

[Data sheet] Instruction manual for general purpose gas analyzer unit
[Item 3.4.2(4)]

[Data Sheet] Analyzed data sheet for first field survey [Table 3.4.2-10(1)]

1. Sofal Jadid
2. Besat power plant
3. Tehran refinery 2H-101
4. Tehran refinery 2H-151
5. Tehran refinery 2H-181
6. Tehran refinery steam boiler
7. Tehran cement No.4
8. Tehran cement No.5
9. Tehran cement No.6
10. Tehran cement No.7

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs A. Ishizaka (JICA)
T. Nambu (JICA)
M. Agir (AQCC)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Sofal Jadid

Address / Location : Ismaiel abad-savehring way-
Sofal Jadid Co

Measuring Date : 22 , Sep . 1996

Item	Measuring Result	
Flow rate of wet flue gas	19600	m ³ N/h
Flow rate of dry flue gas	18200	m ³ N/h
Temperature of flue gas	97	°C
CO ₂ Concentration	1.5	%
O ₂ Concentration	19.4	%
CO Concentration	60	ppm
Dust Concentration	0.005 >	g/m ³ N
NOx Concentration	22	ppm
SOx Concentration	2	ppm

Measurement of water content in flue gas

Measuring time	12:01 ~ 12:05		12:08 ~ 12:13		
Gas volume (V _m , L)	10.0		10.0		
Gas meter temp. (t _m , °C)	31.8		31.8		
Moisture absorption tube	m _{.1}	107.523	108.881	109.142	107.785
	m _{.2}	107.013	108.881	108.622	107.785
	m _{.1} -m _{.2}	0.510		0.520	
Moisture content (X _w , %)	7.35		7.48		
Mean (X _w , %)	7.4				

Measurement of component in flue gas

Measuring time	11:55
CO ₂ concentration (%)	1.5
O ₂ concentration (%)	19.4
CO concentration (ppm)	60
ρ _o (kgf/m ³)	1.26
Air ratio	12.8

Pa= 680 mmHg

Measurement of dust concentration

Measuring time		14:50 ~ 15:20	15:28 ~ 15:58
Gas meter temp. (°C)		31.2	31.5
Gas volume (V _m , L)		664.0	663.1
Gas volume (V _m ', L _N)		533.1	531.9
Filter weight	Sampled (m _{d2} , g)	0.0936	0.0952
	Unsampled (m _{d1} , g)	0.0931	0.0947
Collected dust (m _d , g)		0.0005	0.0005
Dust concentration (g/m ³ _N)		0.0009	0.0009
Mean (C _N , g/m ³ _N)		0.0009	

Flow rate of equal velocity aspiration

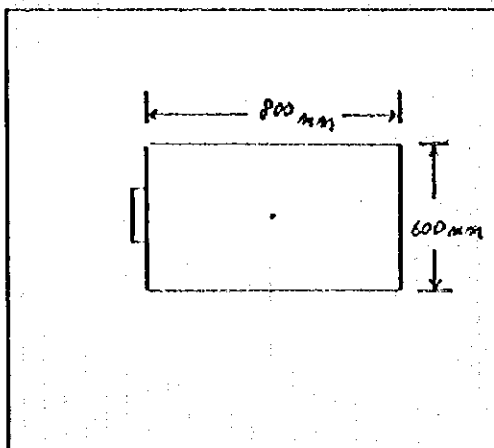
Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	22.4	7		
2	2	22.3	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
16:15	23	2.0	16.4
16:25	24	2.2	16.4
16:35	24	3.0	16.4
16:45	24	3.4	16.4
16:55	20	38.0	16.4
17:05	24	5.0	16.4
17:15	24	4.0	16.4
Mean	23	8.2	16.4

Measuring point

Comment

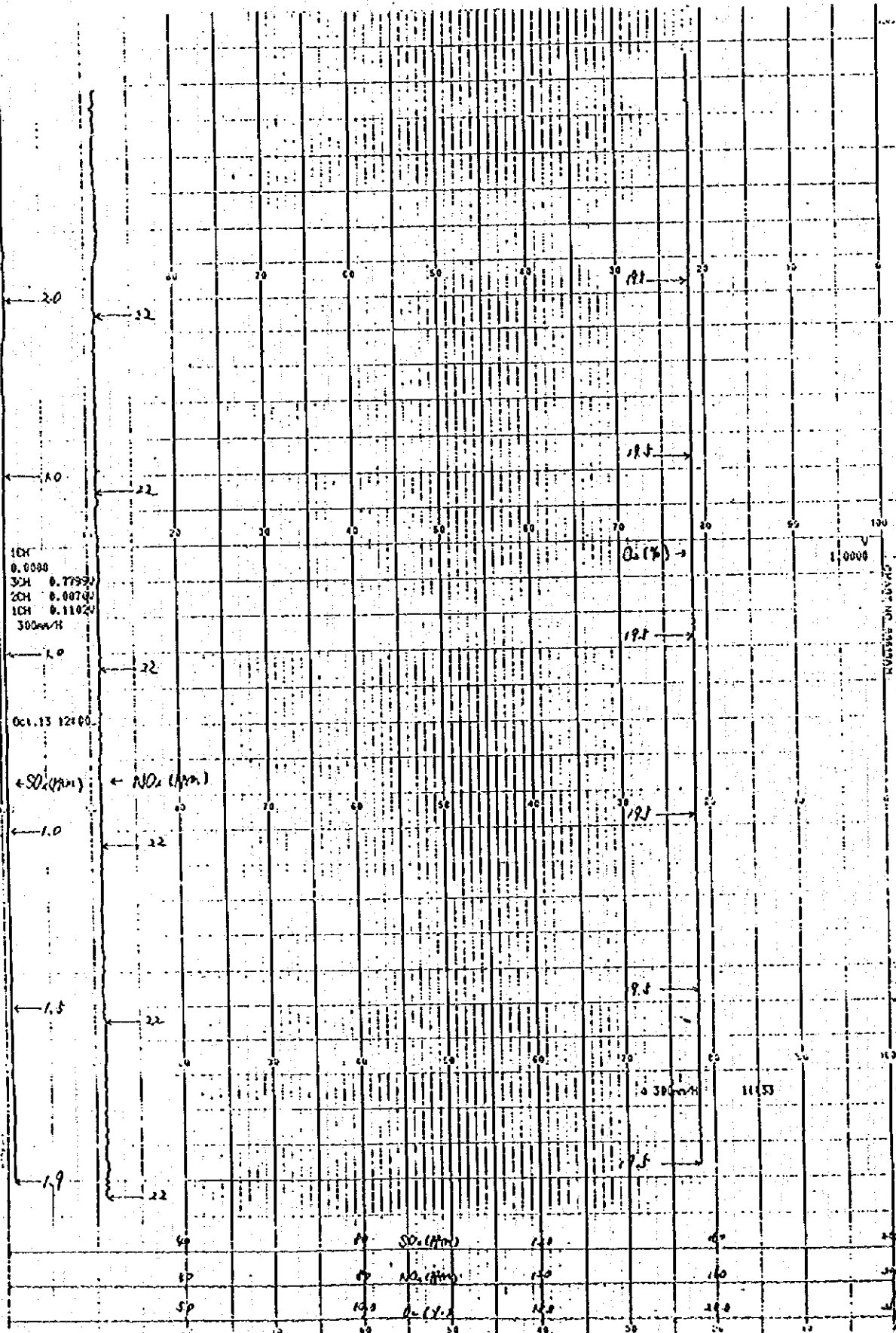


$A = 0.480 \text{ m}^2$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 22	Month 9	Year 96	Time	From	To
1.2	Weather	Cloudy					
1.3	Factory name	Sofal Jadid					
1.4	Location	Ismael abad-saveh ringway Sofal Jadid Co					
1.5	Person in charge						
	- Name	Mr. Abbas Naderi					
	- Department						
	- Position						
	- Tel No.						

