4.Stationary sources data

[Data Sheet] Analyzed data sheet for first field survey [Table 3.4.2-10(2)]

1. Room heater (Gas oil)
2. Room heater (Kerosene)
3. Fire place (Natural gas)
4. Heater (Natural gas)
5. Cooking burner (Natural gas)
6. Cooking burner (LPG)
7. Water boiler (Natural gas)
8. Tehran cement No.4
9. Tehran cement No.6
10. Tehran cement No.7
11. Tehran refinery 2H-101
12. Tehran refinery boiler

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)

F. Goodarz (AQCC)

Facility Name : Room heater (Gas oil)

Measuring Date : 18, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	4.4	%
O_2 Concentration	14.2	%
CO Concentration	105	ppm
NOx Concentration	14.6	ppm
SOx Concentration	137	ppm
Emission factor CO		g/Gj
Emission factor NOx		g/Gj
Emission factor Sox		g/Gj

Measurement of component in flue gas

Measuring time	14:30	15:53
CO_2concentration (%)	4.4	4.4
O_2 concentration (%)	15.4	15.5
CO concentration (ppm)	110	100

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
14:50	17.0	145	10.0
15:00	15.0	148	13.8
15:10	14.0	139	14.1
15:20	14.6	140	13.9
15:30	15.0	133	14.4
15:40	14.5	130	14.8
15:50	12.0	125	15.0
Mean	14.6	137	14.2

Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	Room heater
2	Fuel type	Gas oil
3	Flow rate	0.353 Kg/h
4	Others	

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

CO_2th (%) = 12.23 (NG)、15.11 (Kerosene)

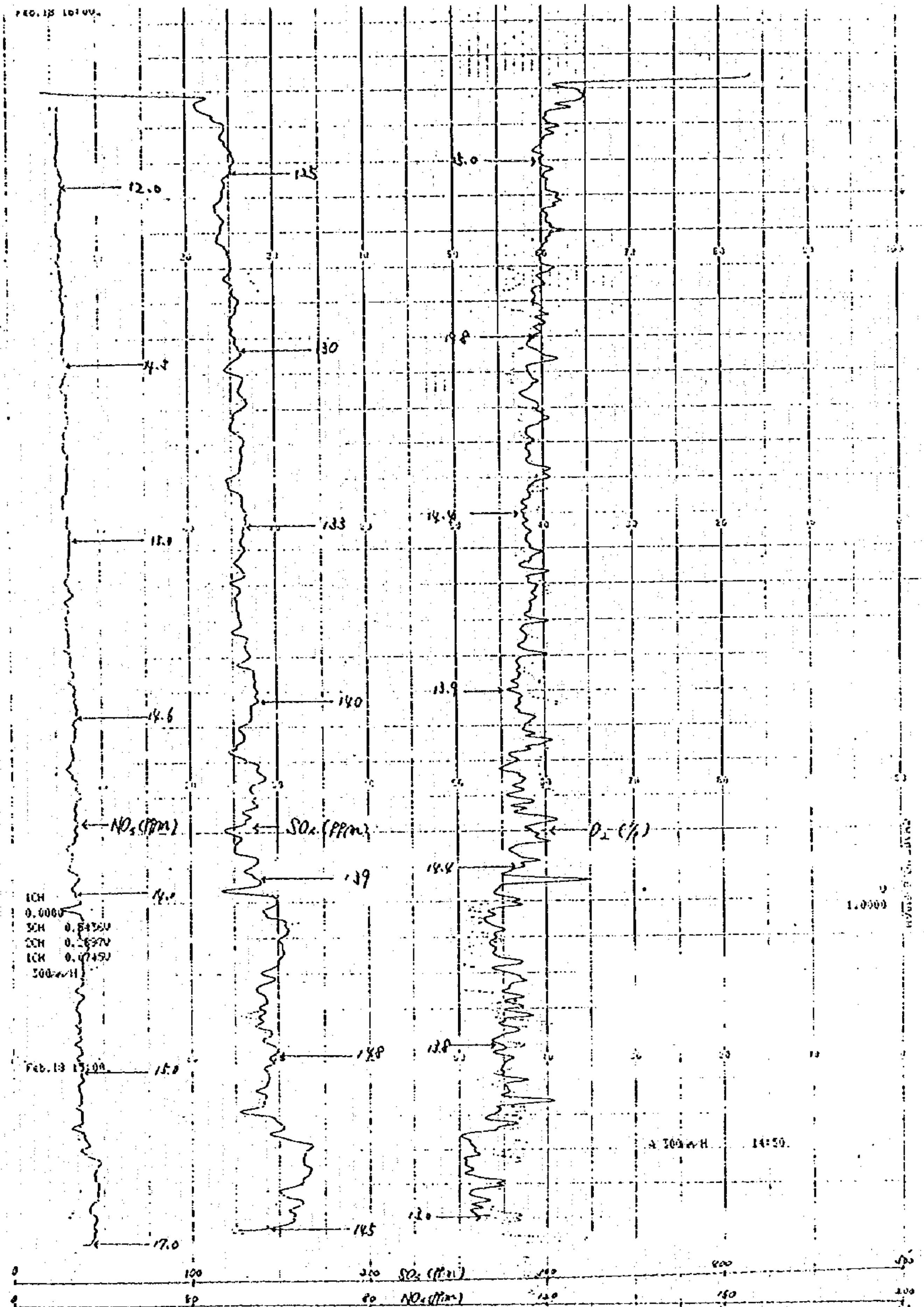
Go = 8.74 (NG)、10.51 (Kerosene)

A = 46 (Nox)、64 (Sox)、28 (CO)

Hh = 0.0472 (NG・Gj／m3)

0.0429 (Kerosene・Gj／L)

EF = Emission factor


125
12.0
130
14.5
133
15.0
14.6
140
NO_x (PPM)
SO_2 (PPM)
O_2 (%)
139
14.0
Feb.13 15:00
15.0
138
145
17.0
13.0
13.8
13.9
14.4
SO₂ (PPM)
NO_x (PPM)
O_2 (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Room heater (Kerosene)

Measuring Date : 18, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	2.8	%
O_2 Concentration	15.8	%
CO Concentration	360	ppm
NOx Concentration	6.5	ppm
SOx Concentration	27.3	ppm
Emission factor CO	595	g/Gj
Emission factor NOx	17.6	g/Gj
Emission factor Sox	103	g/Gj

Measurement of component in flue gas

Measuring time	11:30	12:50
CO_2concentration (%)	2.8	2.8
O_2 concentration (%)	16.8	16.8
CO concentration (ppm)	350	370

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
11:49	8.0	27.0	14.3
11:59	6.6	30.0	15.3
12:09	6.0	29.2	15.5
12:19	6.4	28.4	16.1
12:29	5.0	27.0	16.4
12:39	6.8	28.0	16.4
12:49	7.0	21.8	17.1
Mean	6.5	27.3	15.8

Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	Room heater
2	Fuel type	Kerosesn
3	Flow rate	0.229 Kg/h
4	Others	

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_{2th}}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh}\quad (g/Gj)$$

