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APPENDICES

Appendix 1: Semi-structured Questionnaire for Service providers

		1	2	3	4
Organization (Not compulsory)					
Details of the boiler	Boiler type				
	Design				
	Fuel				
	Rated Capacity				
	Design Pressure				
	Operating pressure				
Steam Boilers	Actual Steam generation rate				
	Feed Water Temperature				
Hot water / thermic oil boilers	Water / Oil inlet temperature				
	Water / Oil outlet temperature				
	Water / oil Flow rate				
	Actual Fuel firing rate				
Flue Gas Analysis	O2 % in flue gas				
	CO2 % in flue gas				
	CO % in flue gas				
	Average flue gas temperature				
Ambient Air	Dry bulb temperature				
	Wet Bulb Temperature				
Surface temperature of boiler					

If feed water tank level used to calculate the operating capacity	Tank orientation and shape				
	Tank Dimensions				
	Level 1				
	Level 2				
	Time Duration for the trial				
If tank level used to calculate fuel consumption rate	Tank orientation and shape				
	Tank dimensions				
	Level 1				
	Level 2				
	Time for the trial				
For biomass boilers	Moisture content of fuel				
	Amount of Fly ash				
	Amount of bottom ash				

Appendix 2: Semi-structured Questionnaire for Boiler Owners

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Questionnaire for Final Year Project on 'Commercial and Industrial Boiler Performance Evaluation'

1	Name of the company (Not compulsory)		
2	Location of the company		
3	Manufacturer of the boiler		
4	Design of the boiler		Dry back
5	Type of the boiler		
6	Fuel use		
7	Design Capacity		kg/hr
8	Design Pressure		kW
9	Actual Working pressure		kg/cm^2
10	Actual Working Temperature		ºC
11	Actual average working capacity		kg/hr
12	Feed water/ oil / water inlet temperature		ºC
13	Availability of steam/water/oil flow meter		
14	Availability of feed water/water/oil flow meter		
15	Availability of fuel flow meter / measuring system		
16	Flue gas temperature just after the boiler		ºC
17	Availability of economizer		
18	Availability of combustion air pre heater		
19	Temperature of water / oil after economizer		ºC
20	Temperature of combustion air after air pre-heater		ºC
21	Temperature of flue gas after economizer and APH		ºC
22	Do you have online efficiency monitoring system		
23	Do you have flue gas measuring instrument installed		
24	If yes, what parameters do you measure?		
25	Do you recover Condensate		
26	If yes, what percentage of the generation is recovered		

27	Frequency of flue gas analysis		
28	Test Results of the last flue gas analysis, Percentage O2		%
29	Percentage CO2		%
30	Percentage CO		%
31	Flue gas temperature at the time of testing		ºC
32	Ambient temperature at the time of testing		ºC
33	What is the feed water TDS (After feed water tank)		
34	Boiler water TDS		ppm
35	Blowdown frequancy		
36	Blowdown duration		Seconds
37	Availability of Continuous Blowdown		
38	If yes, rate of continuous blowdown		
39	Average boiler surface temperature		ºC
40	Have you done any analysis to evaluate the efficiency by direct method		
41	If yes, what is the efficiency by direct method		%
42	What is the actual steam to fuel ratio