2.0	Special information	Remark					
2.1	Fuel type	Natural gas					
2.2	Flow rate	4600 m ³ /day					
2.3	Combustion quantity						
2.4	Exhaust Temperature						
2.5	Height of stack	5m (Diameter of stack = 800mm*600mm)					
2.6	Others						



1CH 0.0000
 2CH 0.7799
 3CH 0.0070
 4CH 0.1102
 300mm/H

Oct. 13 12:00

← SO₂ (PPM) ← NO₂ (PPM)

O₂ (%) →

RANGE ON 20VDC

SP	PP	SO ₂ (PPM)	12.0	10.0	20.0
SP	PP	NO ₂ (PPM)	12.0	10.0	20.0
SP	PP	O ₂ (%)	12.0	10.0	20.0

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs A. Ishizaka (JICA)
T. Nambu (JICA)
F. Goodarz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Besat power plant (No2)

Address / Location : Besat highway-against terminal-
district 16

Measuring Date : 24 . Sep . 1996

Item	Measuring Result	
Flow rate of wet flue gas	-	m ³ N/h
Flow rate of dry flue gas	-	m ³ N/h
Temperature of flue gas	-	℃
CO ₂ Concentration	5.0	%
O ₂ Concentration	12.5	%
CO Concentration	N D	ppm
Dust Concentration	-	g/m ³ N
NO _x Concentration	66	ppm
SO _x Concentration	2	ppm

Measurement of water content in flue gas

Measuring time	: ~ :		: ~ :	
Gas volume (Vm, L)				
Gas meter temp. (tm, °C)				
Moisture absorption tube	m.1			
	m.2			
	m.1-m.2			
Moisture content (Xw, %)				
Mean (Xw, %)				

Measurement of component in flue gas

Measuring time	11:20
CO ₂ concentration (%)	5.0
O ₂ concentration (%)	12.5
CO concentration (ppm)	N D
ro (kgf/m ³)	-
Air ratio	2.32

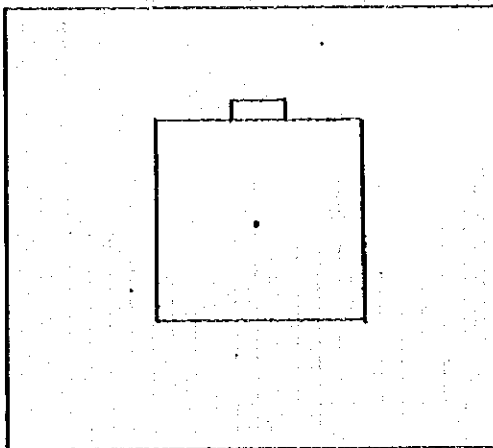
Pa= - mmHg

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
11:34	66	1.9	12.4
11:44	66	2.2	12.3
11:54	64	2.0	12.1
12:04	67	2.0	12.1
12:14	66	2.1	12.4
12:24	65	2.1	12.4
12:34	65	2.1	12.3
Mean	66	2.0	12.3

Measuring point

Comment



Measurements of flow and dust concentration could not be conducted because sampling hole was too small to input sampling probe.

A = □²

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 24	Month 9	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Besat power plant (No2)					
1.4	Location	Besat highway-against terminal-district 16					
1.5	Person in charge						
	- Name	Mr. Hossein Zomorrodian					
	- Department						
	- Position	Manager					
	- Tel No.	654014-11					

2.0	Special information	Remark					
2.1	Fuel type	Natural gas					
2.2	Flow rate	265000 m ³ /day					
2.3	Combustion quantity						
2.4	Exhaust Temperature	700 °F					
2.5	Height of stack	30 m (Diameter of stack =)					
2.6	Others	Electrical production 50 MWh Gas consumption 800000 m ³ /day					

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs A. Yukawa (JICA)
T. Nambu (JICA)
M. Agir (AQCC)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Tehran refinery 2H-101

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

Measuring Date : 28 . Sep . 1996

Item	Measuring Result	
Flow rate of wet flue gas	364000	m ³ N/h
Flow rate of dry flue gas	319000	m ³ N/h
Temperature of flue gas	429	°C
CO ₂ Concentration	6.5	%
O ₂ Concentration	7.8	%
CO Concentration	20	ppm
Dust Concentration	0.025	g/m ³ N
NO _x Concentration	136	ppm
SO _x Concentration	575	ppm

Measurement of water content in flue gas

Measuring time		12:30 ~ 12:35		12:36 ~ 12:41	
Gas volume (V _m , L)		10.0		10.0	
Gas meter temp. (t _m , °C)		36.9		36.9	
Moisture absorption tube	m.1	108.443	112.329	106.896	108.656
	m.2	107.468	112.329	106.114	108.656
	m.1-m.2	0.975		0.782	
Moisture content (X _w , %)		13.46		11.09	
Mean (X _w , %)		12.3			

Measurement of component in flue gas

Measuring time	12:22
CO ₂ concentration (%)	6.5
O ₂ concentration (%)	7.8
CO concentration (ppm)	20
ρ _o (kgf/m ³)	1.25
Air ratio	1.52

Pa= 672 mmHg

Measurement of dust concentration

Measuring time		15:11 ~ 15:23	15:45 ~ 16:07
Gas meter temp. (°C)		36.4	35.5
Gas volume (Vm, L)		266.1	191.8
Gas volume (Vm', LN)		207.8	149.6
Filter weight	Sampled (md2, g)	0.0982	0.0998
	Unsampled (md1, g)	0.0924	0.0965
Collected dust (md, g)		0.0058	0.0033
Dust concentration (g/m³N)		0.028	0.022
Mean (CN, g/m³N)		0.025	

Flow rate of equal velocity aspiration

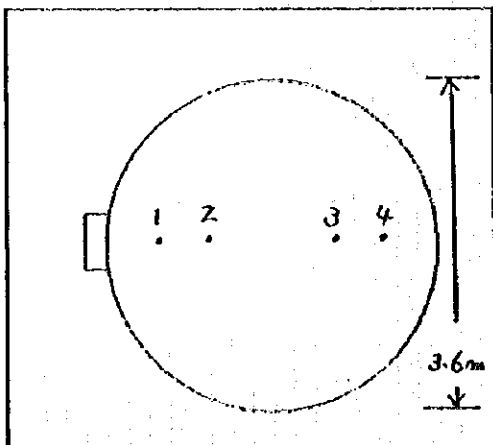
Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	15.8	7		
2	2	10.4	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
14:08	134	545	7.8
14:18	136	565	7.6
14:28	136	575	7.7
14:38	136	582	7.7
14:48	136	580	7.8
14:58	138	591	7.8
15:08	136	590	8.0
Mean	136	576	7.8

Measuring point

Comment



$$A = 10.179 \text{ m}^2$$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark				
1.1	Date / Time	Day 28	Month 9	Year 96	Time	From To
1.2	Weather	Fine				
1.3	Factory name	Tehran refinery 2H-101				
1.4	Location	Qom road-Tehran refinery District Boundry 20				
1.5	Person in charge					
	- Name	Mr. Mohammad Zali				
	- Department					
	- Position	Manager of Tehran refinery				
	- Tel No.	591021-9 591031-9 591041-9				