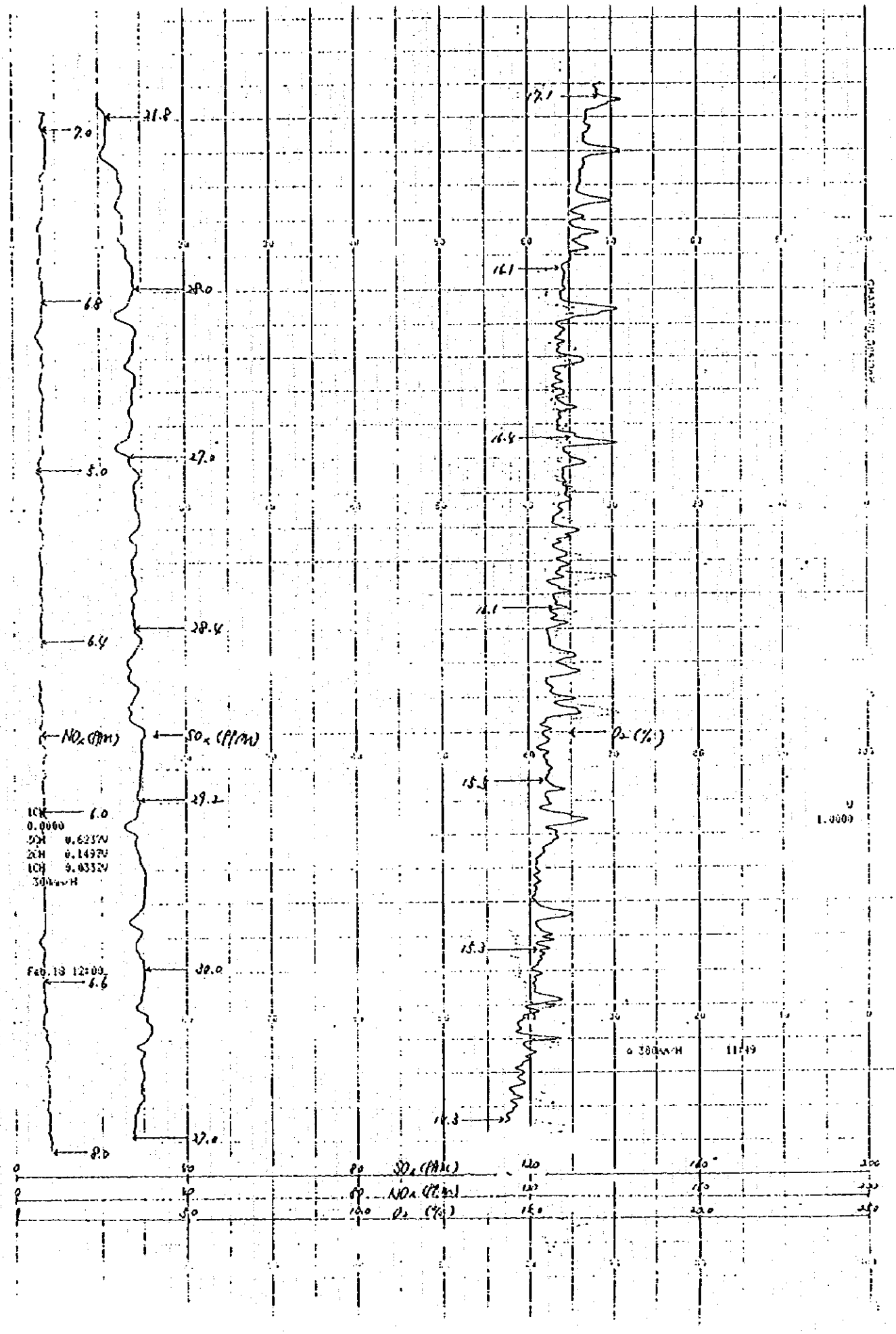
CO_2th (%) = 15.11 (Kerosene)

Go = 10.51 (Kerosene)

A = 46 (Nox)、64 (Sox)、28 (CO)

Hh = 0.0429 (Kerosene・Gj／L)

EF = Emission factor


NOx (ppm)
SOx (ppm)
O2 (%)
SOx (ppm)
NOx (ppm)
O2 (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Fire place

Measuring Date : 19, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	0.64	%
O_2 Concentration	19.6	%
CO Concentration	53	ppm
NOx Concentration	6.4	ppm
SOx Concentration	1.3	ppm
Emission factor CO	234	g/Gj
Emission factor NOx	46.5	g/Gj
Emission factor Sox	13.1	g/Gj

Measurement of component in flue gas

Measuring time	10:00	11:08
CO_2concentration (%)	0.63	0.65
O_2 concentration (%)	19.8	19.9
CO concentration (ppm)	55	50

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
10:05	6.0	1.6	19.6
10:15	6.0	1.6	19.6
10:25	6.4	1.6	19.6
10:35	6.2	1.0	19.6
10:45	6.4	1.0	19.6
10:55	7.0	1.0	19.6
11:05	7.0	1.0	19.6
Mean	6.4	1.3	19.6

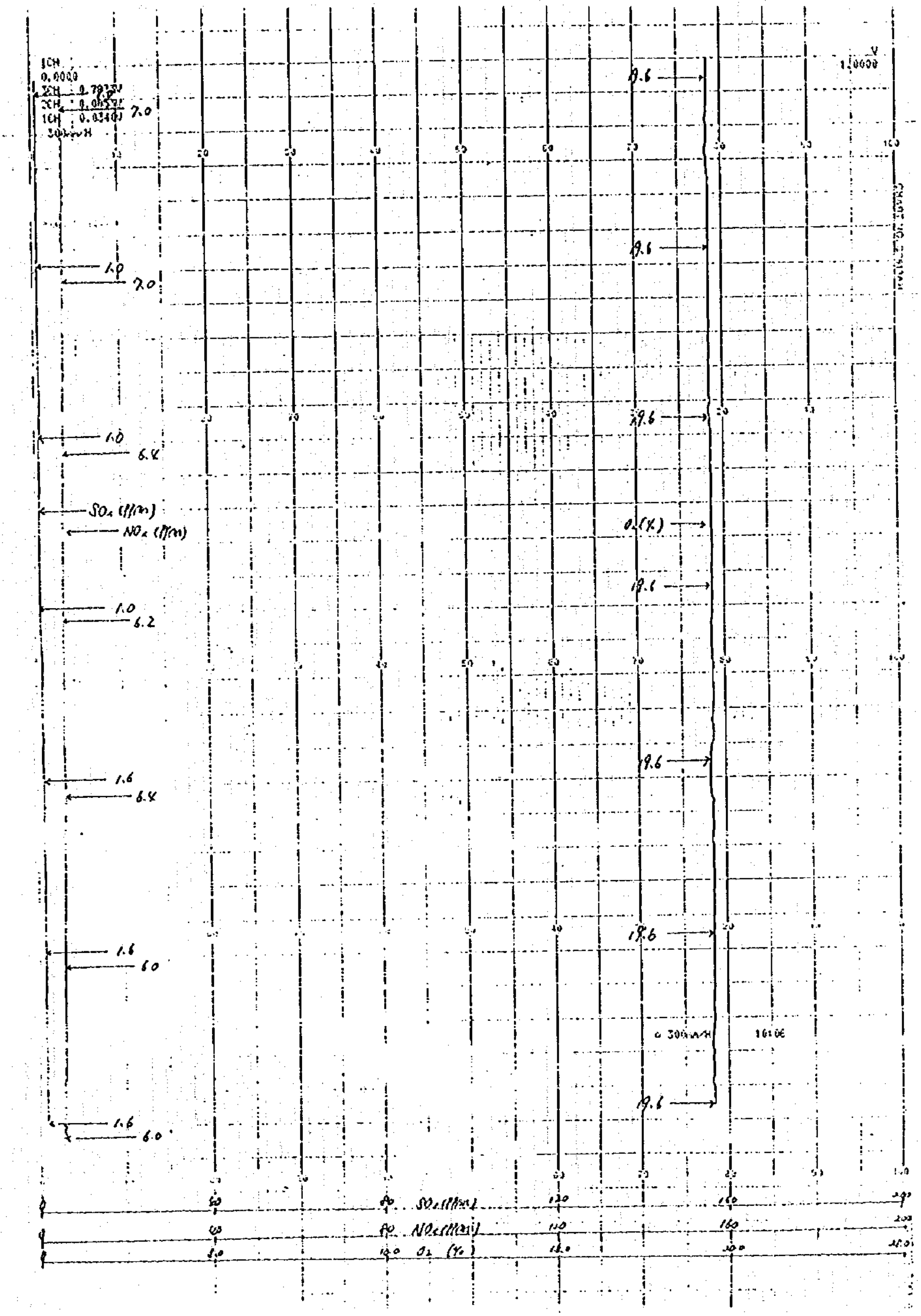
Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	Fire place
2	Fuel type	NG
3	Flow rate	1.27 m^3/h
4	Others	

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

$CO_2th\ (\%)$ = 12.23 (NG)
Go = 8.74 (NG)
A = 46 (Nox)、64 (Sox)、28 (CO)
Hh = 0.0472 (NG・Gj/m^3)
EF = Emission factor


1CH 0.0000
2CH 0.7975V
2CH 0.0457V
1CH 0.0340V
300mm/H
1.0000 V
7.0
19.6
1.0
7.0
1.0
6.4
SO₂ (ppm)
NOₓ (ppm)
O₂ (%)
1.0
6.2
1.6
6.4
1.6
6.0
1.6
6.0
300mm/H
0
40
80
SO₂ (ppm)
120
160
200
0
40
80
NOₓ (ppm)
120
160
200
0
5.0
10.0
O₂ (%)
15.0
20.0
25.0

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Room heater (NG)

Measuring Date : 19, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	2.2	%
O_2 Concentration	16.7	%
CO Concentration	25	ppm
NOx Concentration	21.3	ppm
SOx Concentration	0	ppm
Emission factor CO	32.2	g/Gj
Emission factor NOx	45.0	g/Gj
Emission factor Sox	0	g/Gj

Measurement of component in flue gas

Measuring time	14:15	15:23
CO_2concentration (%)	2.2	2.2
O_2 concentration (%)	16.2	16.4
CO concentration (ppm)	25	25

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
14:20	19.0	0	17.0
14:30	19.0	0	17.0
14:40	22.6	0	16.4
14:50	21.6	0	16.8
15:00	22.4	0	16.7
15:10	22.0	0	16.7
15:20	22.6	0	16.6
Mean	21.3	0	16.7

