 1 pphm</u>	<u>Highest Hourly Average, pphm</u>	<u>Highest Concentration, pphm</u>
<u>5/15 - 5/22 (300 Area)</u>					
NO ₂	109	12	11	3.0	4.0
NO	52	8	15	2.0	3.0
SO ₂	0				
HCHO	0				
H ₂ S	68	0	0	<1.0	<1.0
<u>6/5 - 6/12 (Meterology Tower)</u>					
NO ₂	141	0	0	<1.0	<1.0
NO	150	0	0	<1.0	<1.0
SO ₂	131	0	0	<1.0	<1.0
HCHO	152	0	0	<2.0	<2.0
H ₂ S	172	0	0	<1.0	<1.0
<u>6/14 - 6/21 (100 D)</u>					
NO ₂	143	0	0	<1.0	<1.0
NO	145	0	0	<1.0	<1.0
SO ₂	112	13	11	3.0	10.0
HCHO	143	0	0	<2.0	<2.0
H ₂ S	132	0	0	<1.0	<1.0
<u>6/23 - 7/14 (SE of 200 E)</u>					
NO ₂	374	88	24	10.0	16.0
NO	226	74	33	6.0	23.0
SO ₂	450	19	4	2.0	9.0
HCHO	233	0	0	<2.0	<2.0
H ₂ S	209	0	0	<1.0	<1.0

Date and Location	Hours																							Daily Mean pphm	Highest Value		
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23		23-24	Time	pphm
(300 Area)																											
5/17											1.0	0.9	0.8	0.9	0.8	0.5	<	<	<	<	1.0	2.2	1.9	1.2		2145	3.4
5/18	1.6	0.6	<																		<	<	0.5	<			
5/19	<	0.8	0.8	0.7	0.7	<															<	<	0.5	<		0200	1.5
5/20	0.8	1.0	<	<	<	0.5	<	<		<	0.7	<										<	<	<		0100	1.6
5/21	<	0.6	<	<	0.5	<	<		<									<	<	1.4	0.7	1.2	2.7	0.9	0.5	2100	4.4
5/22	1.7	0.9	<	0.5																						0030	3.4
(SE of 200 E)																											
6/23															<	<	<	<	0.5	<	0.5	0.5	0.9	1.6			
6/24	2.2	1.6	1.1	0.9	1.0	1.3	3.7			<	<	<	<	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.9	0.7	0.7	0.7	0.9	0645	13.8
6/25	1.3	1.3	1.5	1.6	1.5	1.3		0.7	1.0	<	<	<	<	<	<	<	0.5	0.5	0.7	0.8	0.8	0.8	0.8	0.9	0.8		
6/26	1.7	1.3	0.9	1.4	1.8	1.6	1.6	3.9							<	<				1.6	1.0	0.7	0.6	0.7	0.7	0745	6.9
6/27	0.9	3.3	1.0	0.7	0.8	0.7	1.1	1.1	1.2		0.7	<	<	<	<		<	<	0.9	1.5	2.0		0.9	0.9	0.9	0145	8.2
6/28	0.9	0.7	0.8		<	0.5	<	<	1.9		0.5	0.5	0.5	0.7	0.8		<	0.5	0.9	3.6	6.0		1.2	1.0	0.5	0830	3.9
6/29	1.1	1.2	0.7								<	0.6	0.7	0.7	0.8		0.5	0.5	0.7	0.7	0.7		4.9	4.1	1.8	2100	12.8
6/30	1.2				<	<	<	0.5	1.4		<						0.5	0.5	0.7	0.7	0.7		<	<	0.6		
7/1	0.5	0.5	0.7		<	<	0.5	0.5	0.6		<			<	0.6	0.6		0.5	0.8	0.5	0.8		<	<	<		
7/2	<	<	<		<	<	0.5	0.5	<		<	<	<	0.6	0.6		0.5	0.5	0.5	0.5	0.6		<	<	<		
7/3	0.9	1.3	1.4		<	<	<	<	<		<	<	0.7	0.5	0.7		<	<	<	<	<		<	<	<		
7/4	0.7	0.6	0.8		<	0.5	0.8	0.9	<		<	<	<	0.6	0.6		0.5	<	<	<	0.8		<	<	<	0600	1.6
7/5	0.8	1.0	0.8		1.0	1.2	0.6	1.0	1.6				0.5	0.5	0.7		<	0.6	<	<	2.8		1.1	1.4	1.0	2000	3.8
7/6	1.3	0.6	0.8		<	<	<	0.8	0.8				<	0.5	0.7		<	0.9	3.5	4.2	2.5		1.4	2.8	1.2	2000	7.2
7/7	0.5	1.1	2.0		<	<	<	0.7	0.5		<						<	<	0.5	0.5	0.6		<	<	<		
7/8			0.9		1.1	0.5	<	0.8	1.4		<						<	<	<	<	<		0.8	<	<	0400	2.6
7/9	0.8	1.4	1.0		<	<	0.6	0.6	0.8		<						<	<	<	<	<		1.0	1.2	<	1200	2.4
7/10	0.7	0.7	0.5		1.7	<	<	0.9	0.7		<			0.6			<	0.6	0.6	0.6	0.7		<	0.9	0.6	0430	4.6
7/11	1.1	1.4	1.5		<	0.5	<	0.8	0.6		<						<	<	<	<	<		<	<	<	0200	6.7
7/12	1.3	1.1	0.9		2.7	2.9	4.7	4.3	1.0		<						0.5	<	<	0.5	0.5		<	<	<	0715	13.4
7/13	1.1	0.8	0.3		3.4	2.5	4.3	3.5	0.9		<	<	0.6	<	0.6		<	0.5	0.9	7.5	9.6		1.6	2.9	2.1	1930	16.0
7/14	6.3	2.7	0.7		0.4	1.6	0.8	3.0	3.0																		

