No. 64	Date of Visit	July 2, 1990

Name of Establishment	3M DE MEXICO, S.A.		
Type of Industry (Product)	Others (sand paper, adhesive tape, sponge brush)		
Scale of Factory	Large	Number of Employees	700
Annual Sales or Production	300,000,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (175.65 pesos/l) 240,000 l/mon 42,156,000 pesos/mon		

Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	12 ton/hr	Heavy oil (L)	330 l/hr		
Smoke tube boiler	9 ton/hr	Heavy oil (L)			Spare

Outline of the Facility Surveyed		Smoke tube boiler		12 ton/hr (steam)
Evaporation rate	:	Rating : 12 ton/hr	Normal : 4 ton/hr	
Steam pressure	:	16 kg/cm^{2}g		
Fuel consumption	:	Rating : 1,000 l/hr	Normal : 330 l/hr	
Fuel pressure	:	2 kg/cm^{2}g	Temperautre : 100 - 115°C	
Atomizing steam pressure	:	1.5 kg/cm^{2}g	Temperature : saturated	
Combustion air temperature	:	Normal		
Combustion exhaust gas composition	:	O_2 - 6.5%,	CO_2 - 12% (as measured by the plant)	
Combustion exhaust gas temperature	:	250 - 290°C	(as measured by the plant)	
Stack	:	0.35 mφ x 8 m		
Operating time	:	24 hr/day,	168 hr/week	

* Additives used in heavy oil (to prevent clogging of nozzle)
* Relocation of the plant planned

Outline of Survey Result

Present pollution control measures	:	Use of non-dispersive solvent, change of organic solvent to water
Future plan for pollution control	:	Installation of oxidizer, relocation plan of a part of process
Present energy-saving measures	:	None

1. The boiler is used as heat source of drying products. Treatment and measures against solvent vapor are not satisfactory. Transfer of a part of facilities to suburbs and installation of the catalyst deodorizer are being planned.

2. The exhaust gas O_2 content of 9.8% indicates excess air combustion. The Bacharach value of No.4 is relatively good for heavy oil burning. The exhaust gas temperature was 243°C and the boiler efficiency 80%. It is advised to operate at the further reduced air-fuel ratio.

No. 65	Date of Visit	July 3, 1990

Name of Establishment	ANDERSON CLAYTON & COMPANY				
Type of Industry (Product)	Food (cooking oil, pasta, shortening)				
Scale of Factory	Large		Number of Employees		1,200
Annual Sales or Production	200,000,000,000 pesos/yr		932,000 ton/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) 1,450.1 kl/mon (175.65 pesos/l) 254,710,065 pesos/mon Diesel 75.7 kl/mon (478.26 pesos/l) 36,204,282 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Water tube boiler	45.4 ton/hr	Heavy oil (L)	2,000 l/hr	15	Alternate use
2. Water tube boiler	45.4 ton/hr	Heavy oil (L)	2,000 l/hr	15	Alternate use
3. Heat medium boiler	504,000 kcal/hr	Diesel	58.8 l/hr	10	
4. Heat medium boiler	504,000 kdal/hr	Diesel	58.8 l/hr	10	

Outline of the Facility Surveyed		Water tube boiler	45.4 ton/he (steam)
Evaporation rate	:	Rating : 45.4 ton/hr	Normal : 36.1 ton/hr
Fuel consumption	:	Normal 2,000 l/hr	
Steam pressure	:	13 kg/cm^2g	Temperature : 190°c
Fuel pressure	:	6 - 14 kg/cm^2g	Temperature: 96°C
Atomizing steam pressure	:	10.5 kg/cm^2g	
Combustion air temperature	:	90°C	
Combustion exhaust gas composition	:	O_2 - 5.5%, CO_2 - 11.0%, CO - 2.2% (as measured by the plant)	
Temperature	:	210°C (as measured by the plant)	
Stqck	:	1.5 mφ x 15 m	
Operating time	:	24 hr/day, 168 hr/week	

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	

1. This boiler uses heavy oil, but both the fuel pressure and atomizing pressure are high, with the Bacharach value at No. 6.

2. The exhaust gas measurement result is as follows:
   Recuperator inlet : O_2 - 6.0%, Temperature - 240 °C
   Recuperator outlit : O_2 - 12.5%, Temperature - 136 °C

   As the O_2 content increased substantially at the outlet, the combustion air may be leaking into the exhaust gas inside the recuperator.

No. 66	Date of Visit	July 3, 1990

Name of Establishment	ESMALTES Y COLORANTES, S.A.				
Type of Industry (Product)	Non-metallic mineral product (glazing for tile, pigment)				
Scale of Factory	Small	Number of Employees		68	
Annual Sales or Production	13,900,000,000 pesos/yr				
Kind of Fuel, Consumption and Price	Natural gas 200,000 m^3/mon (211 pesos/m^3) 42,200,000 pesos/mon Butane gas 25,000 l/mon (208 pesos/l) 5,200,000 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Melting furnace	0.42 ton/hr	Natural gas	139 m^3/hr	3	glass
2. Melting furnace	0.42 ton/hr	Natural gas	139 m^3/hr	5	glass
3. Drying furnace		Butane gas	25 kl/mon	3	Pigment
4. Spray type dryer		Butane bas		*	Pigment
5. Baking furnace	200 kg/charge	Butane bas		3	Pigment
			* under testing		

Outline of the Facility Surveyed		Melting furnace 0.42 ton/hr (glass)
Rating	:	0.42 ton/hr (glass)
Fuel consumption	:	Rating : 139 m^3/hr Normal : 125 m^3/hr
Temperature of object to be heated	:	800 - 1,200 °C
Combustion air temperautre	:	Normal
Stack	:	0.6 mφ x 10 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	Fuel changed to natural gas
Future plan for pollution control	:	To be moved in three years
Present energy-saving measures	:	None

1. This furnace has natural gas burners, three on each side and one on an opposite side. The exhaust gas temperature was 1,200°C and installation of a recuperator is recommended.

2. The site of the furnace is too narrow, making energy saving measure difficult. Besides, the pigment plant is in a distance. Transfer to a new integrated plant is scheduled in three years.

No. 67	Date of Visit	July 3, 1990

Name of Establishment	ACEITES Y JABONES, S.A.				
Type of Industry (Product)	Chemical (plant oil, soap)				
Scale of Factory	Small		Number of Employees		75
Annual Sales or Production	24,500,000,000 pesos/yr				
Kind of Fuel, Consumption and Price	Heavy oil (L) (192.6 pesos/l) 3,085,700 l/mon 594,000,000 pesos/mon Diesel (495.26 pesos/l) 432,000 l/mon 198,000,000 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Water tube boiler	3.8 ton/hr	Heavy oil (L)	208 l/hr	20	Brick laid
Water tube boiler	2.6 ton/hr	Heavy oil (L)		15	Spare
Heat medium boiler		Diesel	175 l/hr	20	

Outline of the Facility Surveyed		Water tube boiler 3.8 ton/hr (steam)
Evaporation rate	:	Rating : 3.8 ton/hr Normal : 3.0 ton/hr
Steam pressure	:	11.3 kg/cm^{2}g
Fuel consumption	:	Rating : 260 l/hr Normal : 208 l/hr
Fuel pressure	:	10 kg/cm^{2}g Temperature : 110°C
Atomizing steam pressure	:	Saturated steam temeprature
Combustion air pressure	:	Induced draft Temperature : Normal
Stack	:	0.5 mϕ x 15 m
Operating time	:	24 hr/day, 144 hr/week

Outline of Survey Result		
Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is a relatively small plant producing plant oil and washing soap. Solid soaps are dried and cooled in air.

2. The exhaust gas O_2 content was 8.8%, indicating excess air combustion. The Bacharach value was No. 3 to 4, generally satisfactory for heavy oil burning.
   The flame state was not so satisfactory with large amount of unburnt fuel particles. The exhaust gas temperature was high at 328°C, resulting in poor boiler efficiency at 76%. Operation with reduced air-fuel ratio is advisable.