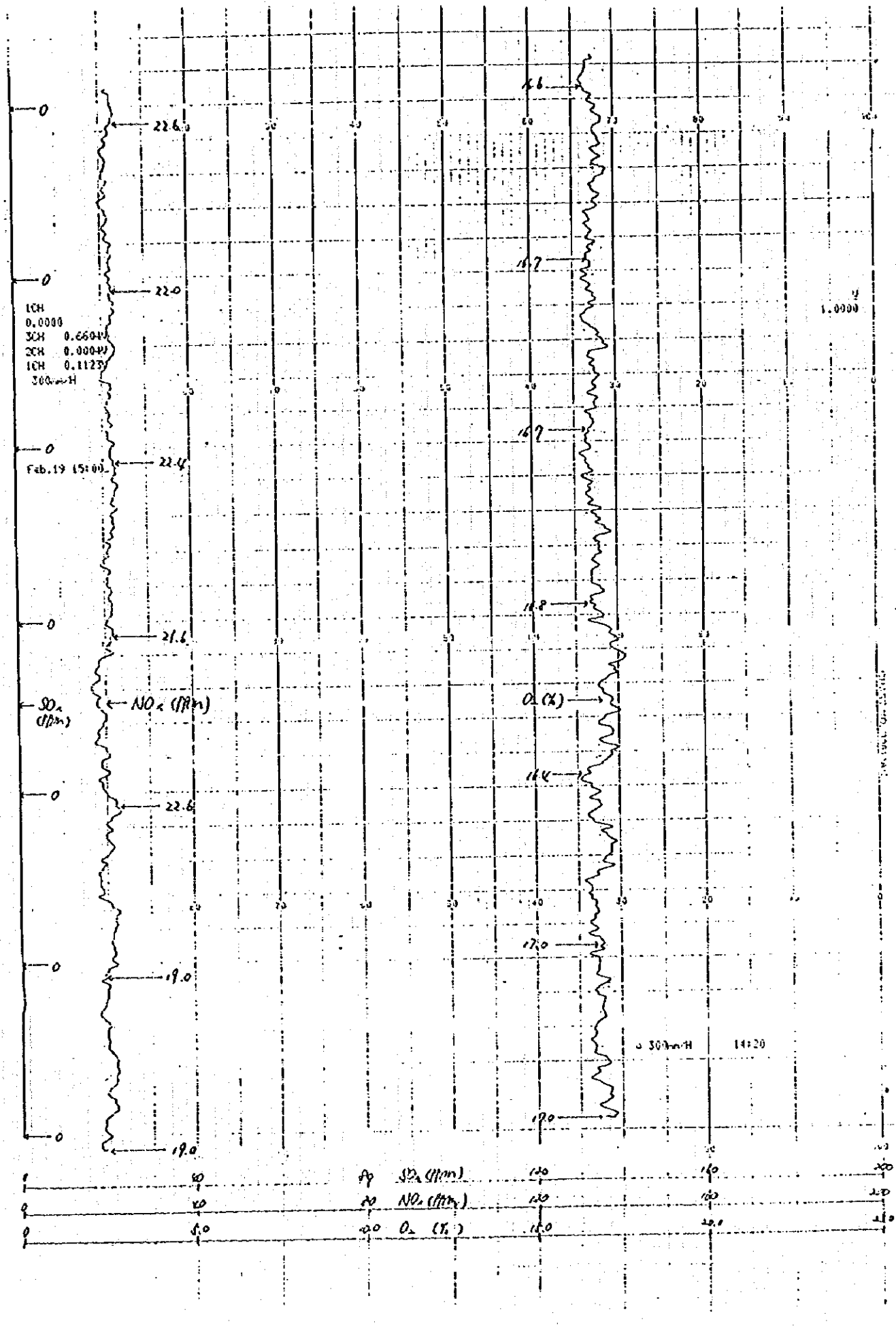
Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	ZARIEF Room heater Type1000A
2	Fuel type	NG
3	Flow rate	0.60 m^3/h
4	Others	Heating Value Minimum 1500 Kcal/h Maximum 8500 Kcal/h

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

CO_2th (%) = 12.23 (NG)
Go = 8.74 (NG)
A = 46 (Nox), 64 (Sox), 28 (CO)
Hh = 0.0472 (NG · Gj/m^3)
EF = Emission factor


1CH
0.0000
3CH 0.6604V
2CH 0.0004V
1CH 0.1123V
300mm/H
Feb.19 15:00
1.0000
22.6
22.0
22.4
21.6
22.6
19.0
19.0
16.6
16.7
16.7
16.8
O2 (%)
16.4
17.0
17.0
300mm/H 14:20
SO2 (ppm)
NO2 (ppm)
O2 (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Stove (NG)

Measuring Date : 22, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	0.64	%
O_2 Concentration	20.5	%
CO Concentration	N D	ppm
NOx Concentration	3.2	ppm
SOx Concentration	2.1	ppm
Emission factor CO	0	g/Gj
Emission factor NOx	23.3	g/Gj
Emission factor Sox	21.2	g/Gj

Measurement of component in flue gas

Measuring time	11:36	12:50
CO_2concentration (%)	0.64	0.64
O_2 concentration (%)	20.5	20.5
CO concentration (ppm)	N D	N D

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
11:43	3.8	2.0	20.5
11:53	3.0	1.0	20.5
12:03	4.0	2.1	20.5
12:13	3.0	2.0	20.5
12:23	3.0	2.1	20.5
12:33	3.0	2.1	20.5
12:43	2.8	2.1	20.5
Mean	3.2	2.1	20.5

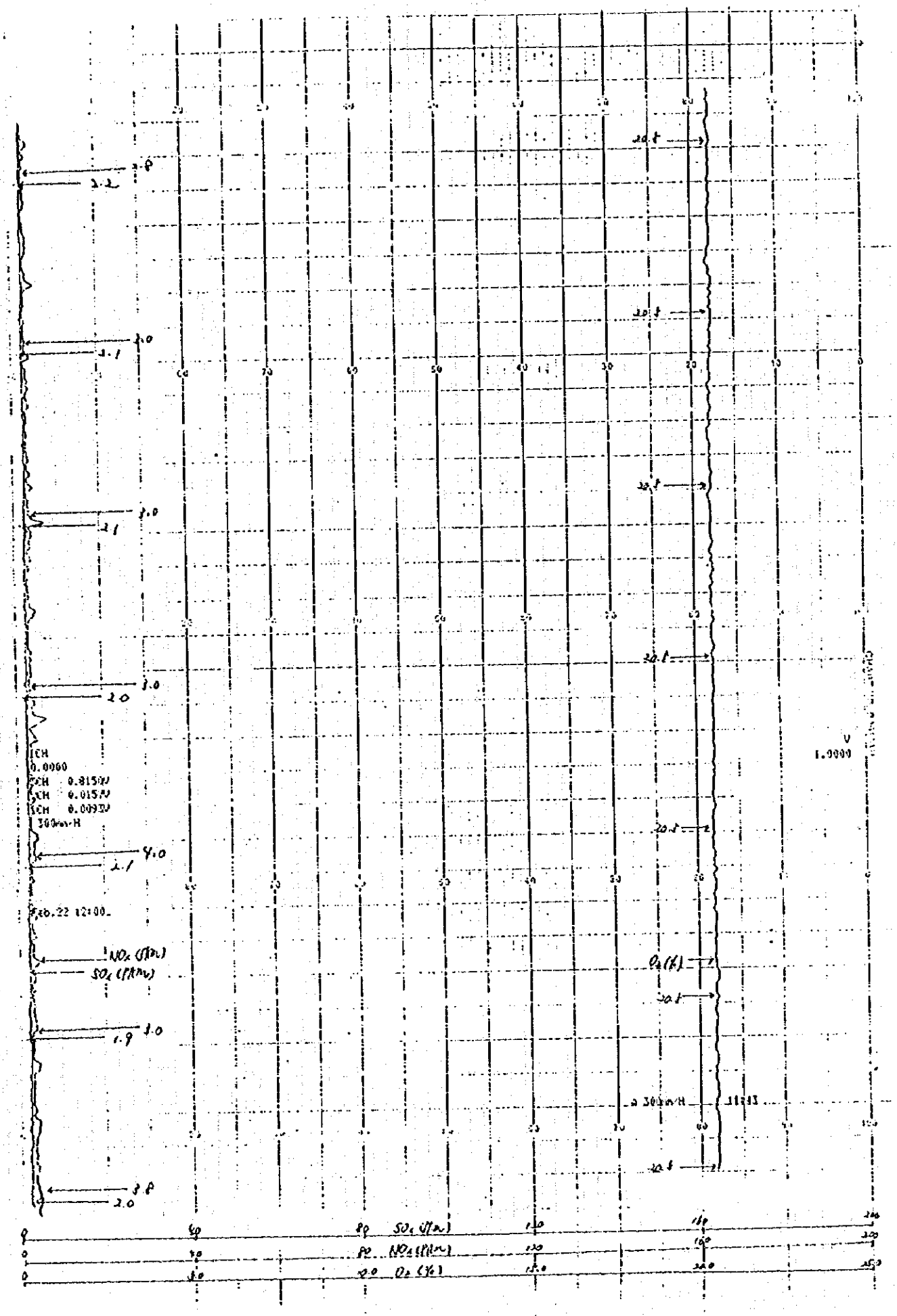
Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	MANDANA Stove
2	Fuel type	NG
3	Flow rate	0.25 m^3/h
4	Others	Heating Value Bigger 2500 BIG 2200 Medium 1400