TABLE III. Hourly Averages Nitrogen Dioxide, pphm

Date and Location	Hours																							Daily Mean pphm	Highest Time	Value pphm				
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23				23-24			
(300 Area)																														
5/17											1.4	0.6	1.4	0.6	0.9	<	<	<	0.9	1.9	2.7	2.5	2.6	2.1		2300	6.1			
5/18	2.4	0.9	<	<	<	<	<	<	<							<											<			
5/19	<	0.5	0.6	0.5	0.6	<	<	<	<				<											<					0200	0.9
(SE of 200 E)																														
6/24																														
6/25	0.5	0.9	0.9	0.8	0.8	0.7	1.0		<	0.6	<					<	<	0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6			
6/26	1.3	1.6	1.4	1.4	1.7	2.2	2.0	2.0	3.6								0.7	0.7	0.9	3.0	4.7	2.8	1.7	1.4	1.2	1.8	1900	8.5		
6/27	1.7	5.2	1.6	1.2	1.6	1.2	1.7	1.4	1.6		1.6	0.9	0.6	0.7	0.6		0.7	0.8	2.7	3.7	4.6		1.4	2.0	1.8	0130	13.1			
6/28	1.5	1.1	1.5		<	<	<	0.6	2.6		0.6	<	0.6	0.5	0.7		0.6	1.3	0.8	1.6	4.7		3.3	1.6	1.3	2000	8.3			
6/29	1.5	1.9	1.6		0.5	0.9	1.3	1.9	0.9		0.6	0.7	<	<	<		<	<	0.5	9.7	11.9		9.5	11.8	2.9	2100	35.8			
6/30	2.9	1.1	1.2		<	<	<	0.8	3.1		<	<	0.6	0.7	0.7		<	0.5	0.5	0.5	0.7		<	<	0.8	0800	8.0			
7/1	1.2	1.2	0.6		<	<	<	0.8	0.5		<	<	<	<	0.5		<	0.5	0.5	0.7	0.7		<	<	0.5	2400	3.1			
7/2	1.6	1.0	0.8		0.7	0.7	0.5	0.5	1.0		<	<	<	<	0.5		<	<	<	0.6	0.6		<	<	0.6	0015	3.5			
7/3	1.0	0.9	0.6		<	<	<	0.6	0.9		<	<	0.5	<	0.5		<					<	<	<	1.2	<				
7/4	1.0	1.0	0.9		0.6	0.6	1.8	0.9	1.6		0.6	0.8	<	0.5	0.6		<	0.6	0.7	1.2	4.2		<	<	0.9	2030	7.9			
7/5	1.3	1.6	1.0		1.1	3.4	1.5	0.8	2.3																	0530	5.5			