No. 68	Date of Visit	July 3 1990

Name of Establishment	VIDRIERA ORIENTAL, S.A. DE C.V.				
Type of Industry (Product)	Non-metallic mineral product (glass bottle, crystal glass, umber glass)				
Scale of Factory	Large		Number of Employees		
Annual Sales or Production					
Kind of Fuel, Consumption and Price	Heavy oil (175.65 pesos/l), 1,710,000 l/mon 300,000,.000 pesos/mon L.P.G. (180.36 pesos/l), 450,000 l/mon 81,200,000 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Glass melting furnace tank oven	12 ton/hr	Heavy oil (L)	1,350 l/hr	6	Cullet 55%
Glass melting furnace tank oven	12 ton/hr	Heavy oil (L)	1,350 l/hr	4	Cullet 55%
Glass melting furnace tank oven		Heavy oil (L)		0	Under repair
Glass annealing furnace		L.P.G.	625 l/hr		

Outline of the Facility Surveyed		Glass melting furnace tank oven (glass)
Capacity of facility	:	12 ton/hr (glass) Unit consumption: 125 l/ton (glass)
Fuel consumption	:	1,350 l/hr Glass melting temeprature : 1,500°C
Fuel pressure	:	1.6 kg/cm^{2}g Temperature : 160°c
Atomizing air pressure	:	1.5 kg/cm^{2}g Temperature : Normal
Combustion air temperature	:	650°C
Combustion exhaust gas composition	:	O_2 - 11.2%, CO_2 - 7.9% (as measured by the plant)
Combustion exhaust gas temperature	:	Recuperator inlet : 1,500°C outlet : 985°C (as measured by the plant)
Stack	:	1.72 mφ x 78 m
Operating time	:	24 hr/day, 168 hr/week

* Waste heat boiler will be installed in future for independent power generation.

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	Heavy oil changed to natural gas, injection of ammonia as necessary
Present energy-saving measures	:	No particular measure except a small recuperator

1. This is a leading manufacturer producing glass bottles. The technology was introduced from Germany. This is the only glass plant which uses heavy oil within the metropolitan area. They intend to install a waste heat boiler for effective utilization of exhaust gas for power generation.

2. The exhaust gas O_2 content was 1.3%, with a considerably low excess air level. The exhaust gas temperature was as high as 985°C due to lack of regenerative recuperator, with the furnace efficiency low at around 58%.

3. The fuel consumption per unit production was 1.2 million kcal/ton.

No. 69	Date of Visit	July 4, 1990

Name of Establishment	TERMOELECTRICA DEL VALLE DE MEXICO		
Type of Industry (Product)	Electric power		
Scale of Factory	Large	Number of Employees	
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Natural gas, 97,161,000 m^3/mon Heavy oil, 29,172,000 l/mon		

Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Water tube boiler (No.1)	476 ton/hr	Natural gas Heavy oil	1,717 m^3/hr 1,950 kg/hr	27	Tangential layout
Water tube boiler (No.2)	503.5 ton/hr	Natural gas Heavy oil	1,998 m^3/hr 2,450 kg/hr	19	Tangential layout
Water tube boiler (No.3)	503.5 ton/hr	Natural gas Heavy oil	1,959 m^3/hr 2,000 kg/hr	20	Tangential layout
Water tube boiler (No.4)	900 ton/hr	Natural gas Heavy oil	5,600 m^3/hr 3,125 kg/hr	16	Front layout

Outline of the Facility Surveyed		Water tube boiler 900 ton/hr (steam)
Fuel consumption	Rating	: Natural gas - 5,600 m^3/hr, Heavy oil - 5,000 kg/hr
	Normal	: Natural gas - 5,600 m^3/hr, Heavy oil - 23,125 kg/hr
Steam pressure		: 174 kg/cm^2g Temperature : 540°C
Fuel pressure		: 20 kg/cm^2g Temperature : 130°C
Atomizing steam pressure		: 20.5 kg/cm^2g
Combustion air pressure		: 670 mmAq Temperature : 288°C
Combustion exhaust gas composition		: O_2 1-2% (as measured in plant)
Combustion exhaust gas temperature		: Recuperator inlet : 390°C outlet : 160°C (as measured by the plant)
Stack		: Length 10.8 m x width 3.6 m x height 52 m
Operating time		: 24 hr/day, 168 hr/week

* Number of burners: 20 pcs for No.1, 32 pcs for No.2, 32 pcs for No.3, 15 pcs for No.4

Outline of Survey Result

Present pollution control measures	:	Currently operated with 80% natural gas and 20% heavy oil, with occasional shift of the percentages up to 50-50.
Future plan for pollution control	:	Installation of low NOx burner planned
Present energy-saving measures	:	Recuperator, economizer, and superheater provided to all boilers

1. This thermal power plant has a capacity of 766 MW, having four boilers which burn heavy oil and natural gas together. Introduction of low-NOx burners is being planned.

2. Measurement was made with No.4 boiler. The exhaust gas O_2 content was 0.5 - 0.8%, indicating excessively low air ratio. The Bacharach value was No.9, with smoke emission observed visually from the stack. Becuase of the sampling at the inlet of the air preheater, the exhaust gas temperature was rather high at 378°C. Operation with a slightly higher air ratio may achieve better result.

No. 70	Date of Visit	July 4, 1990

Name of Establishment	TERMOELECTRICA JORGE LUQUE				
Type of Industry (Product)	Electric powr				
Scale of Factory	Large		Number of Employees		275
Annual Sales or Production	2,688 Mw/hr				
Kind of Fuel, Consumption and Price	Natural gas 18,792,025 m^3 (211.30 pesos/m^3) 3,970,754,883 pesos/mon Heavy oil (H) 2,562,292 kl (152.05 pesos/l) 389,596,499 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Water tube boiler (No.1)	150 ton/hr	Heavy oil (H)	10,246 l/hr	37	Recuperator
Water tube boiler (No.2)	150 ton/hr	Natural gas	12,278 m^3/hr	38	Superheater
Water tube boiler (No.3)	350 ton/hr	Heavy oil (H)	26,400 l/hr	32	Recuperator
Water tube boiler (No.4)	350 ton/hr	Natural gas	23,480 m^3/hr	30	Superheater

Outline of the Facility Surveyed: Water tube boiler (1) 150 ton/hr (2) 350 ton/hr

(1) 150 ton/hr boiler (No.1, 2)

- Evaporation rate : Rating : 150 ton/hr Normal : 147.7 ton/hr
- Fuel consumption : Rating : Natural gas 12,278 m^3/hr Heavy oil (H) 10,246 l/hr
  (currently operated with gas: oil = 80:20 as converted to the power generation amount)
- Steam pressure : 63 kg/cm^2g Temperature : 487°C
- Fuel temperature : Oil - 110 °C
- Atomizing steam pressure : 6 kg/cm^2g
- Combustion air temperature : 288 °C
- Stack : 2.0 mφ x 35 m
- Operating time : 24 hr/day, 168 hr/week

(2) 350 ton/hr boiler (No.3, 4)

- Evaporation rate : Raging : 350 ton/hr Normal : 350 ton/hr
- Fuel consumption : Rating : Natural gas 23,480 m^3/hr Heavy oil (H) 26,400 l/hr
  (currently operated with gas : oil = 80:20 as converted to the power generation amount)
- Steam pressure : 63 kg/cm^2g Temperature : 488°C
- Fuel temperature : Oil - 110 °C
- Atomizing steam pressure : 6 kg/cm^2g
- Combustion air temperautre : 260 °C
- Stack : 2.0 mφ x 20 m x 2
- Operating time : 24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	Proportion of natural gas increased
Future plan for pollution control	:	Reduction of the S content of heavy oil
Present energy-saving measures	:	Recuperator and economizer

1. This thermal power plant normally operates with the fuel ratio of gas: oil = 80:20 as converted to power generation amount. On the date of visit, No. 1 and No. 2 boilers were operated with 100% natural gas, No.3 was shut down due to vibration in the generator, and No.4 was under periodical repair.
2. No. 1 and 2 have respectively six burners, enabling burning of gas and/or oil. No. 3 and 4 are of a corner firing type, with 36 burners respectively. There are three sets of burners in each corner of the boiler, with each set consisting of one unit for oil and two units for gas.
3. Heavy oil used is of low grade.
4. Instruments for operation are nearly complete, except that oil meter is not provided.
5. Relocation of the plant is not planned in mid-term, and effective utilization of existing equipment is intended.