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

CO_2th (%) = 12.23 (NG)
Go = 8.74 (NG)
A = 46 (Nox)、64 (Sox)、28 (CO)
Hh = 0.0472 (NG・Gj/m^3)
EF = Emission factor


CH
0.0000
CH 0.815V
CH 0.015V
CH 0.009V
300m³/H
Feb.22 12:00
NOx (ppm)
SO2 (ppm)
O2 (%)
V
1.0000

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Stove (LPG)

Measuring Date : 22, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	0.22	%
O_2 Concentration	20.6	%
CO Concentration	N D	ppm
NOx Concentration	2.0	ppm
SOx Concentration	0.1	ppm
Emission factor CO		g/Gj
Emission factor NOx		g/Gj
Emission factor Sox		g/Gj

Measurement of component in flue gas

Measuring time	13:50	15:00
CO_2concentration (%)	0.22	0.22
O_2 concentration (%)	20.6	20.6
CO concentration (ppm)	N D	N D

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
13:57	2.0	0.0	20.6
14:07	2.0	0.1	20.6
14:17	2.0	0.1	20.6
14:27	2.0	0.2	20.6
14:37	2.0	0.2	20.6
14:47	2.0	0.1	20.6
14:57	2.1	0.2	20.6
Mean	2.0	0.1	20.6

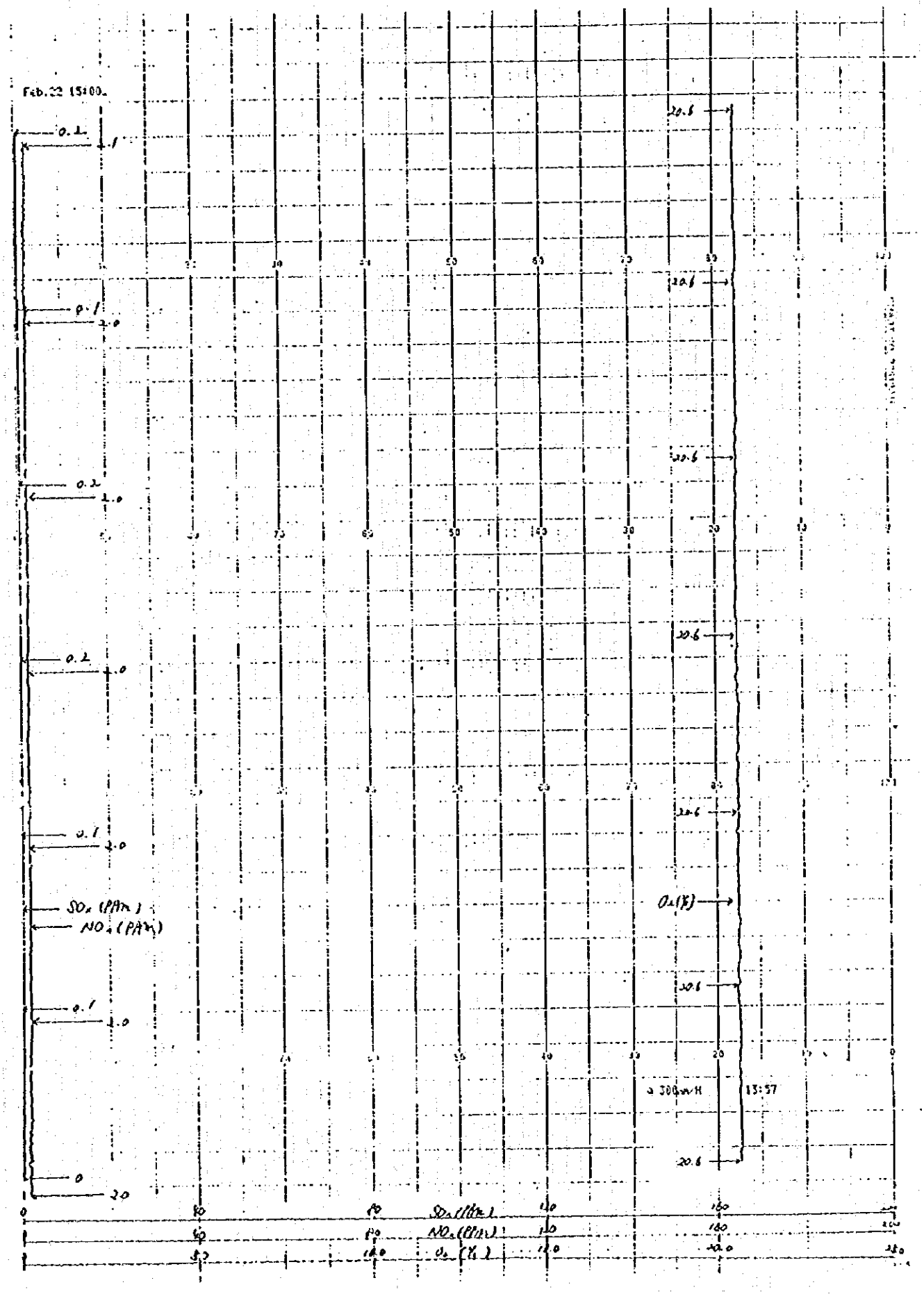
Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	
2	Fuel type	LPG
3	Flow rate	0.18 Kg/h
4	Others	

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

CO_2th (%) = (LPG)
Go = (LPG)
A = 46 (Nox)、64 (Sox)、28 (CO)
Hh = (LPG・Gj/Kg)
EF = Emission factor


Feb.22 15:00
0.2
0.1
0.2
0.2
0.1
SO₂ (PPm)
NO₂ (PPm)
0.1
0
20.6
O₂(%)
a 300m/H
13:57
SO₂(PPm)
NO₂(PPm)
O₂ (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)

Facility Name : Boiler house

Measuring Date : 20, Feb, 1997

Item	Measuring Result	
CO_2 Concentration	2.1	%
O_2 Concentration	15.8	%
CO Concentration	7750	ppm
NOx Concentration	5.9	ppm
SOx Concentration	-	ppm
Emission factor CO	10200	g/Gj
Emission factor NOx	12.5	g/Gj
Emission factor Sox	-	g/Gj

Measurement of component in flue gas

Measuring time	10:00	11:20
CO_2 concentration (%)	2.2	2.0
O_2 concentration (%)	15.8	15.8
CO concentration (ppm)	7300	7800

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
10:12	5.6	-	15.8
10:18	6.0	-	15.8
10:24	6.0	-	15.8
10:30	6.0	-	15.8
10:36	6.0	-	15.8
Mean	21.3	0	16.7