TABLE IV. Hourly Averages Nitric Oxide Plus Nitrogen Dioxide, pphm

Date and Location	Hours																								Highest Time	
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24		
(100 D)																										
6/14																										
6/15	1.3	1.3	2.8																							2215
6/17																										
6/18	<	1.5	0.5	0.5	1.0	<	1.5																			0100
6/19	<	0.5	0.5	<	0.5	0.5	0.5																			
6/20	<	1.5	1.0	1.0	<	0.5	1.0	<	<																	0600
(SE of 200 E)																										
6/27	0.5	<	<	2.0	<	<	1.0	1.0																		
6/28	1.3	1.3	2.3	0.8	1.3	1.3	0.8	0.8																		0700
6/29	<	<	<	1.0	<																					
7/6	<	<	<	1.0	<																					0430
7/10	<																									0930
7/12	<	<																								
7/13	2.3	1.3	0.8	1.3	0.8	2.3	1.3	0.8	<																	0115

TABLE V. Hourly Averages Sulfur Dioxide, pphm

Date	6/23	6/24	6/25	6/26	6/27	6/28	6/29	7/1	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11
Time																	
0-1		W/NW 1	W/SW 1	SW/NW 1	W/NW 15	W/NW 12	N/NW 8					W/NW 12	W/NW 10	W/NW 14	W/NW 13	W/NW 18	W/NW 15
1-2		W/NW 1	W/NW 1	W/NW 1	W/NW 6	W/NW 8	W/NW 10					W/NW 10	N/NW 8	NW/SW 6	W/NW 14	W/NW 15	W/NW 12
2-3		W/NW 1	V 1	W/NW 2	W/NW 4	W/NW 6	W/NW 8					W/NW 10	N/W 6	NW/SW 4	W/NW 12	W/NW 12	NW/SW 9
3-4		V 1	W/SW 1	V 1	V 2	V 2	W/NW 8					W/NW 8	W/NW 8	NW/SW 5	NW/SW 5	W/NW 10	V 4
4-5		SW/NW 1	V 1	V 0	N/NE 2	V 2	W/NW 8					W/NW 6	W/NW 11	NW/SW 3	NW/SW 3	V 5	V 3
5-6		W/NW ~0	S/SE 1	V ~0	E/S 1	W/S 1	W/NW 7					N/W 10	W/NW 12	W/S 3	V 3	V 4	V 3
6-7		W/NW 1	S/E 2	S/SE 1	NW/SW 2	N/NW 3	W/NW 10					NW/SW 5	W/NW 10	W/S 4	E/SE 4	V 3	NW/SW 4
7-8		W/N 1	S/E 2	S/E 1	NW/SW 4	V 3	W/NW 12					V 4	W/NW 8	NW/SW 3	V 3	W/NW 6	W/N 4
8-9		V 1	V 2	N/W 2	W/NW 10	V 2	N/NW 10					V 5	N/W 5	V 3	V 4	W/NW 10	W/N 3
9-10		V 2	V 2	V 2	N/W 8	S/E 4	N/NW 8	NE/NW 0	V 3	N/W 7	V 5	V 5	V 5	V 4	V 4	W/N 10	NE/NW 2
10-11		V 2	V 2	V 2	NW/SW 8	V 4	V 5	NE/NW 0	V 4	V 5	V 5	V 4	V 5	V 5	V 5	W/NW 10	V 2
11-12		V 2	V 2	V 3	W/N 6	E/S 4	V 4	N/E 0	V 4	V 6	V 5	V 6	V 5	V 5	V 5	W/NW 14	V 3
12-13		V 2	V 4	V 4	N/W 8	S/E 7	V 3	V 0	V 5	S/E 8	V 6	V 5	V 6	V 6	V 7	W/N 15	V 2
13-14		V 3	V 3	W/S 5	V 6	S/E 5	V 4	V 0	V 4	V 6	V 4	V 5	V 5	V 5	V 5	N/NW 18	V 3
14-15		V 3	V 4	V 5	V 6	V 6	V 6	N/E 0	V 6	V 8	W/S 6	V 5	V 7	V 7	V 5	N/NW 15	V 4
15-16	N/NW 4	V 4	V 6	N/SW 4	V 8	V 4	V 4	N/E 2	V 6	V 8	V 8	V 4	V 7	V 7	V 6	N/W 12	V 4
16-17	N/NE 4	V 3	V 3	NW/SW 4	V 10	V 4	SE/NE 5	N/E 0	V 5	V 8	NW/SW 6	V 6	V 7	V 7	V 4	N/W 10	V 2
17-18	V 2	V 4	V 3	N/W 15	W/N 6	N/W 4	SE/NE 4	N/E 0	W/NW 15	NW/SW 8	V 8	N/W 9	V 8	V 8	V 4	N/W 15	V 4
18-19	N/NE 2	V 5	V 2	W/NW 20	W/NW 12	N/NW 6		N/NE 0	W/NW 22	NW/SW 8	N/W 10	N/W 12	V 6	N/W 24	V 4		E/N 3
19-20	N/NE 2	SE/NE 2	V 2	W/NW 20	W/NW 18	N/W 10		NE/NW 0	W/NW 20	W/NW 10	W/NW 12	N/W 15	E/S 7	N/W 20	E/NE 3		N/NE 2
20-21	N/NE 1	E/SE 1	SE/NE 1	W/NW 18	W/NW 18	W/NW 10			W/NW 18	W/NW 14	W/NW 15	W/NW 18	V 6	N/W 18	V 4		NE/NW 1
21-22	N/NE ~0	S/SE 2	S/SW 2	W/NW 20	W/NW 18	W/NW 15			W/NW 15	W/NW 15	W/NW 14	W/NW 16	N/W 15	W/NW 13	W/NW 9		N/NW 1
22-23	N/NW ~0	S/SW 1	W/SW 3	W/NW 16	W/NW 16	W/NW 18			W/NW 12	W/NW 15	W/NW 12	W/NW 16	W/NW 17	W/NW 16	W/NW 15		V ~0
23-24	N/W 1	S/SW ~0	S/E 2	W/NW 18	W/NW 16	W/NW 12			W/NW 12	W/NW 12	W/NW 15	W/NW 13	W/NW 20	W/NW 15	W/NW 17		NW/SW 1