No. 71	Date of Visit	July 4, 1990

Name of Establishment	FUNDICION DE FIERRO Y METALES			
Type of Industry (Product)	Basic metals (cast iron)			
Scale of Factory	Small	Number of Employees		42
Annual Sales or Production	1,500,000,000 pesos/yr			
Kind of Fuel, Consumption and Price	Coke	10.6 ton/mon	(US$713/ton)	US$7,557.8/mon
	Butane gas	4.1 kl/mon	(208 pesos/l)	830,000 pesos/mon

Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Cupola	800 kg/charge	Coke	1,285 kg/day	6	

Outline of the Facility Surveyed : Cupola

Capacity : Rating : 800 kg/charge Normal : 350 kg/charge
Fuel consumption (coke) : 50 kg/charge
Temperature of object to be heated : 1,460 °C
Operating time : 7 hr/day, 14 hr/week

Outline of Survey Result

Present pollution control measures : Dust removal by water shower, fuel changed to US-made coke
Future plan for pollution control : None
Present energy-saving measures : None

1. This cupola has water shower to remove dust, but was not operating due to water supply failure on the day of visit.
2. Cupola cover was broken and needs to be repaired
3. CO produced from the process is completely burnt with secondary air.
4. 1,000 l/week of butane gas is used to dry molds.

		No. 72	Date of Visit	July 4, 1990	
Name of Establishment	P.P.G. INDUSTRIAS DE MEXICO				
Type of Industry (Product)	Chemical (paint)				
Scale of Factory	Large	Number of Employees		415	
Annual Sales or Production	83,000,000,000 pesos/yr				
Kind of Fuel, Consumption and Price	Natural gas	(211.3 pesos/m^3)	9,000 m^3/mon	18,990,000 pesos/mon	
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	2.35 ton/hr	Natural gas	110 m^3/hr	15	Alternate use
Smoke tube boiler	1.56 ton/hr	Natural gas	100 m^3/hr	15	

Outline of the Facility Surveyed	Smoke tube boiler	2.35 ton/hr (steam)
Evaporation rate	: Rating : 2.35 ton/hr	Normal : 1.41 ton/hr
Steam pressure	: 6.5 kg/cm^2g	
Fuel consumption	: Normal : 110 m^3/hr	
Fuel pressure	: 0.5 kg/cm^2g	Temperautre : Normal
Combustion air temperature	: Normal	
Stack	: 0.4 mϕ x 8 m	
Operating time	: 24 hr/day,	120 hr/week

Outline of Survey Result		
Present pollution control measures	:	Natural gas used
Future plan for pollution control	:	Duct installed in August to September to discharge hydrocarbon to the outside. Hydrocarbon removal system scheduled to be installed in January.
Present energy-saving measures	:	None

1. This plant is of US capital, and produces paint, varnish, and resin. Organic solvents worth of 1 million pesos are said to be lost every month from the production processes. Solvent odor fills the plant.

2. The exhaust gas O_2 content was 3.3%, indicating proper air ratio. Bacharach value of No.4 is not satisfactory for natural gas burning. The exhaust gas temperature was low at 169°C, and the boiler efficiency satisfactory at 87%. Burner improvement is desirable for prevention of soot generation.

No. 73	Date of Visit	July 5, 1990

Name of Establishment	ORGANIZACION QUIMICA MEXICANA				
Type of Industry (Product)	Food (Food additives, zinc chloride)				
Scale of Factory	Small		Number of Employees		35
Annual Sales or Production	18,500,000,000 pesos/yr				
Kind of Fuel, Consumption and Price	Heavy oil (L) 30.0 kl/mon (180.48 pesos/l) 5,414,400 pesos/mon				
Type of combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Smoke tube boiler	1.3 ton/hr	Heavy oil (L)	18.0 l/hr	14	
2. Smoke tube boiler	1.6 ton//hr	Heavy oil (L)	19.4 l/hr	24	

Outline of the Facility Surveyed		Smoke tube boiler	1.3 ton/hr (steam)
Evaporation rate	:	Rating : 1.3 ton/hr	
Fuel consumption	:	Normal : 18 l/hr	
Steam pressure	:	7.15 kg/cm^2	Temperature : 157°C
Fuel pressure	:	1.0 kg/cm2	Temperature : 50°C
Combustion air temperature	:	Normal	
Stack	:	0.5 mφ x 6 m	
Operating time	:	24 hr/day,	168 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 9.0%, Temperature 304°C, Bacharach No.7
   This boiler burns fuel with excess air and the air needs to be reduced while observing the exhaust gas.

2. There is a high-temperature (120 - 130°C) part on the boiler surface. It is recommended to bond the heat insulating material to reduce wasteful heat release.

3. Instruments necessary for boiler operation are fualty or incomplete, and thus are required to be improved.

4. We were asked about additives of heavy oil and advised to purchase the sample and measure the exhaust gas temperature and Bacharach value under similar conditions. If these values decrease, the additive is proved to be effective.

No. 74	Date of Visit	July 5, 1990

Name of Establishment	PRODUCTOS NUTRICIONALES		
Type of Industry (Product)	Food (Food additives)		
Scale of Factory	Small	Number of Employees	31
Annual Sales or Production	4,104 ton/yr		
Kind of Fuel, Consumption and Price	Diesel 9.8 kl/mon (550 pesos/l) 5,390,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1 Smoke tube boiler	0.63 ton/hr	Diesel	29 l/hr	20	
2 Smoke tube boiler	0.63 ton/hr	Diesel	29 l/hr	12	

Outline of the Facility Surveyed		Smoke tube boiler 0.63 ton/hr (steam)
Evaporation rate	:	Rating: 0.63 ton/hr
Fuel consumption	:	Normal: 29 l/hr
Steam pressure	:	6 kg/cm^2, Temperature: 158°C
Fuel pressure	:	7 kg/cm^2, Temperature: normal
Combustion air temperature	:	Normal
Combustion exhaust gas composition	:	O_2 - 4%, CO_2 - 12% (as measured by the plant)
Temperature	:	170°C (as measured by the plant)
Stack	:	0.2 mϕ x 8 m
Operating time	:	24 hr/day, 120 hr/week

Outline of Survey Result

Present pollution control measures	:	Simple dust collector
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   No. 1: O_2 - 10.4%, temperature - 191 °C, Bacharach - No.1
   No. 2: O_2 - 6.1%, temperature - 210 °C, Bacharach - No. 9

2. No. 1 suffers excess air combustion and the air must be reduced while checking the exhaust gas. No. 2 requires checking and cleaning of burner.