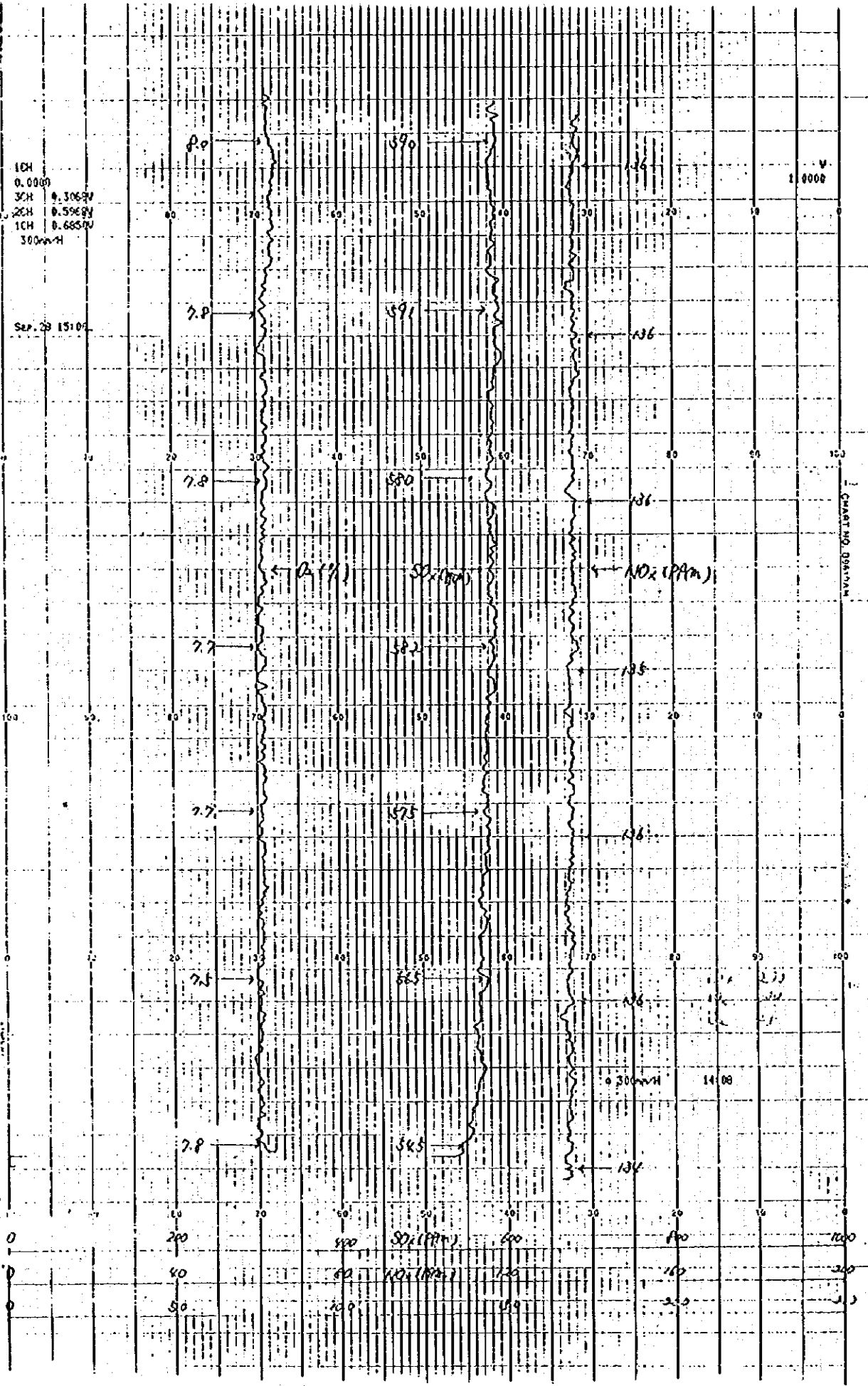
2.0	Special information	Remark				
2.1	Fuel type	Mixture of natural gas & heavy oil				
2.2	Flow rate	284MM Btu/hr				
2.3	Combustion quantity					
2.4	Exhaust Temperature	752° fahrenheit				
2.5	Height of stack	250 ft Diameter of stack = 12ft				
2.6	Others	2H-101 1168372 lb/hr				

1CH 0.0000
 3CH 0.3063V
 2CH 0.5963V
 1CH 0.6857V
 300mmH

V
 1.0000

SEP 29 1510

Charting Diagram



Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs Y. Myoken (JICA)
T. Nambu (JICA)
F. Goodarz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Tehran refinery 2H-151

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

Measuring Date : 29 . Sep . 1996

Item	Measuring Result	
Flow rate of wet flue gas	-	m ³ N/h
Flow rate of dry flue gas	-	m ³ N/h
Temperature of flue gas	-	°C
CO ₂ Concentration	9.5	%
O ₂ Concentration	5.5	%
CO Concentration	5	ppm
Dust Concentration	-	g/m ³ N
NO _x Concentration	129	ppm
SO _x Concentration	396	ppm

Measurement of water content in flue gas

Measuring time		11:36 ~ 11:39		11:46 ~ 11:52	
Gas volume (V _m , L)		10.0		10.0	
Gas meter temp. (t _m , °C)		33.5		33.5	
Moisture absorption tube	m.1	110.442	109.196	108.439	106.319
	m.2	109.611	109.196	107.612	106.319
	m.1-m.2	0.831		0.827	
Moisture content (X _w , %)		12.21		12.16	
Mean (X _w , %)		12.2			

Measurement of component in flue gas

Measuring time	11:30
CO ₂ concentration (%)	9.5
O ₂ concentration (%)	5.5
CO concentration (ppm)	5
ρ _o (kgf/m ³)	1.26
Air ratio	1.32

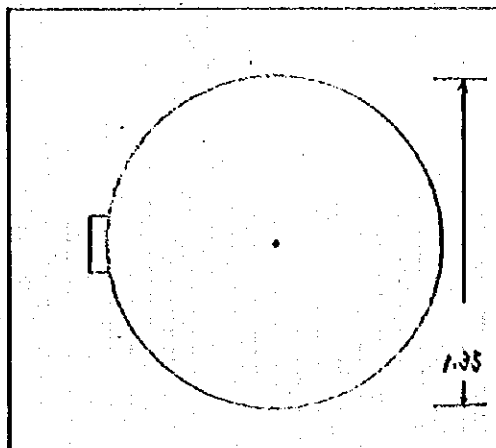
Pa= 672 mmHg

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
13:22	129	367	5.8
13:32	129	387	6.5
13:42	129	390	5.6
13:52	130	400	5.5
14:02	128	410	5.3
14:12	128	410	5.5
14:22	129	410	5.4
Mean	129	396	5.5

Measuring point

Comment



$$A = 5.723 \text{ m}^2$$

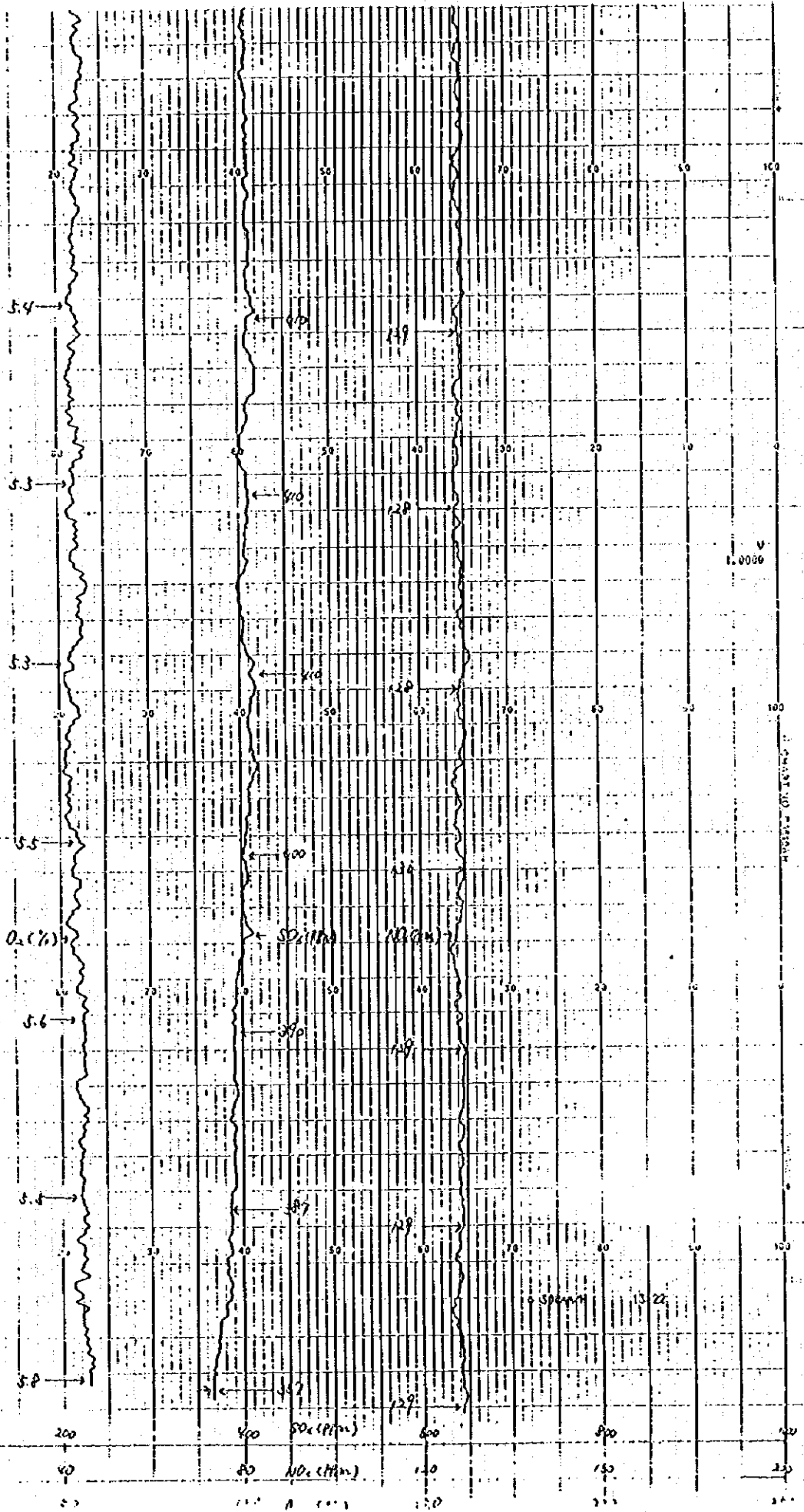
Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 29	Month 9	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Tehran refinery 2H-151					
1.4	Location	Qom road-Tehran refinery-District Bound No20					
1.5	Person in charge						
	- Name	Mr. Mohammad Zali					
	- Department						
	- Position	Manager					
	- Tel No.	591021-9 591031-9 591041-9					

