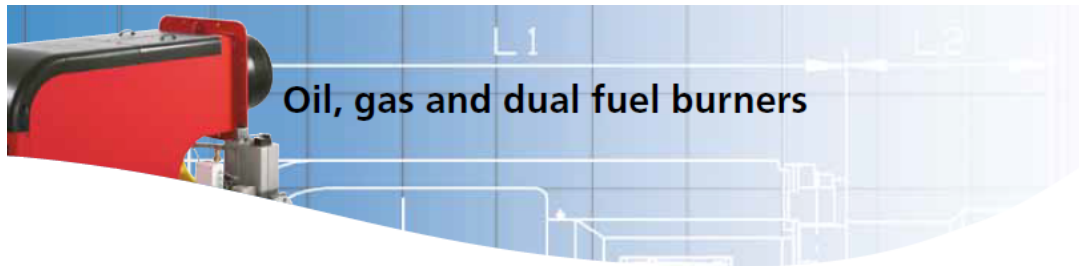


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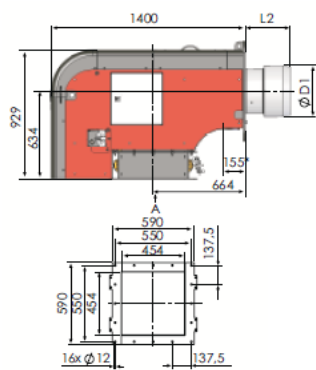
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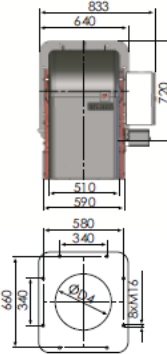
Appendix A: Burner Selection Data Sheet



KP/RP/GP/GKP/GRP-400...600 ME

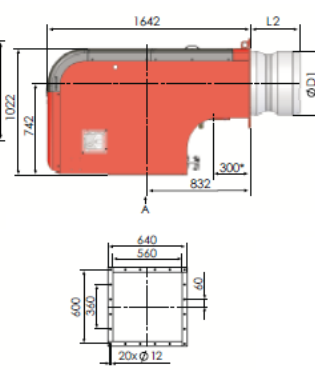


VIEWED FROM DIRECTION A
Air duct installation flange

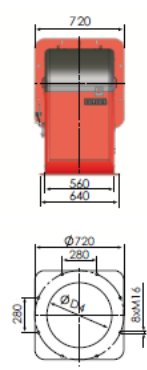


Installation of the burner to a boiler

KP/RP/GP/GKP/GRP-800...1200 ME



VIEWED FROM DIRECTION A
Air duct installation flange

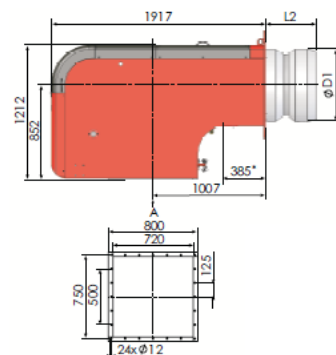


Installation of the burner to a boiler

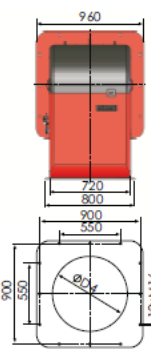
BURNER	L2	ØD1	ØD4
400 ME	325	370	430
600 ME	335	395	455
800 ME	360	422	482
1000 ME	390	496	556
1200 ME	400	520	580