No. 75	Date of Visit	July 5, 1990

Name of Establishment	POLIMEROS (POLIESPUMAS DE MEXICO)		
Type of Industry (Product)	Petrochemical (styrol polymer container, building material)		
Scale of Factory	Medium	Number of Employees	125
Annual Sales or Production	20,000,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (175.65 pesos/l) 270,000 l/mon 474,300,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	7.6 ton/hr	Heavy oil (L)	350 l/hr	2	
Smoke tube boiler	5.1 ton/hr	Heavy oil (L)	100 l/hr	8	

Outline of the Facility Surveyed		Smoke tube boiler 7.6 ton/hr (steam)
Evaporation rate	:	Rating: 7.6 ton/hr, Normal: 7.6 ton/hr
Steam pressure	:	7 kg/cm^{2}g
Fuel consumption	:	Rating: 350 l/hr, Normal: 350 l/hr
Fuel pressure	:	2 kg/cm^{2}g, Temperature: 100 °C
Atomizing air pressure	:	0.8 kg/cm^{2}g
Temperature	:	Normal
Combustion air temperature	:	Normal
Combustion exhaust gas temperature	:	200 °C (as measured by the plant)
Stack	:	0.9 mϕ x 6.0 m
Operating time	:	24 hr/day, 144 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This plant shows positive attitude for pollution control. They purchased the NOx, SOx, smoke and soot measuring instruments at a price of US$10,000.

2. The exhaust gas O_2 content was 5.7%, indicating slight excess air combustion. The Bacharach value of No. 4 is satisfactory for heavy oil combustion. The exhaust gas temperature was low at 178°C, with the boiler efficiency satisfactory at 87%.

No. 76	Date of Visit	July 5, 1990

Name of Establishment	EMPAQUES DE CARTON UNITED		
Type of Industry (Product)	Paper and its product (corrugated fiber board)		
Scale of Factory	Medium	Number of Employees	150
Annual Sales or Production	11,000,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (175.65 pesos/l) 265,000 l/mon 46,550,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Water tube boiler	9.5 ton/hr	Heavy oil (L)	440 l/hr	27	Alternate use
Water tube boiler	8.2 ton/hr	Heavy oil (L)	440 l/hr	15	Alternate use

Outline of the Facility Surveyed		Water tube boiler 9.5 ton/hr (steam)
Evaporation rate	:	Rating: 9.5 ton/hr, Normal: 8.2 ton/hr
Steam pressure	:	8 kg/cm^{2}g
Fuel consumption	:	Rating: 500 l/hr, Normal: 440 l/hr
Fuel pressure	:	5 kg/cm^{2}g, Temperature: 100 °C
Atomizing steam pressure	:	6 kg/cm^{2}g
Temperature	:	Saturated steam temperature
Combustion air temperature	:	Normal
Cumbustion exhaust gas composition	:	O_2 - 7.9%, CO_2 - 12.5% (as measured by the plant)
Combustion exhaust gas temperature	:	280 °C (as measured by the plant)
Stack	:	0.75 mϕ x 20 m
Operating time	:	24 hr/day, 144 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This plant produces paper bags from used paper and uses boilers as heat source to dry paper.

2. The exhaust gas O_2 content was 8.2%, indicating excess air combustion. The Bacharach value was No. 7 with large quantity of soot generation. The exhaust gas temperature was slightly high at 285°C, with the boiler efficiency at 79%. It is recommended to reduce soot by improving the burner and to reduce the excess air.

No. 77	Date of Visit	July 6, 1990

Name of Establishment	SILICATOS Y DERIVADOS, S.A.		
Type of Industry (Product)	Chemical (sodium silicate, potassium silicate, etc.)		
Scale of Factory	Medium	Number of Employees	190
Annual Sales or Production	60,000,000,000 pesos/yr 70,000 ton/yr		
Kind of Fuel, Consumption and Price	Natural gas		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Melting furnace	8.33 ton/hr	Natural gas	958 m^3/hr	25	glass
Melting furnace	3.33 ton/hr	Natural gas		13	Not operating
Melting furnace	0.17 ton/hr	Natural gas		13	Not operating
Smoke tube boiler	7.6 ton/hr	Natural gas *	250 m^3/hr	10	
Smoke tube boiler	5.1 ton/hr	Natural gas *		16	
Smoke tube boiler	3.8 ton/hr	Natural gas *		16	
		* Heavy oil (L) 417 l/hr	during summer		

Outline of the Facility Surveyed — Melting furnace — 8.33 ton/hr (glass)

Rating	:	8.33 ton/hr (glass)
Fuel consumption	:	Rating: 1,250 m^3/hr, Normal: 958 m^3/hr
Temperature of object to be heated	:	1,420 °C
Combustion air temperature	:	1,000 °C
With regenerator	:	(20-minute changeover)
Stack	:	1.68 mϕ x 21 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	Fuel changed to natural gas
Future plan for pollution control	:	None
Present energy-saving measures	:	Regenerator

1. The regenerator has primary and secondary chambers, achieving efficient heat recovery. As compared with the furnace outlet temperature of 1,210°C, the temperature is reduced to 390°C at the secondary chamber of regenerator outlet.
2. Cleaning of the regenerator is made once a month for the primary chamber and once a week for the secondary chamber
3. Heat insulation of the regenerator is recommended to be made with ceramic fiber. The temperature of furnace surface is 251 - 280°C, but its heat insulation is not recommended because it may shorten the life of bricks.

No. 78	Date of Visit	July 6, 1990

Name of Establishment	GANADROS PRODUCTORES DE LECHE PURA		
Type of Industry (Product)	Food (daily products)		
Scale of Factory	Large	Number of Employees	700
Annual Sales or Production	800,000 l/day		
Kind of Fuel, Consumption and Price	Heavy oil (L) 157 kl/mon (202 pesos/l) 31,714,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	4.7 ton/hr	Heavy oil (L)	109 l/hr	17	
Smoke tube boiler	4.7 ton/hr	Heavy oil (L)		17	Not operating
Smoke tube boiler	4.7 ton/hr	Heavy oil (L)	109 l/hr	10	

Outline of the Facility Surveyed — Smoke tube boiler — 4.7 ton/hr (steam)

Evaporation rate	:	Rating: 4.7 ton/hr, Normal: 3.8 ton/hr
Fuel consumption	:	Rating: 335 l/hr, Normal: 109 l/hr
Steam pressure	:	9 kg/cm^2, Temperature: 175.4 °C
Temperature	:	100°C
Atomizing steam pressure	:	3.0 kg/cm^2
Combustion air temperature	:	40 °C
Stack	:	0.4 mϕ x 9 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	Simple dust collector
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 9.1%, temperature - 212°C, Bacharach - No. 7
   This boiler burns fuel with excess air and the air should be reduced while checking the exhaust gas. The temperature is normal. The Bacharach value may be due to low oil atomizating pressure, which should therefore be raised to 2 kg/cm^2 or over.

2. The boiler surface temperature is 35 - 110°C, which is considered to be reasonable.

3. We were asked about additives of heavy oil and advised to purchase the sample and measure the exhaust gas temperature and bacharach value under similar conditions. If these values decrease, the additives is proved to be effective.

4. Importance of knowing fuel consumption and characteristics of fuels and instrument to measure the steam amount was explained.

No. 79	Date of Visit	July 6, 1990

Name of Establishment	HOSPITAL 20 DE NOVIEMBRE ISSSTE		
Type of Industry (Product)	Hospital		
Scale of Factory	Large	Number of Employees	4,000
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Diesel (478.26 pesos/l) 105,000 l/mon 50,190,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	12.8 ton/hr	Diesel	145 l/hr	15	Alternate use
Smoke tube boiler	12.8 ton/hr	Diesel	145 l/hr	15	
Incinerator	0.2 - 0.25 t/h	Diesel		20	
Incinerator	< 0.1 ton/hr	Diesel		20	

Outline of the Facility Surveyed: Incinerator 0.2 - 0.25 ton/hr

Fuel consumption	:	Diesel oil is used for ignition. After that, the fuel consumption is small because wastes themselves burn.
Materials to be incinerated	:	Plastics, polyethylene, glass, syringe
Fuel pressure	:	7 kg/cm^{2}g, Temperature: normal
Burner	:	3 pcs
Combustion air temperature	:	Normal
Stack	:	0.4 mϕ x 35 m
Operating time	:	2 hr/day, 14 hr/week

* Combustion exhaust gas is considered to contain chlorine gas
* Organics are burnt in the smaller incinerator.