2.0	Special information	Remark					
2.1	Fuel type	Mixture of natural gas & heavy oil					
2.2	Flow rate	160 MMBtu/hr					
2.3	Combustion quantity						
2.4	Exhaust Temperature	857 °F					
2.5	Height of stack	173 ft Diameter of stack = 9 ft					
2.6	Others	2H-151 726962 lb/hr					

1CH 0.0000
 2CH 0.2128V
 3CH 0.4100V
 4CH 0.6462V
 300mV

Sep. 29 14:00



Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T.Nambu (JICA)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Tehran refinery 2H-181

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

Measuring Date : 1 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	66400	m ³ N/h
Flow rate of dry flue gas	59500	m ³ N/h
Temperature of flue gas	446	°C
CO ₂ Concentration	8.0	%
O ₂ Concentration	7.9	%
CO Concentration	30	ppm
Dust Concentration	0.021	g/m ³ N
NO _x Concentration	145	ppm
SO _x Concentration	572	ppm

Measurement of water content in flue gas

Measuring time		11:44 ~ 11:49		11:51 ~ 11:56	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (tm, °C)		33.9		33.9	
Moisture absorption tube	m.1	116.881	107.351	104.434	110.982
	m.2	116.142	107.351	103.694	110.982
	m.1-m.2	0.739		0.741	
Moisture content (Xw, %)		10.43		10.43	
Mean (Xw, %)		10.4			

Measurement of component in flue gas

Measuring time	11:35
CO ₂ concentration (%)	8.0
O ₂ concentration (%)	7.9
CO concentration (ppm)	30
ro (kgf/m ³)	1.27
Air ratio	1.55

Pa= 679 mmHg

Measurement of dust concentration

Measuring time		14:19 ~ 14:49	14:59 ~ 15:30
Gas meter temp. (°C)		32.6	33.7
Gas volume (Vm, L)		261.5	214.6
Gas volume (Vm', LN)		208.2	170.2
Filter weight	Sampled (md2, g)	0.0976	0.1007
	Unsampled (md1, g)	0.0930	0.0974
Collected dust (md, g)		0.0046	0.0033
Dust concentration (g/m³N)		0.022	0.019
Mean (CN, g/m³N)		0.021	

Flow rate of equal velocity aspiration

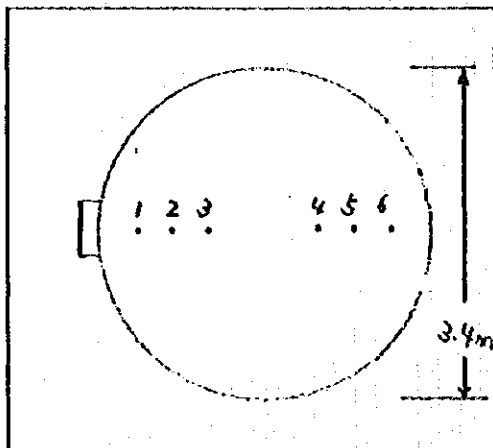
Inner diameter of suction nozzle (d, mm) = 8					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	2	4.5	7		
2	3	9.6	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
11:54	144	565	8.6
12:04	144	565	8.9
12:14	146	570	8.8
12:24	144	570	9.0
12:34	147	580	8.6
12:44	146	583	8.6
12:54	146	570	9.0
Mean	145	572	8.8

Measuring point

Comment



$A = 9.074 \text{ m}^2$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 1	Month 10	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Tehran refinery 2H-181					
1.4	Location	Qom road-Tehran refinery District Boundry 20					
1.5	Person in charge						
	- Name	Mr. Mohammad Zali					
	- Department						
	- Position	Manager of Tehran refinery					
	- Tel No.	591021-9 591031-9 591041-9					

2.0	Special information	Remark					
2.1	Fuel type	Mixture of natural gas & heavy oil					
2.2	Flow rate	42.8M Btu/hr					
2.3	Combustion quantity						
2.4	Exhaust Temperature	853° fahrenheit					
2.5	Height of stack	150 ft Diameter of stack = 1.61m					
2.6	Others	2H-181 309162-lb/hr 17500 BPSD furnacc current					

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs A. Yukawa (JICA)
 T. Nambu (JICA)
 M. Agir (AQCC)
 F. Goodaz (AQCC)
 S. Hossini (AQCC)
 M. Magidi (ORUSUITO)

Factory / Facility Name: Tehran refinery Steam boiler

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

Measuring Date : 2 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	118200	m^3_N/h
Flow rate of dry flue gas	105000	m^3_N/h
Temperature of flue gas	426	°C
CO ₂ Concentration	12.0	%
O ₂ Concentration	4.3	%
CO Concentration	N D	ppm
Dust Concentration	0.023	g/m^3_N
NO _x Concentration	208	ppm
SO _x Concentration	> 1000	ppm

Measurement of water content in flue gas

Measuring time		10:25 ~ 10:29		10:31 ~ 10:35	
Gas volume (V _m , L)		10.0		10.0	
Gas meter temp. (t _m , °C)		30.9		30.9	
Moisture absorption tube	m.1	108.473	108.491	114.105	108.263
	m.2	107.650	108.491	113.325	108.263
	m.1-m.2	0.843		0.788	
Moisture content (X _w , %)		11.47		10.80	
Mean (X _w , %)		11.1			

Measurement of component in flue gas

Measuring time	10:22
CO ₂ concentration (%)	12.0
O ₂ concentration (%)	4.3
CO concentration (ppm)	N D
ρ _o (kgf/m ³)	1.28
Air ratio	1.24

Pa= 683 mmHg

Measurement of dust concentration

Measuring time		14:40 ~ 14:55	15:02 ~ 15:18
Gas meter temp. (°C)		37.0	39.2
Gas volume (V _m , L)		169.8	234.4
Gas volume (V _m ['] , L _N)		133.7	183.1
Filter weight	Sampled (m _{d2} , g)	0.1011	0.0989
	Unsampled (m _{d1} , g)	0.0975	0.0955
Collected dust (m _d , g)		0.0036	0.0034
Dust concentration (g/m ³ _N)		0.027	0.019
Mean (C _N , g/m ³ _N)		0.023	