* Only in gas and dual fuel burners

KP/RP/GP/GKP/GRP-1600...2000 ME

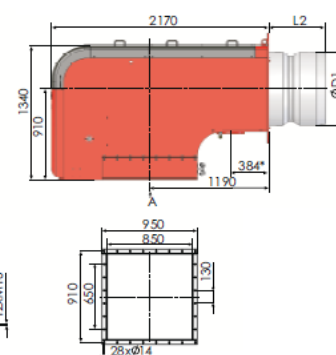


VIEWED FROM DIRECTION A
Air duct installation flange

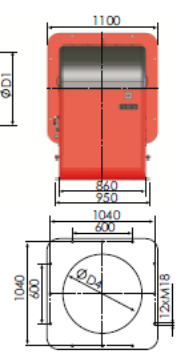


Installation of the burner to a boiler

KP/RP/GP/GKP/GRP-2500 ME



VIEWED FROM DIRECTION A
Air duct installation flange



Installation of the burner to a boiler

BURNER	L2	ØD1	ØD4
1600 ME	450	594	654
2000 ME	450	650	710
2500 ME	570	740	800

* Only in gas and dual fuel burners

KP/RP/GP/GKP/GRP-400...-2500 ME

Technical data

BURNER	KP-400 ME	KP-600 ME	KP-800 ME	KP-1000 ME	KP-1200 ME	KP-1600 ME	KP-2000 ME	KP-2500 ME
Capacity MW	1,2 - 5,0	1,7 - 6,8	2,4 - 9,5	3,0 - 12,0	3,5 - 14,0	4,2 - 16,5	5,6 - 22,5	7,4 - 29,5
kg/h	100 - 420	143 - 573	200 - 800	250 - 1000	300 - 1200	350 - 1400	470 - 1900	621 - 2490
Connections	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	Ø 22/28
Pilot burner			light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil
- fuel	-	-	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)
- connection	-	-	(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)

BURNER	RP-400 ME	RP-600 ME	RP-800 ME	RP-1000 ME	RP-1200 ME	RP-1600 ME	RP-2000 ME	RP-2500 ME
Capacity MW	1,2 - 4,7	1,7 - 6,8	2,2 - 9,0	2,8 - 11,0	3,4 - 13,0	3,9 - 15,5	5,3 - 21,0	8,0 - 28,0
kg/h	106 - 417	150 - 600	200 - 800	250 - 1000	300 - 1200	350 - 1400	470 - 1900	710 - 2530
Connections	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	Ø 22/28
Pilot burner		liquid gas	LPG	LPG	LPG	LPG	LPG	LPG
- fuel	-		(light fuel oil)	(light fuel oil)	(light fuel oil)	(light fuel oil)	(light fuel oil)	(light fuel oil)
- connection	-	Ø 18	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))

BURNER	GP-400 ME	GP-600 ME	GP-800 ME	GP-1000 ME	GP-1200 ME	GP-1600 ME	GP-2000 ME	GP-2500 ME
Capacity MW	1,2 - 5,0	1,7 - 6,8	1,9 - 9,5	2,0 - 12,0	2,8 - 14,0	3,3 - 16,5	4,5 - 22,5	5,9 - 29,5
- connection	DN50 - 100	DN50 - 100	DN65 - 125	DN65 - 125	DN80 - 125	DN100 - 125	DN100 - 125	DN125
Capacity MW / Low-NOx	-	-	1,7 - 8,8	2,2 - 11,0	2,6 - 13,0	3,1 - 15,6	4,1 - 20,5	5,4 - 27,0
Pilot burner								
- connection	Ø 18	Ø 18	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22	Ø 22

BURNER	GKP-400 ME	GKP-600 ME	GKP-800 ME	GKP-1000 ME	GKP-1200 ME	GKP-1600 ME	GKP-2000 ME	GKP-2500 ME
Capacity								
- gas MW	1,2 - 5,0	1,7 - 6,8	1,9 - 9,5	2,0 - 12,0	2,8 - 14,0	3,3 - 16,5	4,5 - 22,5	5,9 - 29,5
- oil MW	1,2 - 5,0	1,7 - 6,8	2,4 - 9,5	3,0 - 12,0	3,5 - 14,0	4,2 - 16,5	5,6 - 22,5	7,4 - 29,5
kg/h	100 - 420	143 - 573	200 - 800	250 - 1000	300 - 1200	350 - 1400	470 - 1900	621 - 2490
Connections								
- gas	DN50 - 100	DN50 - 100	DN65 - 125	DN65 - 125	DN80 - 125	DN100 - 125	DN100 - 125	DN125
- oil	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	Ø 22/28
Pilot burner			natural gas/	natural gas/	natural gas/	natural gas/	natural gas/	natural gas/
- fuel	natural gas	natural gas	light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil
- connection	Ø 18	Ø 18	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)
			(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)	(Ø 22)