Outline of Survey Result

Present pollution control measures	:	Diesel oil used
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is the largest hospital in Latin America, with a incinerator. They have a difficulty in management of the incinerator.

2. Before loading of wastes, diesel oil is burnt to preheat the incinerator. The exhaust gas O_2 content was 18.6% and the Bacharach value Nos. 6 to 7.
   In 10 to 15 minutes after loading of wastes, the O_2 content became 18.9% and the Bacharach value No. 9. The internal temperature does not rise sufficiently because of excessively high air ratio, resulting incomplete burning of wates. The O_2 content should be reduced to raise the internal temperature to 800°C or more.

No. 80	Date of Visit	July 6, 1990

Name of Establishment	HOTEL DEL ANGEL				
Type of Industry (Product)	Hotel				
Scale of Factory		Number of Employees		72	
Annual Sales or Production					
Kind of Fuel, Consumption and Price	Diesel (382.61 pesos/l) 6,000 l/mon 230,000,000 pesos/mon				
Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	0.47 ton/hr	Diesel	17 l/hr	10	Alternate use
Smoke tube boiler	0.47 ton/hr	Diesel	17 l/hr	10	Alternate use

Outline of the Facility — Smoke tube boiler — 0.47 ton/hr (steam)

Evaporation rate	:	Rating : 0.47 ton/hr
Steam pressure	:	7 kg/cm^2 g
Fuelconsumption	:	Normal : 17 l/hr
Fuel pressure	:	10 kg/cm^2 g
Temperature	:	Normal
Combustion air temperature	:	Normal
Stack	:	0.25 mφ x 20 m
Operating time	:	12 hor/day, 84 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is medium-scale hotel in Mexico, with boilers installed underground.

2. The exhaust gas O_2 content was 11.7%, indicating excess air combustion. The Bacharach was No. 3. The exhaust gas temperature was 226°C, with the boiler efficiency 78%.

No. 81	Date of Visit	July 6, 1990

Name of Establishment	MA. ISABEL SCHERATON		
Type of Industry (Product)	Hotel		
Scale of Factory		Number of Employees	850
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Heavy oil (L) (163.48 pesos/l) 123,000 l/mon 20,110,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	6.3 ton/hr	Heavy oil (L)	171 l/hr	1	Only one unit
Smoke tube boiler	6.3 ton/hr	Heavy oil (L)	171 l/hr	1	used
Smoke tube boiler	6.3 ton/hr	Heavy oil (L)	171 l/hr	1	alternately

Outline of the Facility — Smoke tube boiler 6.3 ton/hr (steam)

Evaporation rate	:	Rating : 6.3 ton/hr Normal : 1.8 ton/hr
Steam pressure	:	7 kg/cm^{2}g
Fuel consumption	:	Rating : 565 l/hr Normal : 171 l/hr
Fuel pressure	:	2.5 kg/cm^{2}g Temperature : 96 °C
Atomizing air pressure	:	1.1 kg/cm^{2}g Temperature : Normal
Combustion air temperature	:	Normal
Stack	:	0.5mϕ x 25 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is one of largest hotels in Mexico. The boiler is installed at a height approximately equivalent to the fifth floor of the building.

2. The exhaust gas O_2 content was 10.2%, indicating excess air combustion. The Bacharach value was No. 4, relatively satisfactory for heavy oil (L) burning. The exhaust gas temperature was slightly lower at 206°C, and the efficiency may be improved by reducing the air ratio slightly.

No. 82	Date of Visit	July 6, 1990

Name of Establishment	SOSA TEXCOCO, S.A.		
Type of Industry (Product)	Chemical (sodium carbonate, sodium chlorine)		
Scale of Factory	Large	Number of Employees	1,080
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Natural gas (211.3 pesos/m^3) 10,260,000 m^3/mon 2,168,000,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Water tube boiler	20 ton/hr	Natural gas	total 13,688 m^3/h	40	
Water tube boiler	20 ton/hr	Natural gas		40	
Water tube boiler	20 ton/hr	Natural gas		40	
Water tube boiler	36 ton/hr	Natural gas		28	High pressure
Water tube boiler	50 ton/hr	Natural gas		25	
Water tube boiler	50 ton/hr	Natural gas		16	
Water tube boiler	30 ton/hr	Natural gas		29	
Water tube boiler	60 ton/hr	Natural gas		15	
Water tube boiler	50 ton/hr	Natural gas		4	
Roasting furnace	9.2 ton/hr	Coke	1.250 kg/hr		Thermal decomposition of lime stone
Roasting furnace (8 units)	4.2 ton/hr	Natural gas	500 m^3/hr	42 22	7 units operating currently
Drying furnace (2 units)		Natural gas	63 m^3/hr		Drying of algae

Outline of the Facility — Water tube boiler 60 ton/hr (steam)

Evaporation rate	:	Rating : 60 ton/hr Normal : 35ton/hr
Steam pressure	:	20 kg/cm^2g
Fuel consumption	:	Rating : 4,400 m^3/hr Normal : 2,600 m^3/h Unit fuel consumption : 73 m^3/ton ($Na\ CO_3$)
Fuel pressure	:	0.25 kg/cm^2g
Combustion air temperature	:	Normal
Combustion exhaust gas composition O_2	:	1.9 to 2.5% (as measured by the plant)
Stack	:	0.5mφ x 10 m
Operating time	:	24 hr/day, 168 hr/week

* Boiler load is 50% in dry season and 100% in rainy season.
* Fine dust is emitted in large quantity around the roasting furnace.
* High-pressure boiler will be added for power generation.

Outline of Survey Result

Present pollution control measures	:	Dust removed with cyclone and spray in roasting furnace. Natural gas used.
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Raw material is taken from mud of Lake Texcoco and refined to produce Na_2CO_3 and NaCl. Combustion control is made through daily measurement of exhaust gas by Orsat analyzer.

2. The exhaust gas O_2 content was very good at 2% and the Bacharach value was No. 0. The exhaust gas temperature was satisfactory at 253°C, with the boiler efficiency high at 86%. There existed vibrated combustion, causing vibration of the boiler outer wall. Improvement to enhance flame stability should be made.

No. 83	Date of Visit	July 9, 1990

Name of Establishment	AMERICAN TEXTIL, S.A. DE C.V.		
Type of Industry (Product)	Petrochemical (Synthetic fiber)		
Scale of Factory	Large	Number of Employees	650
Annual Sales or Production	50,500,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (192.65 pesos/l) 177,000 l/mon 34,100,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Heat medium boiler	6000 Mcal/hr	Heavy oil	160 l/hr	8	
Heat medium boiler	1000 Mcal/hr	Heavy oil		20	Not operating
Heat medium boiler	1000 Mcal/hr	Heavy oil		20	Not operating
Smoke tube boiler	6 ton/hr	Heavy oil	153 l/hr	10	Alternate use
Smoke tube boiler	5 ton/hr	Heavy oil	153 l/hr	20	
Iron		L.P.G.	small amount		

Outline of the Facility — Heat medium boiler 6,000 Mcal/hr (oil)

Capacity of Facility	:	6,000 Mcal/hr
Fuel consumption	:	160 l/hr
Heat medium temperature	:	230 to 250°C
Fuel pressure	:	1.5 kg/cm^{2}g Temperature : 80 °C
Atomizing steam pressure	:	1.4 kg/cm^{2}g
Temperature	:	Saturated steam temperature
Combustion air temperature	:	Normal
Stack	:	0.5 mφ x 15 m
Operating time	:	24 hr/day, 132 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This plant produces clothes (curtain, etc.) from polyester and nylon fibers. This company is of 20% US capital.

2. The exhaust gas O_2 content was 9.0 to 11.5%, indicating excess air combustion. The Bacharach value was No. 9, with soot generation in large quantity (however, no soot emission was observed from the stack). The exhaust gas temperature was 340°C higher than ordinary boilers. Accordingly, the boiler efficiency was 72%, possibly due to poor atomization of burner.