Flow rate of equal velocity aspiration

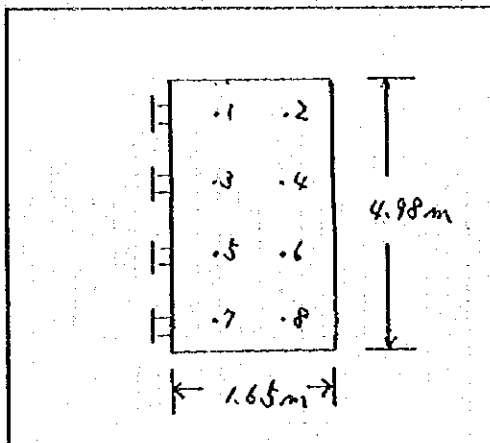
Inner diameter of suction nozzle (d, mm) = 8					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	5	17.8	7		
2	6	8.6	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NOx, SOx and O₂

Sampling Time	NOx (ppm)	SOx (ppm)	O ₂ (%)
12:03	205	> 1000	5.8
12:13	205	> 1000	5.9
12:23	206	> 1000	5.9
12:33	207	> 1000	5.8
12:43	210	> 1000	5.3
12:53	210	> 1000	5.1
13:03	210	> 1000	5.3
Mean	208	> 1000	5.6

Measuring point

Comment



Concentration of SOx was exceeded a upper limit (1000ppm) of the analyzer.

$$A = 8.217 \text{ m}^2$$

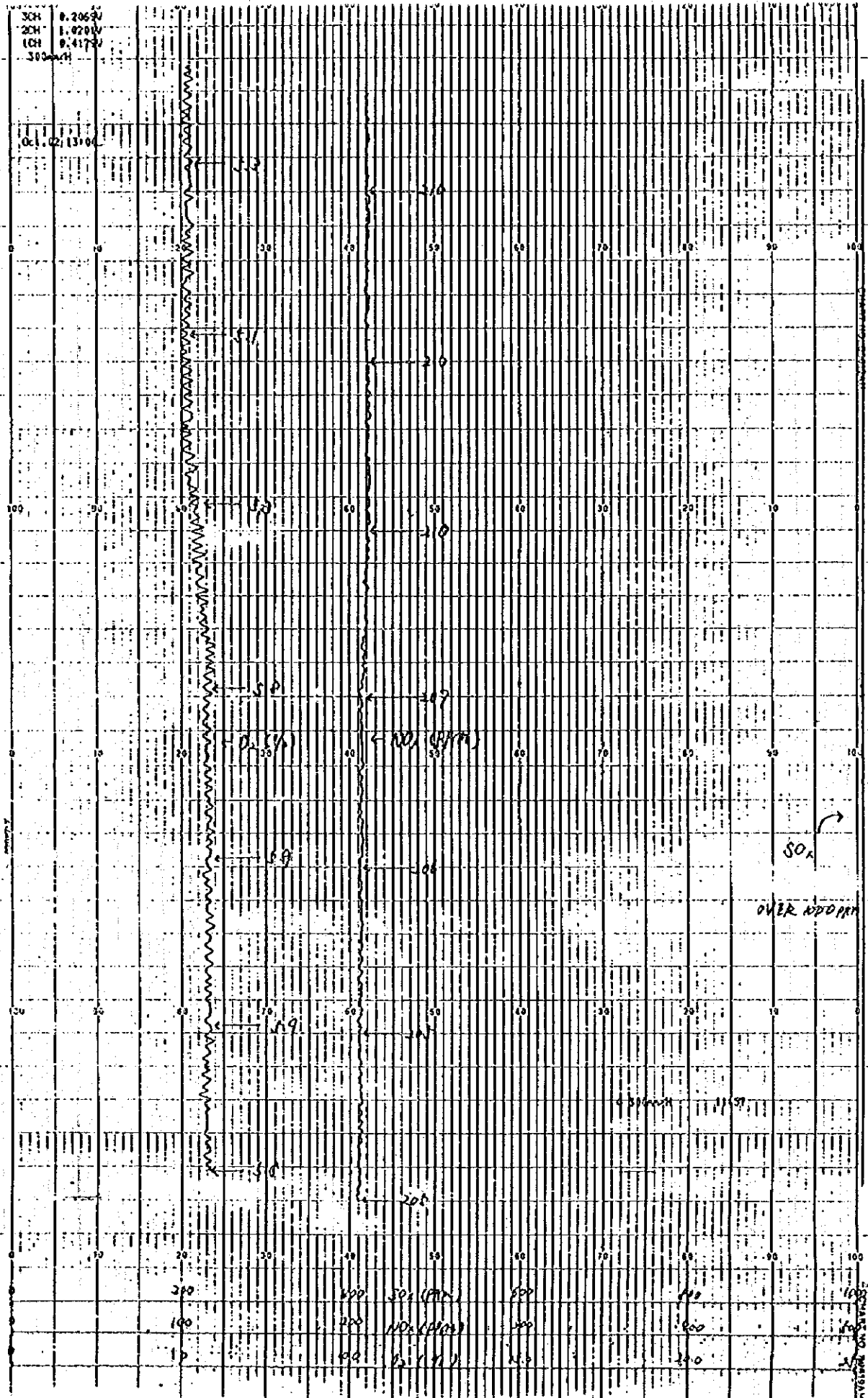
Fuel Combustion Analysis Work Sheet

1.0	General information	Remark				
1.1	Date / Time	Day 2	Month 10	Year 96	Time	From To
1.2	Weather	Fine				
1.3	Factory name	Tehran refinery Steam boiler				
1.4	Location	Qom road-Tehran refinery District Boundry 20				
1.5	Person in charge					
	- Name	Mr. Mohammad Zali				
	- Department					
	- Position	Manager of Tehran refinery				
	- Tel No.	691021-9 591031-9 591041-9				

2.0	Special information	Remark
2.1	Fuel type	Mixture of natural gas & heavy oil
2.2	Flow rate	25160 lb/hr Design based on oil
2.3	Combustion quantity	665-700 ^o F
2.4	Exhaust Temperature	752 ^o fahrenheit
2.5	Height of stack	250 ft Inner diameter of stack 10 ft
2.6	Others	fuel oil : LHU 17000 Btu/lb

3CH 0.2063V
 2CH 1.0201V
 1CH 0.4173V
 300mV

Oct. 2, 1964



Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T.Nambu (JICA)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Cement factory No. 4

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

Measuring Date : 8 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	258000	m ³ N/h
Flow rate of dry flue gas	214000	m ³ N/h
Temperature of flue gas	148	°C
CO ₂ Concentration	10.6	%
O ₂ Concentration	11.3	%
CO Concentration	0.4	%
Dust Concentration	0.49	g/m ³ N
NO _x Concentration	274	ppm
SO _x Concentration	5	ppm

Measurement of water content in flue gas

Measuring time		10:37 ~ 10:41		10:43 ~ 10:48	
Gas volume	(V _m , L)	10.0		10.0	
Gas meter temp.	(T _m , °C)	22.1		22.2	
Moisture absorption tube	m ₁	109.205	109.054	110.004	114.405
	m ₂	107.965	109.054	108.537	114.400
	m ₁ -m ₂	1.248		1.472	
Moisture content	(X _w , %)	15.92		18.26	
Mean	(X _w , %)	17.1			

Measurement of component in flue gas

Measuring time	10:30
CO ₂ concentration (%)	10.6
O ₂ concentration (%)	11.3
CO concentration (%)	0.4
ρ _o (kgf/m ³)	1.25
Air ratio	2.19

P_a= 671 mmHg

Measurement of dust concentration

Measuring time		13:22 ~ 13:48	13:49 ~ 14:03
Gas meter temp. (°C)		32.7	36.5
Gas volume (V _m , L)		330.5	150.1
Gas volume (V _{m'} , L _N)		259.6	116.3
Filter weight	Sampled (m _{d2} , g)	0.2176	0.1582
	Unsampled (m _{d1} , g)	0.0982	0.0985
Collected dust (m _d , g)		0.1194	0.0597
Dust concentration (g/m ³ _N)		0.46	0.51
Mean (C _N , g/m ³ _N)		0.49	