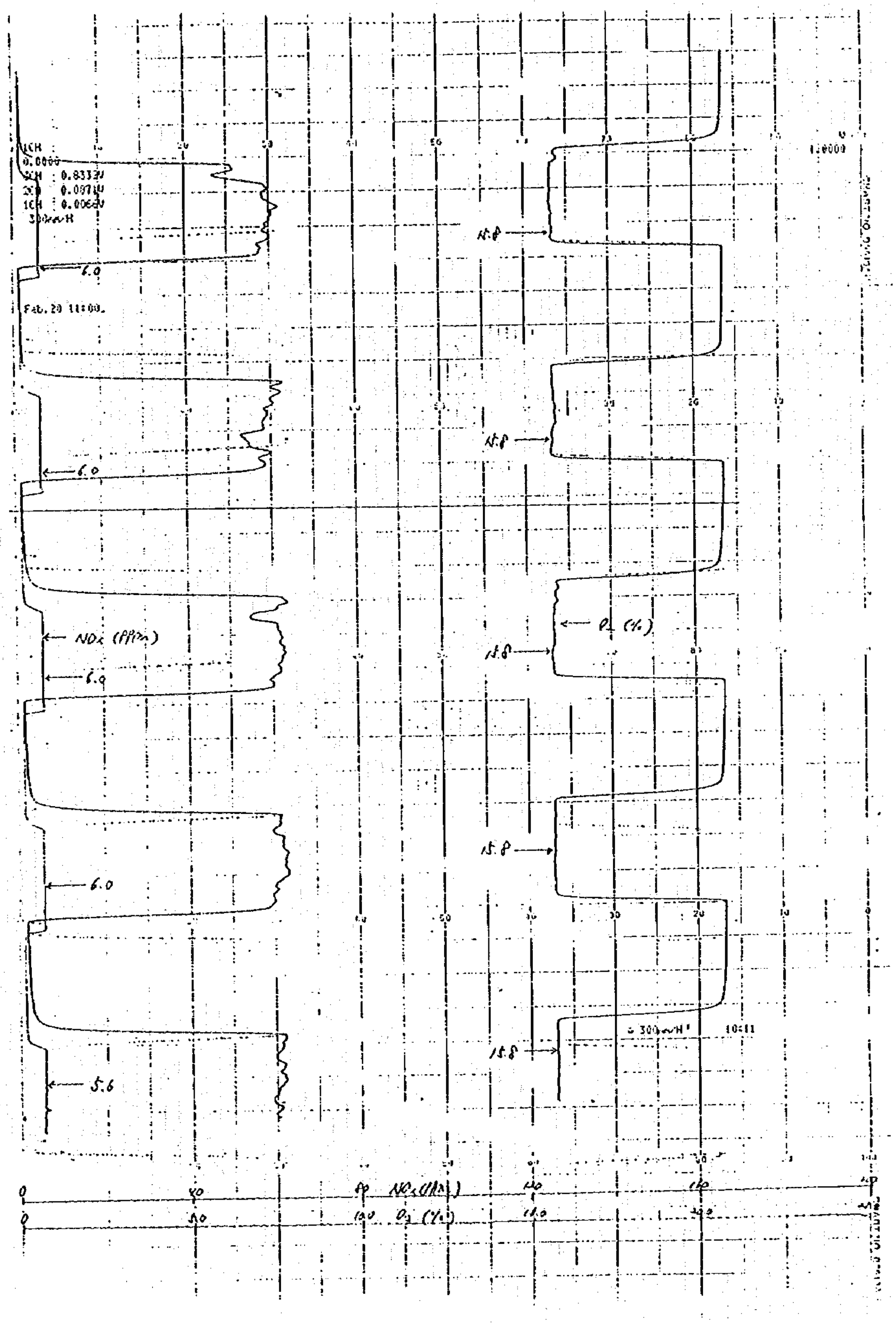
Fuel Combustion Analysis Work Sheet

	Item	Remark
1	Type	AZARPAD Boiler
2	Fuel type	NG
3	Flow rate	6.30 m^3/h
4	Others	Concentration of Sox was not available because of high content of CO and CH_4 etc. in the flue gas.

Calculation of Emission factor

$$EF = C\ (ppm) \times \frac{CO_2th}{CO_2} \times Go \times \frac{A}{22.4} \times 10^{-3} \times \frac{1}{Hh} \quad (g/Gj)$$

CO_2th (%) = 12.23 (NG)
Go = 8.74 (NG)
A = 46 (Nox)、64 (Sox)、28 (CO)
Hh = 0.0472 (NG・Gj/m^3)
EF = Emission factor



1CH : 0.0000
2CH : 0.8333V
3CH : 0.0071V
1CH : 0.0066V
300mm/H
Feb.20 11:00
6.0
NOx (ppm)
5.6
15.8
O2 (%)
300mm/H
10:11

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)
S. Hossini (AQCC)

Factory / Facility Name: Cement factory No. 4

Address / Location : Khavaran road-Tehran Cement factory district 15

Measuring Date : 25 . Feb . 1997

Item	Measuring Result	
Flow rate of wet flue gas	241000	m^3_N/h
Flow rate of dry flue gas	210000	m^3_N/h
Temperature of flue gas	145	℃
CO_2 Concentration	16.0	%
O_2 Concentration	10.6	%
CO Concentration	0.22	%
Dust Concentration	0.32	g/m^3_N
NOx Concentration	307	ppm
SOx Concentration	4	ppm

Measurement of water content in flue gas

Measuring time		10:26 ~ 10:31		10:33 ~ 10:38	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (θm, ℃)		20.5		20.5	
Moisture absorption tube	m₁	107.110	104.912	110.152	118.121
	m₂	106.130	104.912	109.220	118.121
	m₁-m₂	0.980		0.952	
Moisture content (Xw, %)		12.9		12.6	
Mean (Xw, %)		12.8			

Measurement of component in flue gas

Measuring time	10:45
CO_2concentration (%)	16.0
O_2 concentration (%)	10.6
CO concentration (%)	0.22
r_o (kgf/m³)	1.32
Air ratio	2.17

Pa= 673 mmHg

Measurement of velocity

Measuring time 13:22 ~ 13:45			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m3)	Dt (℃)	V (m/s)
1	11.2	-10	0.763	145	14.4
2	12.0	-10	0.763	145	14.9
3	13.1	-10	0.763	145	15.6
4	14.5	-10	0.763	145	16.4
5	17.5	-10	0.763	145	18.0
6	19.0	-10	0.763	145	18.8
	Mean	-10	0.763	145	16.4

Measurement of dust concentration

Measuring time		11:55 ~ 12:04	12:08 ~ 12:15
Gas meter temp. (℃)		22.9	22.0
Gas volume (Vm, L)		111.6	74.7
Gas volume (Vm', L_N)		91.0	61.1
Filter weight	Sampled (md2, g)	0.1217	0.1119
	Unsampled (md1, g)	0.0932	0.0924
Collected dust (md, g)		0.0285	0.0195
Dust concentration(g/m^3_N)		0.31	0.32
Mean (C_N, g/m^3_N)		0.32	

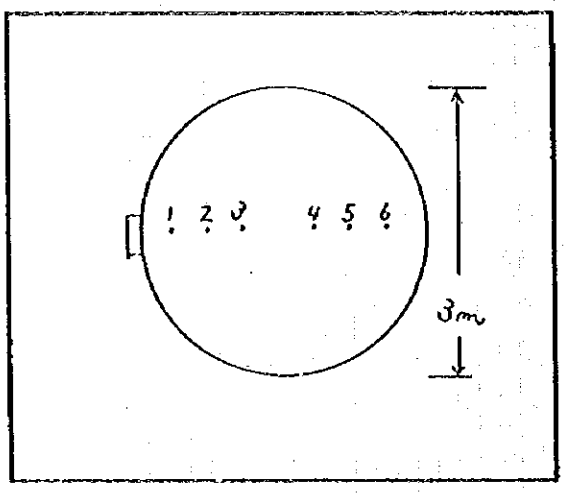
Flow rate of equal velocity aspiration

Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	17.1	7		
2	2	15.5	8		
3	3	14.5	9		
4			10		
5			11		
6			12		

Measurement of NOx, SOx and O_2

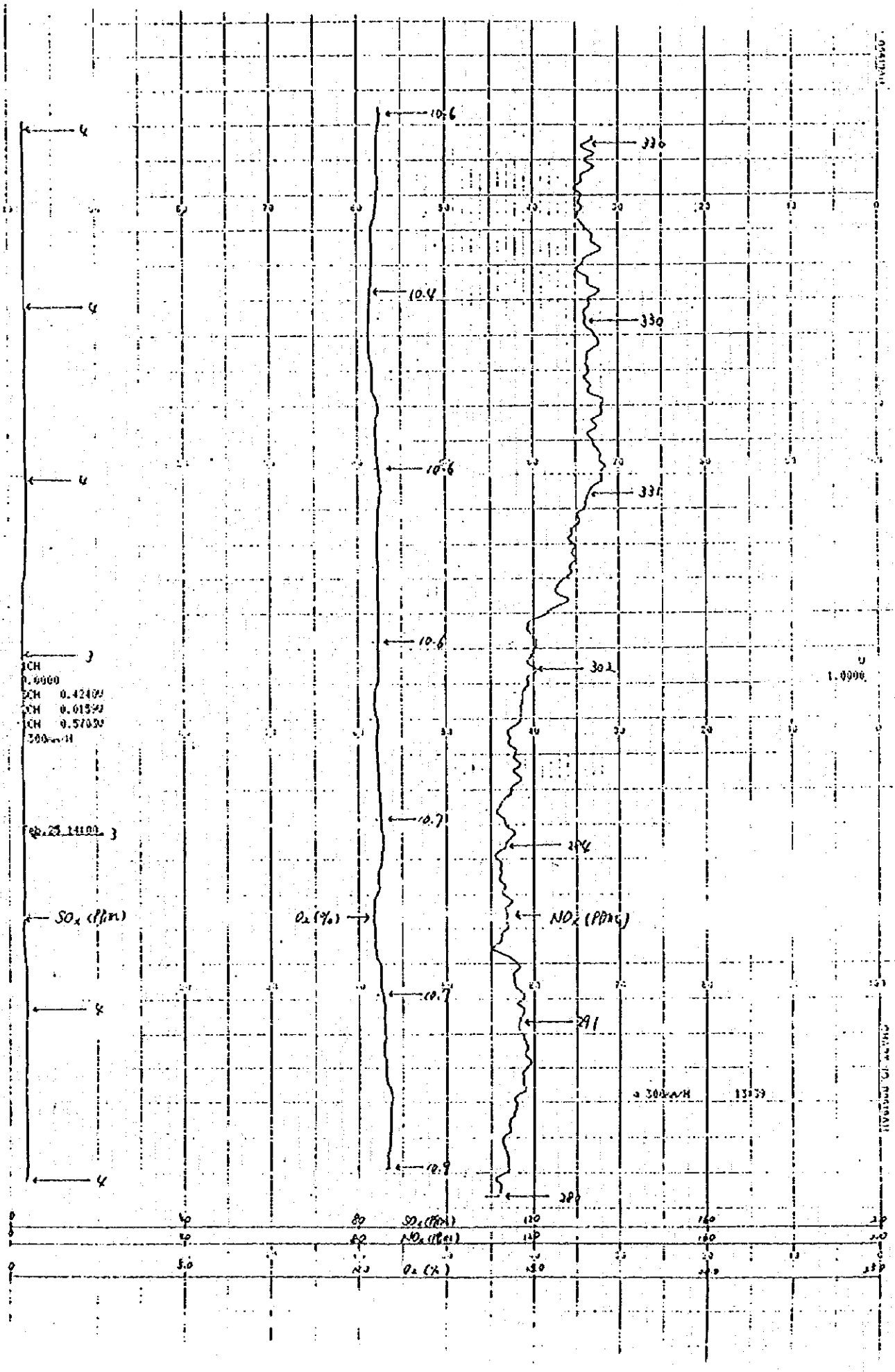
Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
13:40	280	4	10.9
13:50	291	4	10.7
14:00	284	3	10.7
14:10	302	3	10.6
14:20	331	4	10.6
14:30	330	4	10.4
14:40	330	4	10.6
Mean	307	4	10.6