No. 84	Date of Visit	July 9, 1990

Name of Establishment	MANUFACTURAS GARGO, S.A. DE C.V.		
Type of Industry (Product)	Paper and its products (Carton)		
Scale of Factory	Large	Number of Employees	450
Annual Sales or Production	20,000 ton/yr		
Kind of Fuel, Consumption and Price	Heavy oil (H) 425 kl/mon (192.65 pesos/l) 81,876,250 pesos/mon Propane 50 kl/mon (208.00 pesos/l) 10,400,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. water tube boiler	13.6 ton/hr	Heavy oil (H)	625 l/hr	11	
2. Gas burner	625,000 kcal/hr	Propane	74 l/hr	15	

Outline of the Facility — Water tube boiler 13.6 ton/hr (steam)

Evaporation rate	:	Rating : 13.6 ton/hr Normal : 8 ton/hr
Fuel consumption	:	Normal : 625 l/hr
Steam pressure	:	7.0 kg/cm^2 g
Fuel pressure	:	8 kg/cm^2 g Temperature : 110 °C
Atomizing steam pressure	:	4 to 5 kg/cm^2 g
Combustion air temperature	:	Normal
Combustion exhaust gas composition	:	O_2 : 4.1 to 6.6%, CO_2: 11 to 11.5% (as measured by the plant) Temperature: 370°C (as measured by the plant)
Stack	:	1.14 mφ x 12 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	Boiler and burner renewal plan
Present energy-saving measures	:	None

Exhaust gas measurement result is as follows:
O_2 - 8.0%, temperature - 395°C , Bacharach - No.4
Since combustion air is in excess, the air should be reduced while observing the exhaust gas. The temperature is proper in view of the construction (one-way return) of boiler. The low Bacharach value may be due to satisfactory fuel pressure, fuel temperature, and atomizing steam pressure.

No. 85	Date of Visit	July 9, 1990

Name of Establishment	INDUSTRIAL PAVIMENTADORA, S.A.		
Type of Industry (Product)	Coal and petroleum product (asphalt mix)		
Scale of Factory	Small	Number of Employees	20
Annual Sales or Production	150,000 ton/yr		
Kind of Fuel, Consumption and Price	Diesel 100 kl/mon (532 pesos/l) 53,200,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Rotary kiln	55 ton/hr	Diesel	135 l/hr	40	
2. Rotary kiln	75 ton/hr	Diesel	135 l/hr	33	
3. Heat medium boiler	504,000 kcal/hr	Diesel	38.6 l/hr	25	
4. Heat medium boiler	630,000 kcal/hr	Diesel	38.6 l/hr	25	

Outline of the Facility Rotary kiln 75 ton/hr, Heat medium boiler 504,000 kcal/hr

1. Rotary kiln
   - Capacity : Rating : 75 ton/hr
   - Fuel consumption : Normal : 135 l/hr
   - Temperature of object to be heated : 130°C
   - Fuel pressure : 12 kg/cm^2 g Fuel temperature : Normal
   - Stack : 1.65 mφ x 9 m
   - Operating time : 12 hr/day, 72 hr/week (depending on order acceptance)

2. Heat medium boiler
   - Capacity : 504,000 kcal/hr
   - Fuel temperature : Normal : 60 l/hr
   - Temperature of object to be heated : 150°C
   - Fuel Temperature : Normal
   - Stack : 0.3 mφ x 5 m
   - Operating time : 24 hr/day

Outline of Survey Result

Present pollution control measures	:	Fuel change, cyclone, venturi scrubber
Future plan for pollution control	:	Boiler and burner renewal plan
Present energy-saving measures	:	None

1. Exhaust gas measurement result of heat medium boiler is shown below:
   O_2 - 7.6%, temperature - 550°C , Bacharach - No.3
   This Boiler is used as a heat source to heat the inside of asphalt tank to keep temperature constant. As the boiler construction is simple, the exhaust gas temperature is high.

2. There is a high-temperature portion on boiler surface and heat insulation is necessary.

No. 86	Date of Visit	July 10, 1990

Name of Establishment	HULE INDUSTRIAL, S.A.		
Type of Industry (Product)	Rubber and plastic product (rubber, packing)		
Scale of Factory	Medium	Number of Employees	210
Annual Sales or Production	12,000,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Diesel 40.0 kl/mon (490.26 pesos/l) 19,610,400 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Smoke tube boiler	0.77 ton/hr	Diesel	62 l/hr	20	
2. Smoke tube boiler	0.77 ton/hr	Diesel	62 l/hr	13	

Outline of the Facility — Smoke tube boiler 0.77 ton/hr (steam)

Evaporation rate	:	Rating : 0.77 ton/hr Normal: 0.65 ton/hr
Fuel consumption	:	Rating : 62 l/hr Normal : 34.4 l/hr
Steam pressure	:	8 kg/cm^{2}g Temperature : 170°C
Fuel pressure	:	3.5 kg/cm^{2}g Temperature : Normal
Combustion air temperature	:	Normal
Stack	:	0.25 mϕ x 12 m
Operating time	:	24 hr/day, 120 hr/week

Outline of Survey Result

Present pollution control measures	:	Fuel changed to diesel oil
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 10.9%, temperature - 230°C , Bacharach - No.5
   As there is a tendency of excess air combustion, it is necessary to reduce the size of air inlet. The temperature is reasonable in view of the boiler construction (2-way return). The bacharach value is reasonable, though slightly high.

2. The furnace body temperature is reasonable.

3. Adjusting the combustion air may enhance the boiler efficiency.

No. 87	Date of Visit	July 10, 1990

Name of Establishment	POLIRESINAL HUETTENES ALBERTOS, S.A.		
Type of Industry (Product)	Petrochemical (phenol, formalin, glue)		
Scale of Factory	Small	Number of Employees	100
Annual Sales or Production	2,100 ton/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) 425.0 kl/mon (192.65 pesos/l) 81,876,250 pesos/mon Diesel 40.0 kl/mon (490.26 pesos/l) 19,610,400 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Smoke tube boiler	2.4 ton/hr	Heavy oil (L)	53 l/hr	11	
2. Smoke tube boiler	2.4 ton/hr	Heavy oil (L)	53 l/hr	17	No operating

Outline of the Facility : Smoke tube boiler 2.4 ton/hr (steam)

Evaporation rate	:	Rating : 2.4 ton/hr Normal: 1.34 ton/hr
Fuel consumption	:	Rating : 158 l/hr Normal : 53 l/hr
Steam pressure	:	8 kg/cm^{2}g Temperature : 150°C
Fuel pressure	:	2.0 kg/cm^{2}g Temperature : 82°C
Combustion air temperature	:	Normal
Stack	:	0.4 mφ x 12 m
Operating time	:	24 hr/day, 168 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 11.1%, temperature - 205 °C, Bacharach - No.4

2. As there is a tendency of excess air combustion, it is necessary to reduce the size of air inlet. The temperature is reasonable. As burner atomization is poor because of low fuel pressure, the Bacharach value is high. Though the fuel pressure is currently set to 0.7 kg/cm^2, it was said that raising the pressure above this level causes abnormal sound. The countermeasures include increase of the atomizing air pressure at the same time as increase of the fuel pressure. Fuel and air pipings are thin and should be improved.