Flow rate of equal velocity aspiration

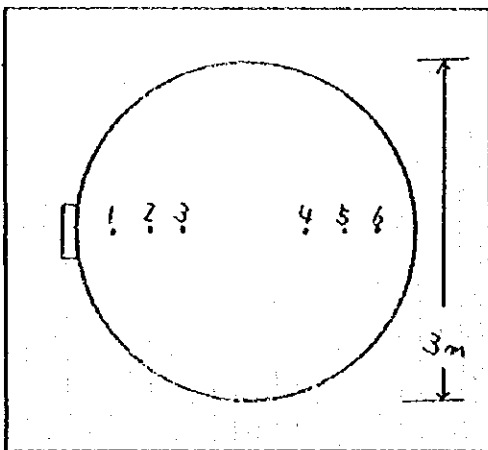
Inner diameter of suction nozzle (d, mm) = 6					
No.	Point	Flow rate (L/min)	No.	Point	Flow rate (L/min)
1	1	16.0	7		
2	2	16.3	8		
3	3	16.9	9		
4			10		
5			11		
6			12		

Measurement of NOx, SOx and O₂

Sampling Time	NOx (ppm)	SOx (ppm)	O ₂ (%)
11:05	235	4	12.1
11:15	235	5	11.3
11:25	243	5	11.8
11:35	270	5	11.8
11:45	330	6	10.3
11:55	318	6	10.4
12:05	290	5	12.0
Mean	274	5	11.4

Measuring point

Comment

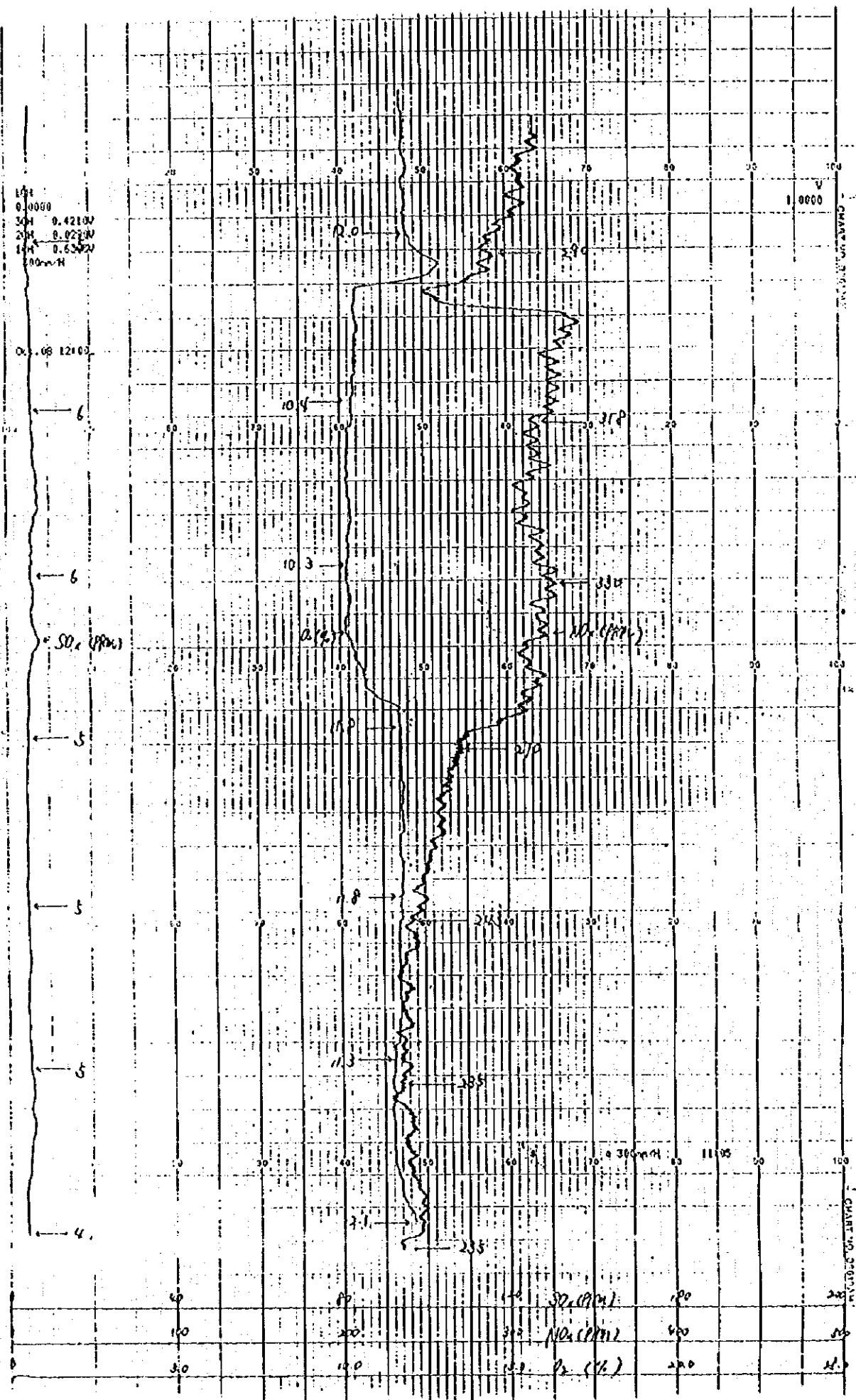


$A = 7.069 \text{ m}^2$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 8	Month 10	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Cement factory No4					
1.4	Location	Khavaran road-Tehran Cement factory district 15					
1.5	Person in charge						
	- Name	Mr. Heidari					
	- Department						
	- Position	Manager					
	- Tel No.	592021-9					

2.0	Special information	Remark					
2.1	Fuel type	Natural gas or Mixture of NG & heavyoil					
2.2	Flow rate	NG: 166203m ³ /d & RO: 384000L/d					
2.3	Combustion quantity	130°C (Dry)					
2.4	Exhaust Temperature						
2.5	Height of stack	45m (Diameter of stack = 3m)					
2.6	Others	No of personnel in total 2000					



1/4" = 10000'
 0.0000
 3/4" = 0.42100
 2 1/4" = 0.02200
 1 1/4" = 0.65000
 100mm/H

0.08 121.00
 ← 6
 ← 6
 ← SD (PPM)
 ← 5
 ← 5
 ← 5
 ← 4

20 100 200 300 400 500 600 700 800 900 1000
 SD (PPM) 100 200
 NO (PPM) 400 600
 P (1/2) 200 400

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Cement factory No5

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

Measuring Date : 6 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	74200	m ³ N/h
Flow rate of dry flue gas	67200	m ³ N/h
Temperature of flue gas	188	°C
CO ₂ Concentration	10.0	%
O ₂ Concentration	10.4	%
CO Concentration	N D	ppm
Dust Concentration	0.009	g/m ³ N
NO _x Concentration	192	ppm
SO _x Concentration	1 >	ppm

Measurement of water content in flue gas

Measuring time		11:08 ~ 11:11		11:14 ~ 11:19	
Gas volume (V _m , L)		10.0		10.0	
Gas meter temp. (t _m , °C)		25.0		25.2	
Moisture absorption tube	m.1	108.631	109.046	109.332	108.537
	m.2	107.965	109.046	108.628	108.537
	m.1-m.2	0.666		0.704	
Moisture content (X _w , %)		9.28		9.76	
Mean (X _w , %)		9.5			

Measurement of component in flue gas

Measuring time	11:03
CO ₂ concentration (%)	10.0
O ₂ concentration (%)	10.4
CO concentration (ppm)	N D
ρ _o (kgf/m ³)	1.29
Air ratio	1.97