V = variable
Wind speed in mph

TABLE VI. Wind Direction and Average Speed (SE of 200 E, 6/23-7/14)

concentrations were observed. A diurnal pattern of wind direction and NO₂ concentration also was observed (Figure 7).

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FIGURE 7. Diurnal Variation NO_2 at SE of 200 E St.; Average for a 20 Day Period

APPENDIX A

SULFUR DIOXIDE AND FORMALDEHYDE

Sulfur dioxide and formaldehyde are determined by use of the West and Gaeke⁽⁹⁾ method based on the Schiff reaction:

The absorbance of red purple pararosaniline methylsulfonic acid is measured at 562 mμ. For sulfur dioxide determinations, an excess of aldehyde is provided; for the aldehyde determination an excess of sulfite is provided. This method is not subject to interference from other acidic or basic gases or solids, but concentration of ozone and nitrogen dioxide higher than the sulfur dioxide can cause interference.

NITRIC OXIDE AND NITROGEN DIOXIDE

Nitric oxide and nitrogen dioxide are determined by use of the Griess test as adapted by Saltzman.^(5,6,7) The chemistry of this method is represented by the following equations.

The absorbance of the stable pink color produced is measured at 550 mμ. Nitric oxide is determined after it is converted to nitrogen dioxide by oxidation with chromium trioxide paper. Only minor interferences occur from other gases.

INSTRUMENTATION

The four colorimetric analyzers used are basically identical with the exception of the chemistry employed, and the wave length at which the light absorbance is measured. The Technicon Autoanalyzers[®] have been described in

detail elsewhere^(8,9) and will be described only briefly here. The basic component of the analyzer system is a constant speed peristaltic pump. The flow rates and flow ratios of all reagents in the methodology are maintained by the diameter of the pump tubing. Air flow rates are measured with calibrated rotameters. Flow diagrams for the methods used are reported by Yunghans.⁽⁹⁾

CALIBRATION

Static calibrations were made by diluting known quantities of sodium nitrite, sodium meta bisulfite, and formaldehyde with the proper absorbing solution for nitrogen oxides, sulfur dioxide, and formaldehyde, respectively. The standards used in this survey were prepared by BNW's Analytical Laboratories. Absorption efficiencies for NO₂ were determined to be greater than 95%. Absorption efficiencies determined by Yunghans⁽⁸⁾ on identical apparatus and under comparable sampling conditions were used in computing the SO₂ and HCHO calibration curves from the static calibration data. The NO₂ analyzers were calibrated dynamically with gas mixtures. The dynamic and static calibration data agreed within experimental error. Dynamic calibrations for SO₂ are planned for confirmation, but any revisions are expected to be small, and are not expected to affect the magnitude or the trends of the data reported here.

Problems encountered during the survey were primarily caused by the fluctuating and high temperatures (up to 115 °F) in the trailer. The analyzers per se performed exceptionally well in view of the temporary setup in the trailer. Difficulties with the recorder chart paper and pens were caused by the high temperatures.

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