Table 1. Large Industrial Boiles under Regulation 1142: Emission Rate Analysis.

Unit ID	Description	Heat Input Capacity (mmBtu/Hr)	2002 Actual Heat Input (mmBTU/hr)	Present Permit Limit (lb/mmBtu)	Present Control (yr installed)	2002 Emission Rate* (lb/mmBtu)	Weighted Rate**	2002 NOx Emission (TPD)
21-H-2	Heater	221	212	0.2	LNB (1996)	0.09	0.0053	0.24
21-H-701	Heater	349	403	0.043/0.066	ULNB+SNCR	0.04	0.0046	0.21
22-H-3	CO boiler	676	329	None	SNCR	0.45	0.0395	1.79
23-H-3	CO boiler	679	406	None	None	0.41	0.0444	2.01
37-H-1	Heater	337	340	0.2	None	0.06	0.0053	0.24
41-H-1	Heater	461	0	0.2	COEN LNB (1983)	0.00	0.0000	0.00
42-H-1,2,3	Heater	353	375	0.2	None	0.11	0.0113	0.51
80-1	Boiler 1	618	464	0.2	None	0.18	0.0221	1.00
80-2	Boiler 2	716	312	0.04	ULNB+FGR+SI (2004)	0.16	0.0132	0.60
80-3	Boiler 3	618	426	0.2	None	0.19	0.0214	0.97
80-4	Boiler 4	737	507	0.2	None	0.19	0.0252	1.14
		5765	3774			Weighted Average:	0.1923	8.71

* Calculated using 2002 heat input and 2002 emissions.

** Weighted on individual unit's 2002 actual heat input.

Table 2. States' Regulations Limiting NOx Emissions from Boilers and Heaters

Unit	Heat Input Rating	Control Method	Standard	Cost Effect.	Aqency	Affected Units	Date of Rule
Small Combustion Sources - All gas-fired heaters and boilers	>2MMBtu/hr	none specified	0.036 lb/MMBtu ***or*** 30 ppm @ 3% O2	n/s	Texas CEQ	New and Existing	Adopted April 2005, Effective May 2005
FCCU CO boilers	none specified	n/s	40 ppm @ 0% O2 ***or*** 90% NOx reduction of calculated June-Aug 1997 daily exhaust concentration	n/s	TCEQ for Houston-Galveston area	New and Existing	
Gas-fired boilers	> 100 MMBtu/hr	n/s	0.02 lb/MMBtu	n/s	TCEQ for Houston-Galveston	New and Existing	
Gas-fired boilers	> 40 MMBtu/hr	n/s	30 ppm @ 3% O2	n/s	TCEQ for Dallas-Fort Worth	New and Existing	
Gas-fired boilers	> 40 MMBtu/hr	n/s	0.10 lb/MMBtu	n/s	TCEQ for Beaumont-Port	New and Existing	
Gas-fired process heater	> 40 MMBtu/hr	n/s	0.08 lb/MMBtu	n/s	TCEQ for Beaumont-Port	New and Existing	
Refinery boilers inc. CO boilers	> 40 MMBtu/hr	n/s	0.03 lb/MMBtu ***or*** Case-by Case Alternative	n/s	South Coast AQMD (California)	New and Existing	Last Amended Aug 1988
Refinery boilers and heaters	> 110 MMBtu/hr	n/s	0.0062 lb/MMBtu ***or*** 5 ppm @3% O2	n/s	San Joaquin Valley APCD (California)	New and Existing	Sept 2003

Table 3. Control Standards and Cost Information in Other States.

Unit	Standard (MMBtu/hr)	Heat Input Rating	Control Method	Cost Effect.	Fuel	Date of Determination	RBLC ID#
Fractionator Furnace	0.04	360	ULNB	$12,417 per ton	n/s	2002	LA-0123
Hydrogen Reforming Process Heater	0.0360	689	ULNB	$2,442	NG	1999	MN-0040
Crude Heater	0.0450	147	LNB	n/s	RFG	2003	PA-0231
Delayed Coker Heater	0.0350	116	LNB	n/s	RFG	2003	PA-0231
Atmos. Crude Heater	0.0125	346	ULNB+SCR	n/s	NG/RFG	2004	AZ-0046
Reactor Charge Heater	0.0125	311	LNB+SCR	n/s	NG/RFG	2005	AZ-0046
H2 Reformer Heater	0.0125	1435	LNB+SCR	n/s	NG/RFG	2005	AZ-0046
Boiler	0.012	250	LNB+SCR	n/s	n/s	2005	LA-0204
Crude Heater	0.045	145	ULNB	n/s	n/s	2003	OK-0089
Reformer Charge Heater	0.05	248	none	n/s	RFG	2000	TX-0395
Reactor Feed Heater	0.036	104	SCR	n/s	RFG	2002	TX-0375
Crude Vacuum Feed Heater	0.038	150	ULNB	n/s	NG	1999	LA-0119
Boiler	0.028	363	ULNB+FGR	$801	NG	2005	WA-0301
Heater	0.032	237	ULNB	n/s	NG	1999	LA-0119
Steam/Methane Reformer Furnace	5ppm / 0.006 lb/MMBtu	780	LNB+SCR	n/s	RFG+ PSA gas	2004	SCAQMD-411357
Reformer Furnace	5ppm / 0.006 lb/MMBtu	653	LNB+SCR	n/s	RFG	1999	SCAQMD-341340
Reformer Furnace	7ppm / 0.0085 lb/MMBTU	460	LNB+SCR	n/s	RFG+ PSA gas	1999	SCAQMD-326118

Table 4. Cost Information for Other Source Categories

Cost ranges for coal-fired boilers at EGUs

Control Technology	Reduction Capability (%) Capacity (%)	Cost Effectiveness ($ per ton NOx reduction)
Low NOx Burner	30 - 50	200 - 1000
Overfire Air	20 - 30	250 - 600
Reburn	30 - 60	500 - 2000
SNCR	30 -50	800 - 1500
SCR	70 - 90	1000 - 2000

Cost range for mobile source control measures

Control Progam	Implementing Date	Cost Effectiveness $ per ton VOC/NOx reduction
Control of Highway Motorcycle Emission	2003	1150 - 2130
Marine SI engine standard	1998	1128 - 1778
On-board diagnostics	2002	2228
NLEV	1999	1859
Tier 1 vehicle standard	1995	1980 - 2690
Non-road diesel engine Tier 2 srandard	1999	410 - 690