Pa= 669 mmHg

Measurement of dust concentration

Measuring time		13:20 ~ 13:38	13:59 ~ 14:30
Gas meter temp. (°C)		27.3	24.8
Gas volume (V _m , L)		342.3	364.1
Gas volume (V _m ⁰ , L _N)		274.5	293.6
Filter weight	Sampled (m _{d2} , g)	0.0943	0.1002
	Unsampled (m _{d1} , g)	0.0917	0.0977
Collected dust (m _d , g)		0.0026	0.0025
Dust concentration (g/m ³ _N)		0.009	0.009
Mean (C _N , g/m ³ _N)		0.009	

Flow rate of equal velocity aspiration

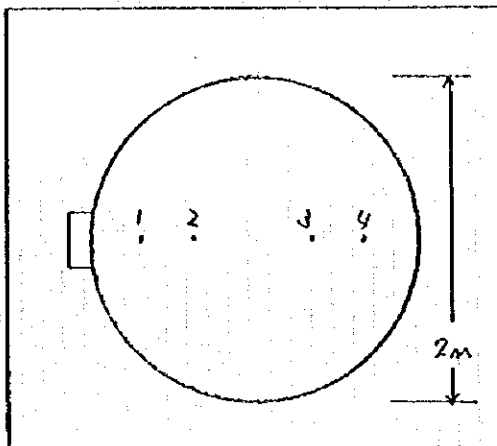
Inner diameter of suction nozzle (d, mm) = 6					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	12.3	7		
2	2	11.1	8		
3			9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
11:50	215	0	11.3
11:44	193	0	11.3
11:54	173	0	11.3
12:04	175	0	11.3
12:14	185	0	11.5
12:24	200	0	11.5
12:34	205	0	11.3
Mean	192	1 >	11.4

Measuring point

Comment



$$A = 3.142 \text{ m}^2$$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 6	Month 10	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Cement factory No5					
1.4	Location	Khavaran road-Tehran Cement factory district 15					
1.5	Person in charge						
	- Name	Mr. Heidari					
	- Department						
	- Position	Manager					
	- Tel No.	592021-9					

2.0	Special information	Remark					
2.1	Fuel type	Natural gas or Mixture of NG & heavyoil					
2.2	Flow rate	NG:58500m ³ /d & HO:5400L/d					
2.3	Combustion quantity						
2.4	Exhaust Temperature	180-200(wet)					
2.5	Height of stack	Diameter of stack = 2.0 m					
2.6	Others						

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T.Nambu (JICA)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Cement factory No.6

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

Measuring Date : 9 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	577000	m ³ N/h
Flow rate of dry flue gas	505000	m ³ N/h
Temperature of flue gas	128	°C
CO ₂ Concentration	11.0	%
O ₂ Concentration	12.6	%
CO Concentration	10	ppm
Dust Concentration	0.51	g/m ³ N
NO _x Concentration	319	ppm
SO _x Concentration	1 >	ppm

Measurement of water content in flue gas

Measuring time		10:22 ~ 10:25		10:26 ~ 10:31	
Gas volume (Vm, L)		10.0		10.0	
Gas meter temp. (tm, °C)		23.4		24.7	
Moisture absorption tube	m ₁	113.023	109.054	109.505	110.621
	m ₂	112.014	109.054	108.654	110.621
	m ₁ -m ₂	1.009		0.851	
Moisture content (Xw, %)		13.28		11.56	
Mean (Xw, %)		12.4			

Measurement of component in flue gas

Measuring time	10:18
CO ₂ concentration (%)	11.0
O ₂ concentration (%)	10.6
CO concentration (ppm)	10
ρ _o (kgf/m ³)	1.28
Air ratio	2.03

Pa= 671 mmHg

Measurement of velocity

Measuring time 13:22 ~ 13:45			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m ³)	Dt (°C)	V (m/s)
1	9.4	-15	0.768	128	13.2
2	10.1	-15	0.768	128	13.6
3	9.4	-15	0.768	128	13.2
4	10.3	-15	0.768	128	14.4
5	11.4	-15	0.768	128	14.5
6	14.4	-15	0.768	128	16.3
7	6.4	-15	0.768	128	10.9
8	7.2	-15	0.768	128	11.5
9	8.0	-15	0.768	128	12.1
10	9.7	-15	0.768	128	13.4
11	10.4	-15	0.768	128	13.8
12	14.2	-15	0.768	128	16.2
	Mean	-15	0.768	128	13.6

Measurement of dust concentration

Measuring time		10:57 ~ 11:05	11:16 ~ 11:23
Gas meter temp. (°C)		27.1	27.7
Gas volume (V _m , L)		79.7	88.8
Gas volume (V _m ['] , L _N)		64.0	71.1
Filter weight	Sampled (md2, g)	0.1283	0.1367
	Unsampled (md1, g)	0.0982	0.0984
Collected dust (md, g)		0.0301	0.0383
Dust concentration (g/m ³ _N)		0.47	0.54
Mean (C _N , g/m ³ _N)		0.51	

Flow rate of equal velocity aspiration

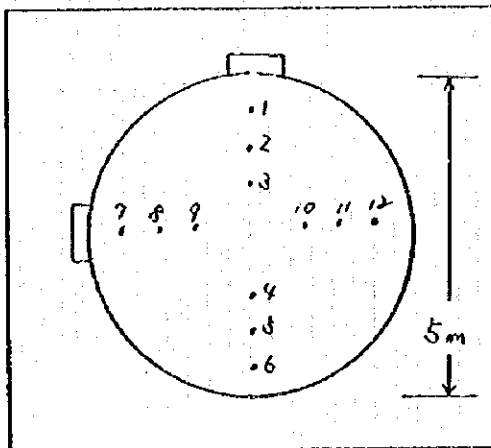
Inner diameter of suction nozzle (d, mm) = 6					
No.	Point	Flow rate (L/min)	No.	Point	Flow rate (L/min)
1	1	14.6	7		
2	2	15.2	8		
3	3	14.6	9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
11:46	325	0	13.0
11:56	340	0	13.3
12:06	365	0	13.3
12:16	300	0	13.0
12:26	325	0	13.3
12:36	245	0	13.0
12:46	335	0	13.3
Mean	319	0	13.2