Measuring point



A = 7.069 m^2

Comment


10.6
330
10.4
330
10.6
331
10.6
302
10.7
294
10.7
291
10.9
288
SO_x (ppm)
O_2 (%)
NO_x (ppm)
SO_x (ppm)
NO_x (ppm)
O_2 (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)
S. Hossini (AQCC)

Factory / Facility Name: Cement factory No. 6

Address / Location : Khavaran road-Tehran Cement factory district 15

Measuring Date : 26 . Feb . 1997

Item	Measuring Result	
Flow rate of wet flue gas	569000	m^3_N/h
Flow rate of dry flue gas	506000	m^3_N/h
Temperature of flue gas	158	℃
CO_2 Concentration	11.4	%
O_2 Concentration	11.6	%
CO Concentration	N.D	ppm
Dust Concentration	0.37	g/m^3_N
NOx Concentration	258	ppm
SOx Concentration	1 >	ppm

Measurement of water content in flue gas

Measuring time		9:50 ~ 9:53		9:55 ~ 10:00	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (θm, ℃)		18.8		18.8	
Moisture absorption tube	m.1	106.930	104.850	108.890	106.570
	m.2	106.256	104.824	108.152	106.362
	m.1-m.2	0.700		0.946	
Moisture content (Xw, %)		9.5		12.4	
Mean (Xw, %)		11.0			

Measurement of component in flue gas

Measuring time	10:02
CO_2 concentration (%)	11.4
O_2 concentration (%)	14.8
CO concentration (ppm)	N.D
r_o (kgf/m³)	1.29
Air ratio	2.31

Pa= 672 mmHg

Measurement of velocity

Measuring time 10:11 ~ 10:18			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m3)	Dt (℃)	V (m/s)
1	8.5	-22	0.726	158	12.9
2	12.0	-22	0.726	158	15.4
3	15.0	-22	0.726	158	17.2
4	12.0	-22	0.726	158	15.4
5	9.5	-22	0.726	158	13.7
6	9.0	-22	0.726	158	13.3
7	5.5	-22	0.726	158	10.4
8	8.0	-22	0.726	158	12.5
9	10.0	-22	0.726	158	14.0
10	13.0	-22	0.726	158	16.0
11	13.0	-22	0.726	158	16.0
12	12.0	-22	0.726	158	15.4
	Mean	-22	0.726	158	14.3

Measurement of dust concentration

Measuring time		11:08 ~ 11:12	11:15 ~ 11:20
Gas meter temp. (℃)		20.1	20.5
Gas volume (Vm, L)		37.9	56.1
Gas volume (Vm', L_N)		31.1	46.0
Filter weight	Sampled (md2, g)	0.1050	0.1106
	Unsampled (md1, g)	0.0928	0.0950
Collected dust (md, g)		0.0122	0.0156
Dust concentration (g/m^3_N)		0.39	0.34
Mean (C_N, g/m^3_N)		0.37	

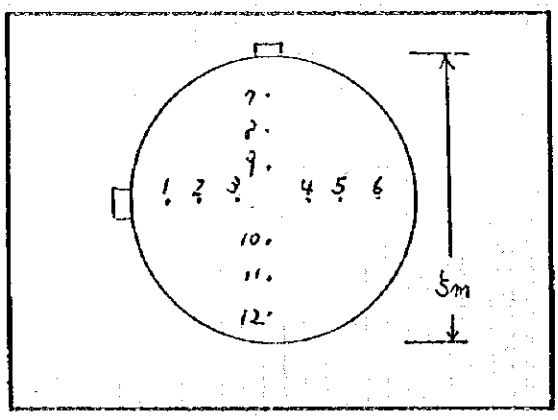
Flow rate of equal velocity aspiration

Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	13.8	7		
2	2	11.4	8		
3	3	11.8	9		
4			10		
5			11		
6			12		

Measurement of NOx, SOx and O_2

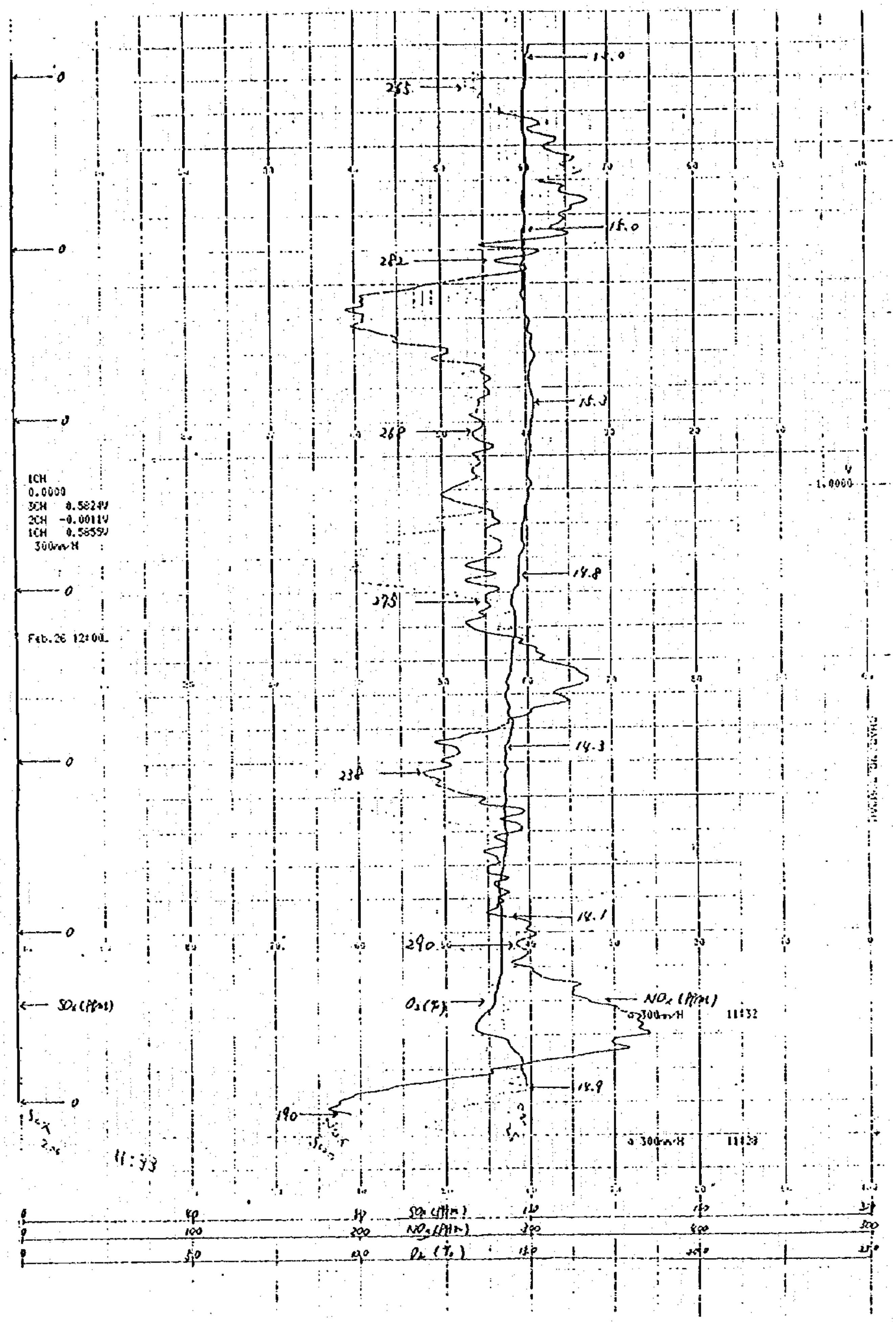
Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
11:33	190	0	14.9
11:43	290	0	14.1
11:53	238	0	14.3
12:03	275	0	14.8
12:13	268	0	15.3
12:23	282	0	15.0
12:33	265	0	15.0
Mean	258	0	14.8