3. It is advisable to install fuel and steam flow meters.

No. 88	Date of Visit	July 10, 1990

Name of Establishment	AGA DE MEXICO, S.A. DE C.V.		
Type of Industry (Product)	Chemical (GAS - O_2, N_2, H_2, Ar, N_2, - welding rod)		
Scale of Factory	Large	Number of Employees	650
Annual Sales or Production	50,500,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Natural gas (211.3 pesos/m^3) 973,800 m^3/mon 205,760,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Gas turbine	4,250 Hp	Natural gas	800 m^3/hr	16	For compresser
Gas turbine	4,250 Hp	Natural gas	800 m^3/hr		operation
Drying furnace	2.5 ton/5.5 hr	Natural gas			Pre-drying of
Drying furnace	2.5 ton/5.5 hr	Natural gas			welding rod
Drying furnace	2.5 ton/5.5 hr	Natural gas	total 50 m^3/h		Continuous pre-drying
Drying furnace	10 ton 5.5 hr	Natural gas			Iron wire
Annealing furnace	0.85 ton/3 hr	Natural gas			

Outline of the Facility Gas tuurbine 4,250 Hp

Capacity of facility	:	4,250 Hp
Fuel consumption	:	800m^3/hr
Combustion air temperature	:	Normal
Exhaust gas temperature	:	1,000°C
Stack	:	Length 1. m x width 1.5m x height 6m
Operating time	:	24 hr/day, 120 hr/week

* Gas turbine and annealing furnace discharge high-temperature exhaust gas.

Outline of Survey Result

Present pollution control measures	:	Natural gas used
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. The gas turbine used as power source of compressor is planned to be replaced by a motor in 1991.
2. The exhaust gas O_2 content was 15.3%. The gas operating temperature was around 930°C, indicating that the turbine's efficiency was not so good. The Bacharach value was No. 0 and there was no problem. CO content was 190 ppm, which is below the allowable value.

No. 89	Date of Visit	July 10, 1990

Name of Establishment	TAMM Y CIA, S.A. DE C.V.		
Type of Industry (Product)	Petrochemical (acrylic, cotton)		
Scale of Factory	Large	Number of Employees	400
Annual Sales or Production	34,280,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (175.65 pesos/l) 70,000 l/mon 12,300,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	4.5 ton/hr	heavy oil (L)	78 l/hr	9	Alternate use
Smoke tube boiler	3.2 ton/hr	heavy oil (L)	78 l/hr	22	

Outline of the Facility: Water tube boiler 4.5 ton/hr (steam)

Evaporation rate	:	Rating : 4.5 ton/hr
Steam pressure	:	7 kg/cm^{2}g
Fuel consumption	:	Rating : 400l/hr Normal : February to August 78 l/hr September to January 120 l/hr
Fuel pressure	:	2.6 kg/cm^{2}g Temperature : 70^{0}C
Atomizing air pressure	:	0.65kg/cm^{2}g Temperature : Normal
Combustion air temperature	:	Normal
Combustion exhaust gas composition	:	O_2 : 4.2 % CO_2 : 12.8% (as measured by the plant)
Stack	:	0.35mϕ x 8m
Operating time	:	24 hr/day, 134 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is an old company founded in 1936, which produces synthetic fiber wool. The plant is located in the residential area.
2. The exhaust gas O_2 content was satisfactory at 3.4% The Bacharach value was No.7, with soot emission. The exhaust gas temperature was low at 178^{0}C,with the boiler efficiency satisfactory at 88%.

No. 90	Date of Visit	July 11, 1990

Name of Establishment	CIA. HULLRA ATRAS, S.A.		
Type of Industry (Product)	Rubber and plastic product (Rubber products for automobile)		
Scale of Factory	Small	Number of Employees	55
Annual Sales or Production	24 ton/yr		
Kind of Fuel, Consumption and Price	Diesel 4.0 kl/mon (550 pesos/l) 2,200,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	1.28 ton/hr	heavy oil (L)	64 l/hr	7	

Outline of the Facility — Smoke tube boiler 1.28 ton/hr (steam)

Evaporation rate	:	Rating : 1.28 ton/hr Normal: 1.02 ton/hr
Fuel consumption	:	Normal : 64 l/hr
Steam pressure	:	8 kg/cm^{2}g Temperature : 150^{0}C
Fuel pressure	:	10.5 kg/cm^{2}g Temperature : Normal
Combustion air temperature	:	Normal
Stack	:	0.3 mϕ x 8 m
Operating time	:	13 hr/day, 65 hr/week

Outline of Survey Result

Present pollution control measures	:	Fuel changed to diesel oil
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 9.4%, temperature - 208^{0}C, Bacharach - No. 5
   As there is a tendency of excess air combustion, the air must be reduced. There is no problem concerning the temperature. The Bacharach value is medium, possibly due to the use of diesel oil and atomized steam of 7.6 kg/cm^2.

2. Heat insulation on the boiler body is satisfactory.

3. The boiler construction is of 2-way return type, with a satisfactory efficiency.

No. 91	Date of Visit	July 11, 1990

Name of Establishment	CORRUGADO Y FIBRA, S. A.		
Type of Industry (Product)	Paper and its product (carton)		
Scale of Factory	Medium	Number of Employees	130
Annual Sales or Production	25,000,000,000 pesos/yr 22,500 ton/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) 80.0 kl/mon (175.65 pesos/l) 15,808,500 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	3.2 ton/hr	heavy oil (L)	39.7 l/hr	16	

Outline of the Facility — Smoke tube boiler 3.2 ton/hr (steam)

Evaporation rate	:	Rating : 3.2 ton/hr Normal : 1.9 ton/hr
Fuel consumption	:	Normal : 39.7 l/hr
Steam pressure	:	10.5 kg/cm^{2}g Temperature : 150°C
Fuel pressure	:	0.7 kg/cm^2 g Temperature : 90°C
Combustion air temperature	:	Normal
Stack	:	0.51 mϕ x 15 m
Operating time	:	16 hr/day, 96 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 9.4%, temperature - 322°C, Bacharach - No. 8
   The temperature is slightly high because of small body length of the boiler. Dust content is rather high because of poor atomization as the compressed air pressure is low in relation to full pressure. This may be improved by raising the atomized air pressure.

2. Through the measurement of the furnace wall surface temperature, it was known that a part of heat insulation bricks inside the furnace were broken off.

No. 92	Date of Visit	July 11, 1990

Name of Establishment	SALES INDUSTRIALES DE MEXICO		
Type of Industry (Product)	Chemical (Ammonium chloride, zinc chloride, sodium sulfate)		
Scale of Factory	Small	Number of Employees	12
Annual Sales or Production	190,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) 20.5 kl/mon (202 pesos/l) 14,141,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	1.02 ton/hr	heavy oil (L)	48.7l/hr	17	

Outline of the Facility : Smoke tube boiler 1.02 ton/hr (steam)

Evaporation rate	:	Rating : 1.02 ton/hr
Fuel consumption	:	Normal : 48.7 l/hr
Steam pressure	:	5 kg/cm^2 Temperature : 130°C
Fuel temperature	:	40°C
Combustion air temperature	:	Normal
Stack	:	1.2 mϕ x 10 m
Operating time	:	15.5 hr/day, 102.5 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is as follows:
   O_2 - 14%, temperature - 126°C
   Because of excess air combustion, the air should be reduced. There is no problem concerning temperature.

2. Boiler maintenance is not made at all.

3. There are openings around the burner, admitting entry of air in large quantity. Fuel jet out from the burner impinge on lump of fuel residue in a middle of furnace bottom and is burning there.