Measuring point

Comment

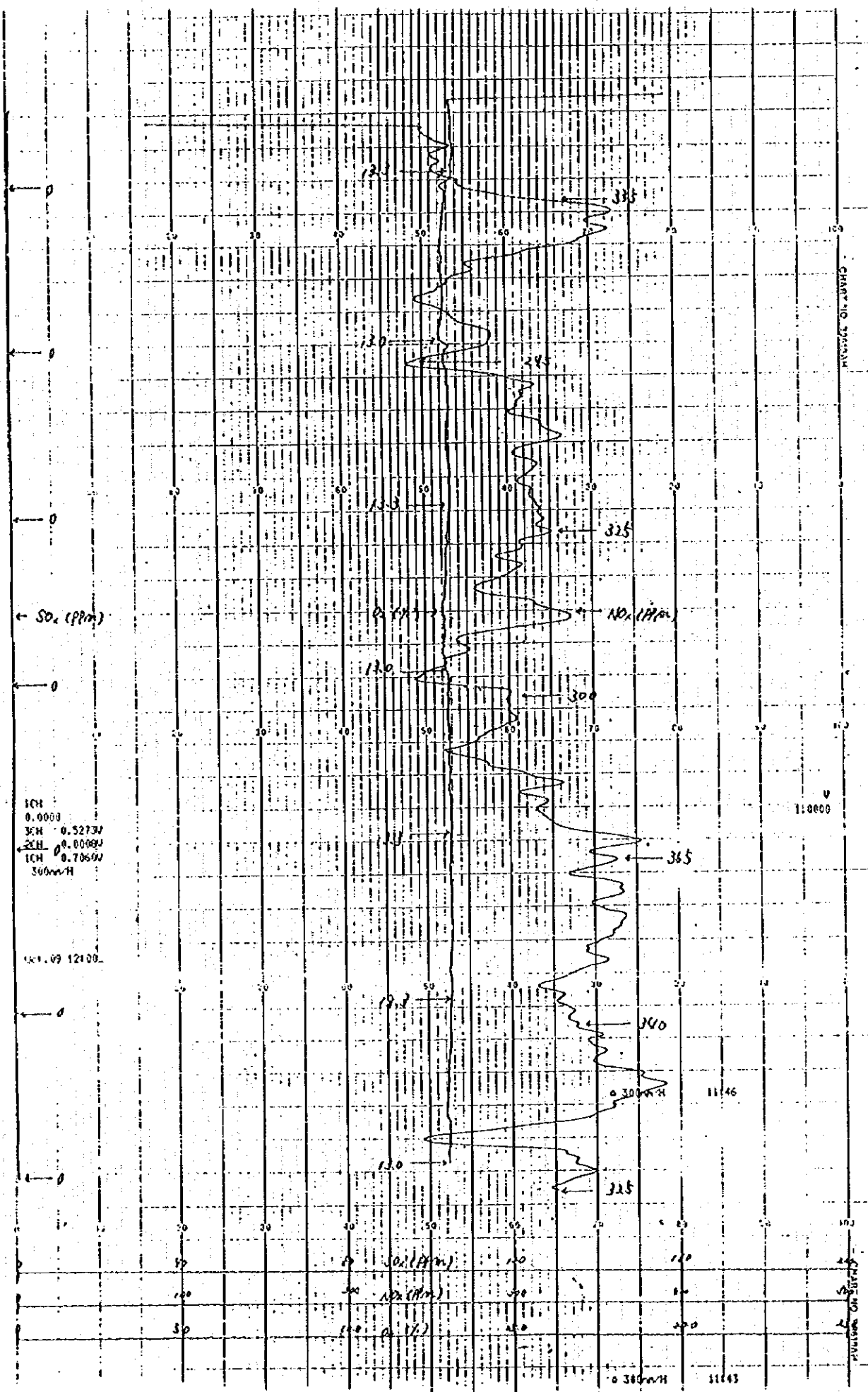


$A = 19.635 \text{ m}^2$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 9	Month 10	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Cement factory No6					
1.4	Location	Khavaran road-Tehran Cement factory district 15					
1.5	Person in charge						
	- Name	Mr. Heidari					
	- Department						
	- Position	Manager					
	- Tel No.	592021-9					

2.0	Special information	Remark					
2.1	Fuel type	Natural gas or Mixture of NG & heavyoil					
2.2	Flow rate	NG:352161m ³ /d & HO:216000L/d					
2.3	Combustion quantity	130°C (Dry)					
2.4	Exhaust Temperature						
2.5	Height of stack	80m (Diameter of stack = 5m)					
2.6	Others	No of personnel in total 2000					



1CH 0.0000
 3CH 0.52737
 2CH 0.00000
 1CH 0.70600
 300m-H

1:10000

SO. (PPM)
 NO. (PPM)
 300m-H

CHART 10, 251000

CHART 10, 251000

Analyzed Data Sheet for Stationary Emission Sources

Analyzer : Messrs T. Nambu (JICA)
M. Agir (AQCC)
F. Goodaz (AQCC)
S. Hossini (AQCC)
M. Magidi (ORUSUITO)

Factory / Facility Name: Cement factory No.7

Address / Location : Moshirieh-Cement Co-District15

Measuring Date : 5 . Oct . 1996

Item	Measuring Result	
Flow rate of wet flue gas	369000	m ³ /h
Flow rate of dry flue gas	330000	m ³ /h
Temperature of flue gas	115	°C
CO ₂ Concentration	6.1	%
O ₂ Concentration	14.6	%
CO Concentration	30	ppm
Dust Concentration	0.026	g/m ³
NO _x Concentration	300	ppm
SO _x Concentration	1 >	ppm

Measurement of water content in flue gas

Measuring time		10:58 ~ 11:03		11:06 ~ 11:11	
Gas volume	(Vm, L)	10.0		10.0	
Gas meter temp.	(tm, °C)	21.0		21.1	
Moisture absorption tube	m.1	108.278	108.851	110.018	107.793
	m.2	107.540	108.851	109.255	107.793
	m.1-m.2	0.738		0.763	
Moisture content	(Xw, %)	10.07		10.38	
Mean	(Xw, %)	10.2			

Measurement of component in flue gas

Measuring time	10:53
CO ₂ concentration (%)	6.1
O ₂ concentration (%)	14.6
CO concentration (ppm)	30
ρ _o (kgf/m ³)	1.27
Air ratio	3.26

Pa= 666 mmHg

Measurement of velocity

Measuring time 13:55 ~ 14:18			Pitot tube coefficient = 0.850		
Point	h (mmAq)	Ps (mmAq)	r (kgf/m ³)	Dt (°C)	V (m/s)
1	38.4	-23	0.784	115	26.3
2	44.2	-23	0.784	115	28.3
3	43.1	-23	0.784	115	27.9
4	5.0	-23	0.784	115	9.5
5	1.2	-23	0.784	115	4.7
6	1.4	-23	0.784	115	5.0
7	12.6	-23	0.784	115	15.1
8	15.0	-23	0.784	115	16.5
9	15.0	-23	0.784	115	16.5
10	15.5	-23	0.784	115	16.7
11	22.0	-23	0.784	115	19.9
12	25.5	-23	0.784	115	21.5
	Mean	-23	0.784	115	17.3

Measurement of dust concentration

Measuring time		13:55 ~ 14:18	14:38 ~ 14:48
Gas meter temp. (°C)		22.6	33.1
Gas volume (V _m , L)		206.2	159.4
Gas volume (V _m ⁿ , L _N)		106.7	128.6
Filter weight	Sampled (m _{d2} , g)	0.1013	0.0966
	Unsampled (m _{d1} , g)	0.0981	0.0925
Collected dust (m _d , g)		0.0032	0.0041
Dust concentration (g/m ³ _N)		0.019	0.032
Mean (C _N , g/m ³ _N)		0.026	

Flow rate of equal velocity aspiration

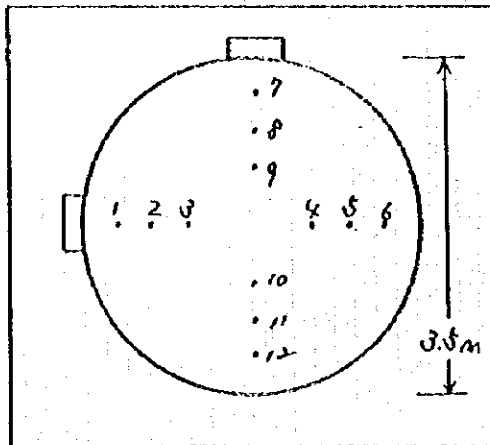
Inner diameter of suction nozzle (d, mm) = 4					
No	Point	Flow rate (L/min)	No	Point	Flow rate (L/min)
1	1	13.7	7		
2	2	14.6	8		
3	3	14.4	9		
4			10		
5			11		
6			12		

Measurement of NO_x, SO_x and O₂

Sampling Time	NO _x (ppm)	SO _x (ppm)	O ₂ (%)
11:34	300	0	14.3
11:44	315	0	14.3
11:54	318	0	14.3
12:04	310	0	14.1
12:14	285	0	14.1
12:24	280	0	14.3
12:34	290	0	14.3
Mean	300	1 >	14.2

Measuring point

Comment



$A = 9.621 \text{ m}^2$

Fuel Combustion Analysis Work Sheet

1.0	General information	Remark					
1.1	Date / Time	Day 5	Month 10	Year 96	Time	From	To
1.2	Weather	Fine					
1.3	Factory name	Cement factory No7					
1.4	Location	Moshirieh-Cement Co-District 15					
1.5	Person in charge						
	- Name	Mr. Heidari					
	- Department						
	- Position	Manager					
	- Tel No.	3705164					

2.0	Special information	Remark					
2.1	Fuel type	Natural gas or Mixture of NG & heavyoil					
2.2	Flow rate	8000 m ³ /day or 8000 L/day					
2.3	Combustion quantity						
2.4	Exhaust Temperature	150 ~ 180 °C					
2.5	Height of stack	80m (Diameter of stack = 3.5m)					
2.6	Others						