Measuring point



A = 19.635 m^2

Comment


1CH
0.0000
3CH 0.5824V
2CH -0.0011V
1CH 0.5659V
300mm/H
Feb.26 12:00L
1.0000
300mm/H 11:32
300mm/H 11:33
SO2 (PPM)
NOx (PPM)
O2 (%)

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)

F. Goodarz (AQCC)

S. Hossini (AQCC)

Factory / Facility Name: Cement factory No. 7

Address / Location : Moshirieh-Cement Co-District15

Measuring Date : 6 . Mar . 1997

Item	Measuring Result	
Flow rate of wet flue gas	283000	m^3_N/h
Flow rate of dry flue gas	241000	m^3_N/h
Temperature of flue gas	126	℃
CO_2 Concentration	14.5	%
O_2 Concentration	10.8	%
CO Concentration	38	ppm
Dust Concentration	0.14	g/m^3_N
NOx Concentration	252	ppm
SOx Concentration	1 >	ppm

Measurement of water content in flue gas

Measuring time		10:00 ~ 10:14		10:14 ~ 10:19	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (θm, ℃)		21.6		21.6	
Moisture absorption tube	m.1	105.815	107.090	108.212	108.537
	m.2	104.715	107.090	106.950	108.535
	m.1-m.2	1.100		1.264	
Moisture content (Xw, %)		14.0		15.8	
Mean (Xw, %)		14.9			

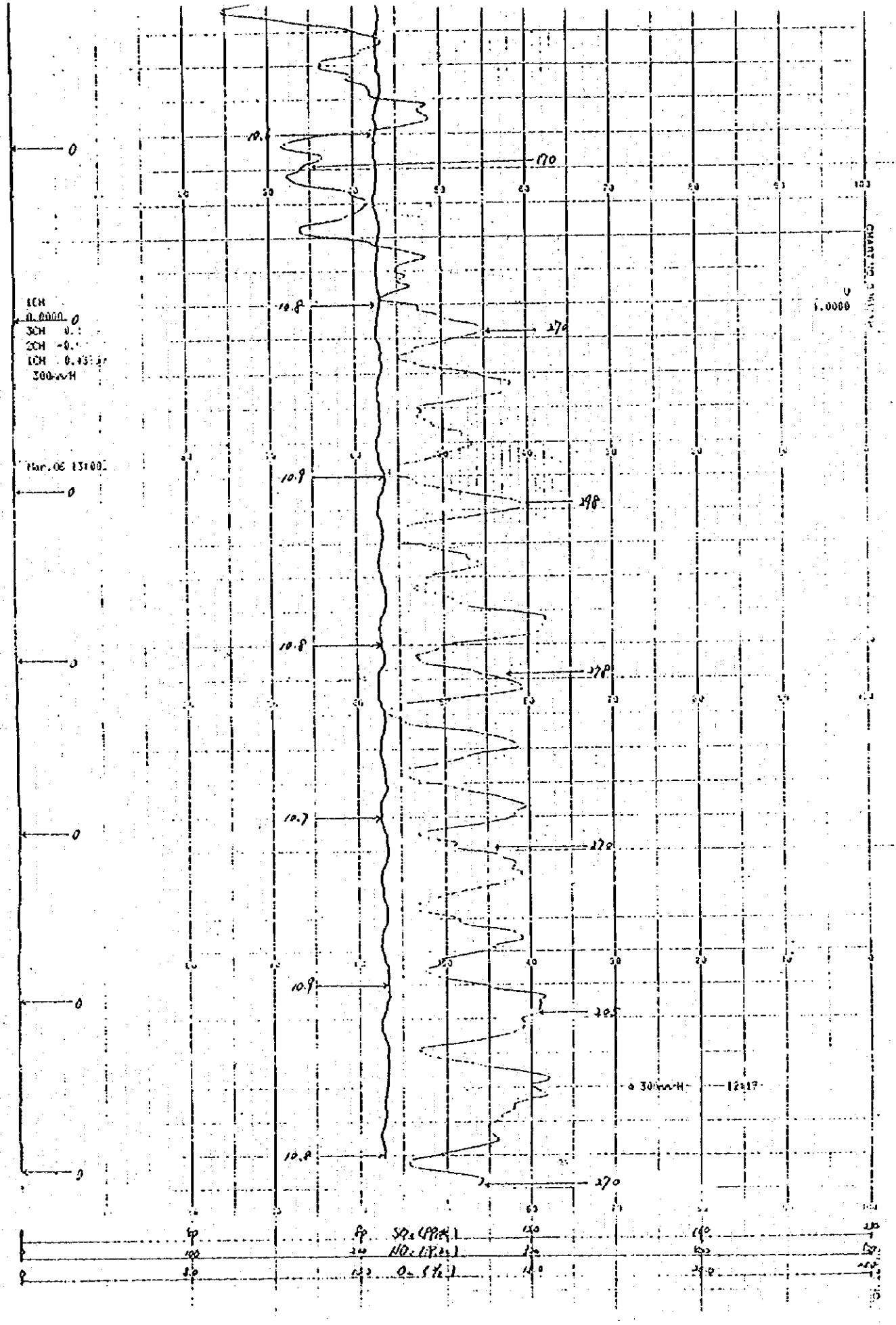
Measurement of component in flue gas

Measuring time	10:22
CO_2 concentration (%)	14.5
O_2 concentration (%)	10.8
CO concentration (ppm)	38
r_o (kgf/m³)	1.29
Air ratio	2.19

Pa= 663 mmHg

Measurement of velocity

Measuring time 10:40 ~ 10:50			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m3)	Dt (℃)	V (m/s)
1	12.0	-20	0.768	126	14.9
2	12.0	-20	0.768	126	14.9
3	10.5	-20	0.768	126	13.9
4	7.5	-20	0.768	126	11.8
5	9.5	-20	0.768	126	13.2
	Mean	-20	0.768	126	13.7



Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)

F. Goodarz (AQCC)

S. Hossini (AQCC)

Factory / Facility Name: Tehran refinery 2H-101

Address / Location : Qom road-Tehran refinery

District Boundary No20

Measuring Date : 1 . Mar . 1997

Item	Measuring Result	
Flow rate of wet flue gas	976000	m^3_N/h
Flow rate of dry flue gas	880000	m^3_N/h
Temperature of flue gas	429	℃
CO_2 Concentration	6.8	%
O_2 Concentration	9.4	%
CO Concentration	N.D	ppm
Dust Concentration	0.028	g/m^3_N
NOx Concentration	111	ppm
SOx Concentration	521	ppm

Measurement of water content in flue gas

Measuring time		11:47 ~ 11:51		11:55 ~ 12:00	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (θm, ℃)		13.2		13.2	
Moisture absorption tube	m,1	108.795	106.995	107.865	108.108
	m,2	108.126	106.908	107.120	108.082
	m,1-m,2	0.716		0.771	
Moisture content (Xw, %)		9.5		10.1	
Mean (Xw, %)		9.8			

Measurement of component in flue gas

Measuring time	11:45
CO_2 concentration (%)	6.8
O_2 concentration (%)	9.4
CO concentration (ppm)	N.D
r_o (kgf/m³)	1.27
Air ratio	1.73

Pa= 678 mmHg

Measurement of velocity

Measuring time 12:03 ~ 12:07			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m3)	Dt (℃)	V (m/s)
1	1.6	-27	0.439	429	7.2
2	2.3	-27	0.439	429	8.6
3	1.9	-27	0.439	429	7.8
4	2.2	-27	0.439	429	8.4
5	2.1	-27	0.439	429	8.2
6	1.2	-27	0.439	429	6.2
	Mean	-27	0.439	429	7.7

Measurement of dust concentration

Measuring time		12:44 ~ 13:00	13:06 ~ 13:22
Gas meter temp. (℃)		16.5	15.9
Gas volume (Vm, L)		185.3	164.8
Gas volume (Vm', L_N)		155.8	138.8
Filter weight	Sampled (md2, g)	0.0976	0.0989
	Unsampled (md1, g)	0.0939	0.0945
Collected dust (md, g)		0.0037	0.0044
Dust concentration (g/m^3_N)		0.024	0.032
Mean (C_N, g/m^3_N)		0.028	

Flow rate of equal velocity aspiration

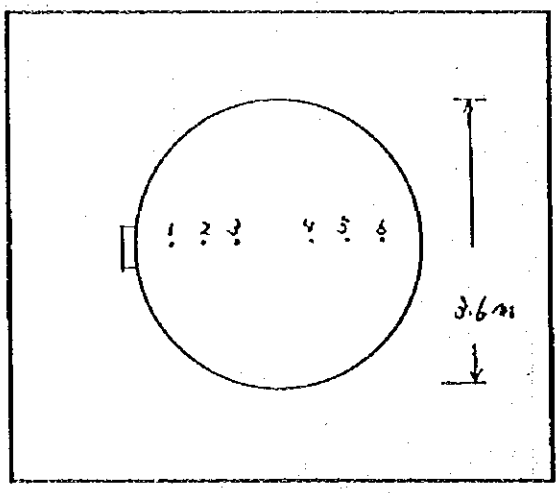
Inner diameter of suction nozzle (d, mm) = 10