4. Engineers have no knowledge on the boiler.

No. 93	Date of Visit	July 11, 1990

Name of Establishment	TENERIA TEMOLA, S. A. DE C. V.		
Type of Industry (Product)	Leather (leather for shoes)		
Scale of Factory	Medium	Number of Employees	165
Annual Sales or Production	3,000,000,000 pesos/yr		
Kind of Fuel, Consumption and Price	Heavy oil (L) (180 pesos/l) 55,000 l/mon 9,900,000 pesos/mon Diesel 1,600 l/hr (for starting) 7,680,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	3.2 ton/hr	Heavy oil (L)	122 l/hr	25	16 hr/day
Smoke tube boiler	0.8 ton/hr	Heavy oil (L)	48 l/hr	25	3 hr/day
Smoke tube boiler	0.8 ton/hr	Heavy oil (L)	48 l/hr	25	Spare

Outline of the Facility — Smoke tube boiler 3.2 ton/hr (steam)

Evaporation rate	:	Rating : 3.2 ton/hr Normal : 1.3 ton/hr
Steam pressure	:	5 kg/cm^2 g
Fuel consumption	:	Rating : 290 l/hr Normal : 125 l/hr
Fuel pressure	:	4.2 kg/cm^2 g
Temperature	:	90 to 100°C
Atomizing air pressure	:	0.9 kg/cm^2 g Temperature : Normal
Combustion air temperature	:	Normal
Stack	:	0.36 mφ x 12 m
Operating time	:	16 hr/day, 96 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This is a leather tanning plant, in particular tanning of calf leather for shoes. Boilers are used as heat source for drying of leather.

2. The exhaust gas O_2 content was 4.8%, indicating slight excess air combustion. The Bacharach was No. 5, within an allowable limit. The exhaust gas temperature was low at 163°C, with the boiler efficiency 88%. In general, combustion control is satisfactory.

No. 94	Date of Visit	July 11, 1990

Name of Establishment	SABRITAS, S. A. DE C. V.		
Type of Industry (Product)	Food (potato chips, snacks)		
Scale of Factory	Large	Number of Employees	1.650
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Natural gas (211.34 pesos/m^3) 755.982 m^3/mon 159,800,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Frying oven	0.47 ton/hr	Natural gas	60 m^3/hr		
Frying oven	0.47 ton/hr	Natural gas	60 m^3/hr		
Smoke tube boiler	2.6 ton/hr	Natural gas	190 to 237 m^3/hr	15	
Smoke tube boiler	1.3ton/hr	Natural gas	120 m^3/hr	15	
Smoke tube boiler	1.3 ton/hr	Natural gas	120 m^3/hr	15	
Oven		Natural gas			

Outline of the Facility — Smoke tube boiler 2.6 ton/hr (steam)

Evaporation rate	:	Rating : 2.6 ton/hr Normal : 2.1 ton/hr
Steam temperature	:	100°C
Fuel consumption	:	Rating : 237 m^3/hr Normal : 195m^3/hr
Fuel pressure	:	200 mmAq
Combustion air temperature	:	Normal
Combustion exhaust gas composition	:	O_2 - 2% CO_2 - 10% (as measured by the plant)
Stack	:	0.3 mφ x 12 m
Operating time	:	24 hr/day, 144 hr/week

Outline of Survey Result

Present pollution control measures	:	Natural gas used
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. This plant is equipped with boilers and many small combustion equipment (called "fryer") to fry potatoes with oil.

2. The exhaust gas O_2 content was 2.9%, with proper air ratio. But, the Bacharach value was No. 3 to 4, rather unsatisfactory for natural gas burning. The exhaust gas temperature was 236°C, nearly satisfactory, and the boiler efficiency was 86%. Soot should be areduced by improving burner.

No. 95	Date of Visit	July 12, 1990

Name of Establishment	LA HACIENDA, S. A. DE C. V.		
Type of Industry (Product)	Food (livestock feed)		
Scale of Factory	Medium	Number of Employees	160
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Heavy oil (L) 40.95 kl/mon (175.65 pesos/l) 7,192,867 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
Smoke tube boiler	1.9 ton/hr	heavy oil (L)	70 l/hr	22	

Outline of the Facility — Smoke tube boiler 1.9 ton/hr (steam)

Evaporation rate	:	Rating : 1.9 ton/hr
Fuel consumption	:	Rating : 163 l/hr Normal : 70 l/hr
Steam pressure	:	6 kg/cm^2
Fuel pressure	:	2.1 kg/cm^{2}g Temperature : 108°C
Atomizing air pressure	:	*0.9 kg/cm^{2}g*
Combustion air temperature	:	Normal
Stack	:	0.4 mϕ x 10 m
Operating time	:	22.5 hr/day, 135 hr/week

Outline of Survey Result

Present pollution control measures	:	
Future plan for pollution control	:	
Present energy-saving measures	:	

Exhaust gas measurement result is shown below:
O_2 - 16 to 18%, temperature - 216°C, Bacharach - No. 8
As there is a tendency of excess air combustion, the air quantity need be reduced. Heavy oil is not preheated, resulting in poor atomization and high Bacharach value. Installation of a preheater is recommended.

No. 96	Date of Visit	July 12, 1990

Name of Establishment	EMPAQUES Y CARTON CORRUGADO, S. A.		
Type of Industry (Product)	Paper and its product (carton)		
Scale of Factory	Medium	Number of Employees	170
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Heavy oil (H) 90 kl/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Water tube boiler	6.4 ton/hr	heavy oil (H)	550 l/hr	5	
2. Water tube boiler	3.8 ton/hr	heavy oil (H)		10	

Outline of the Facility Water tube boiler 6.4 ton/hr (steam)

Evaporation rate	:	Rating : 6.4 ton/hr
Fuel consumption	:	Rating : 550 l/hr Normal : 167 l/hr
Steam pressure	:	12 kg/cm^{2}g
Fuel pressure	:	3 kg/cm^{2}g Temperature : 102°C
Atomizing air pressure	:	0.8 kg/cm^{2}g
Atomizing air temperature	:	Normal
Combustion air temperature	:	Normal
Stack	:	0.5 mϕ x 25 m
Operating time	:	24 hr/day, 135 hr/week

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Exhaust gas measurement result is shown below:
   O_2 - 9.5%, temperature - 205°C, Bacharach - No. 7
   As there is a tendency of excess air combustion, the air should be reduced. The smoke and soot content is high because of low atomized air pressure, therefore, the latter should be raised to around 3 g/cm^2.

2. Heat insulation on the boiler is satisfactory.

3. It is advisable to install fuel and steam flow meters.

No. 97	Date of Visit	July 12, 1990

Name of Establishment	DOW QUIMICA MEXICANA, S. A.		
Type of Industry (Product)	Chemical (herbicide, insecticide, wire)		
Scale of Factory	Medium	Number of Employees	
Annual Sales or Production			
Kind of Fuel, Consumption and Price	Diesel 13.4 kl/mon (570 pesos/l) 7,638,000 pesos/mon		

Type of Combustion Facility	Capacity	Kind of Fuel	Fuel consumption	Age	Remarks
1. Smoke tube boiler	3.8 ton/hr	Diesel	329 l/hr	15	
2. Smoke tube boiler	1.3 ton/hr	Diesel		18	

Outline of the Facility — Smoke tube boiler 3.8 ton/hr (steam)

Evaporation rate	:	Rating : 3.8 ton/hr
Fuel consumption	:	Rating : 329 l/hr Normal : 60 l/hr
Steam pressure	:	7 kg/cm^2
Fuel pressure	:	4 kg/cm^2 Temperature : Normal
Atomizing air pressure	:	0.6 kg/cm^2
Atomizing air temperature	:	Normal
Combustion air temperature	:	Normal
Combustion exhaust gas composition	:	O_2 - 1.5%, CO_2 - 15.5% (as measured by the plant)
Stack	:	0.5 mφ x 7 m
Operating time	:	8 hr/day, 48 hr/week, 7 mon/yr

Outline of Survey Result

Present pollution control measures	:	None
Future plan for pollution control	:	None
Present energy-saving measures	:	None

1. Refined diesel oil is used by special order, with sulfur content of 0.4%.

2. Exhaust gas measurement result is as follows:
   O_2 - 2.8%, temperature - 109°C, Bacharach - No. 0
   The combustion state is extremely good and the Bacharach value of No. 0 is achieved only by this plant among those using diesel.

3. This plant is positive in environmental protection and the facility is well maintained.

4. This plant showed the best combustion state among plants surveyed. This is a good example of effectiveness of fuel changeover. The plant is 100% owned by the US capital.