No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	10.4	7		
2	2	13.1	8		
3	3	13.1	9		
4			10		
5			11		
6			12		

Measuremont of NOx, SOx and O_2

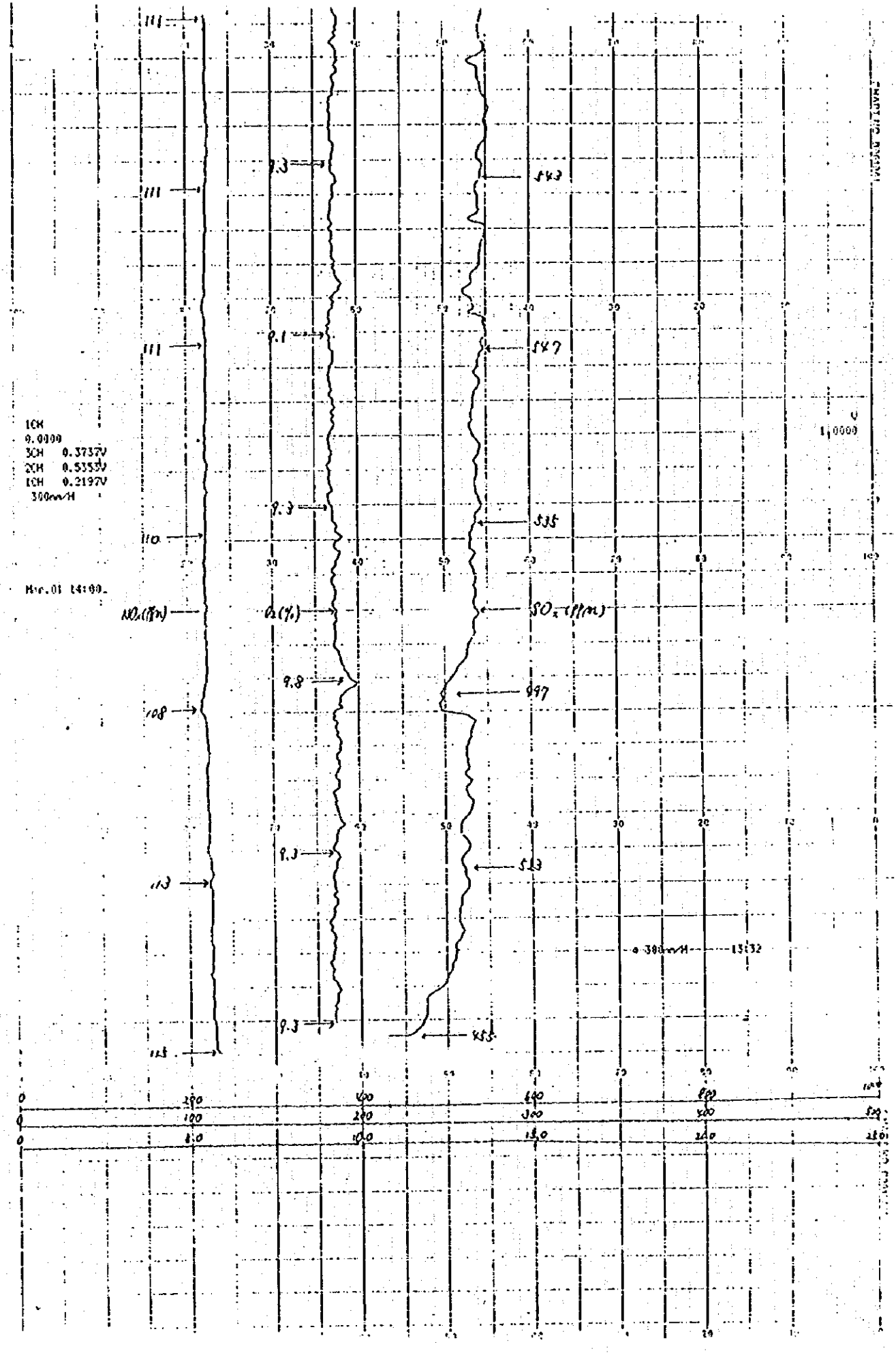
Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
13:32	115	455	9.3
13:42	113	523	9.3
13:52	108	497	9.8
14:02	110	535	9.3
14:12	111	547	9.1
14:22	111	543	9.3
14:32	111	545	9.3
Mean	111	521	9.3

Measuring point



A = 10.179 m^2

Comment


1CH
0.0000
3CH 0.3737V
2CH 0.5355V
1CH 0.2197V
300mm/H
Mar.01 14:00
NOx(ppm)
O2(%)
SOx(ppm)
111
111
111
110
108
113
115
9.3
9.1
9.3
9.8
9.3
9.3
543
547
535
997
513
455
300mm/H
15:32

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodarz (AQCC)
S. Hossini (AQCC)

Factory / Facility Name: Tehran refinery Steam boiler

Address / Location : Qom road-Tehran refinery
District Boundary No20

Measuring Date : 2 . Mar . 1997

Item	Measuring Result	
Flow rate of wet flue gas	127000	m^3_N/h
Flow rate of dry flue gas	112000	m^3_N/h
Temperature of flue gas	460	℃
CO_2 Concentration	12.4	%
O_2 Concentration	2.8	%
CO Concentration	750	ppm
Dust Concentration	-	g/m^3_N
NOx Concentration	186	ppm
SOx Concentration	778	ppm

Measurement of water content in flue gas

Measuring time		9:28 ~ 9:32		9:33 ~ 9:38	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (θm, ℃)		23.0		23.0	
Moisture absorption tube	m,1	107.870	108.780	108.960	107.780
	m,2	106.905	108.776	108.090	107.780
	m,1-m,2	0.969		0.870	
Moisture content (Xw, %)		12.7		11.7	
Mean (Xw, %)		12.2			

Measurement of component in flue gas

Measuring time	9:43
CO_2 concentration (%)	12.4
O_2 concentration (%)	2.8
CO concentration (ppm)	750
r_o (kgf/m³)	1.28
Air ratio	1.14

Pa= 677 mmHg

Measurement of velocty

Measuring time 10:22 ~ 10:30			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m3)	Dt (℃)	V (m/s)
1	0.9	-32	0.377	460	5.8
2	4.8	-32	0.377	460	13.4
3	3.2	-32	0.377	460	11.0
4	7.0	-32	0.377	460	16.2
5	0.2	-32	0.377	460	2.7
6	7.0	-32	0.377	460	16.2
7	7.6	-32	0.377	460	16.9
8	12.6	-32	0.377	460	21.8
	Mean	-32	0.377	460	13.0

Measurement of dust concentration

Measuring time		10:42 ~ 10:52	10:54 ~ 11:04
Gas meter temp. (℃)		27.0	25.3
Gas volume (Vm, L)		64.1	79.6
Gas volume (Vm', L_N)		51.9	64.8
Filter weight	Sampled (md2, g)	-	-
	Unsampled (md1, g)	-	-
Collected dust (md, g)		-	-
Dust concentration (g/m^3_N)		-	-
Mean (C_N, g/m^3_N)		-	

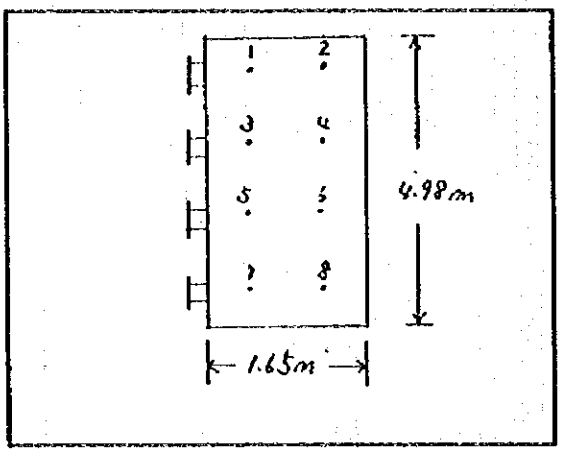
Flow rate of equal velocity aspiration

Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	5	2.0	7		
2	6	9.6	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NOx, SOx and O_2

Sampling Time	NOx (ppm)	SOx (ppm)	O_2 (%)
11:32	185	700	2.0
11:42	188	780	2.0
11:52	185	790	1.9
12:02	185	793	2.0
12:12	186	795	2.0
12:22	185	807	1.9
12:32	185	780	2.0
Mean	186	778	2.0

Measuring point



A = 8.217 m^2

Comment

Dust concentration was not available because the teflon packing of the instrument was melted due to the high temperature of flue gas, ca. 450°C.