BURNER	GRP-400 ME	GRP-600 ME	GRP-800 ME	GRP-1000 ME	GRP-1200 ME	GRP-1600 ME	GRP-2000 ME	GRP-2500 ME
Capacity								
- gas MW	1,2 - 5,0	1,7 - 6,8	1,9 - 9,5	2,0 - 12,0	2,8 - 14,0	3,3 - 16,5	4,5 - 22,5	5,9 - 29,5
- oil MW	1,2 - 4,7	1,7 - 6,8	2,2 - 9,0	2,8 - 11,0	3,4 - 13,0	3,9 - 15,5	5,3 - 21,0	8,0 - 28,0
kg/h	106 - 417	150 - 600	200 - 800	250 - 1000	300 - 1200	350 - 1400	470 - 1900	710 - 2530
Connections								
- gas	DN50 - 100	DN50 - 100	DN65 - 125	DN65 - 125	DN80 - 125	DN100 - 125	DN100 - 125	DN125
- oil	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	2 x Ø 22	Ø 22/28
Pilot burner			light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil	light fuel oil
- fuel	natural/liquid gas	natural/liquid gas	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)	(LPG)
- connection	Ø 18	Ø 18	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))	(Ø 22 (Ø 8))

Light fuel oil: 1 kg/h \cong 11,86 kW

1 kW \cong 860 kcal/h

Heavy fuel oil: 1 kg/h \cong 11,22 kW

1 kW \cong 860 kcal/h

Natural gas: caloric value $H_u = 9,5 \text{ kWh/m}^3$ (34,3 MJ/m³)

density $\rho = 0,723 \text{ kg/m}^3$

Regulating range:

Light fuel oil: 1:3 (100 - 33 %)

Heavy fuel oil: 1:2,5 (100 - 40 %)

Gas: 1:5 (100 - 20 % , 1:4 /400/600)

Appendix B :Burners Technical Data

Table 01: Collected data for Direct method efficiency calculation

Description	Units	Hot water Watawala	Bio Mass, Watawala	Mahiyang anaya	Higurana Suger	Welioya tea Hot water	Welioya tea Bio Mass	Ranala Factory	Boiler at Avissawella	Boiler At Pannala Textile Factory	Boiler At Ratmalana Textile Factory
Heat Output (MCR)	Kcal/h	600,000	850,000	4,620,000	420,000	850,000	800,000	60,000	300,000	240,000	240,000
Operating Pressure	bar	10.54	10.34	10.34	15.17	5	6	9.5 bar	35	10	10
Water Flow Rate	m ³ /h	35	38	26-30	55	36	6	1	26	25	25
Operating Temperature	°C	110-135	145	1000	900	270	260	270	900		
Fuel		Fuel Wood	Fuel wood	Fuel wood (Griceidia, and other)	Fuel wood Bagasse	Jungle wood(Size 18"x4"), Rubber	Jungle wood(Size 24"), Rubber	Fuel wood (Griceidia, and other)	Pulverized coal	Pulverized coal	Pulverized coal

Description	Units	Hot water Watawala	Bio Mass, Watawala	Mahiyang anaya	Higurana Suger	Welioya tea Hot water	Welioya tea Bio Mass	Ranala Factory	Boiler at Avissawella	Boiler At Pannala Textile Factory	Boiler At Ratmalana Textile Factory
Fuel calorific Value (GCV)	kcal/kg	3200	3200	7643	7643 4490	3200	3200	3200	6448.8	6448.8	6448.8
Fuel Consumption on GCV basis	Kg/hr	275	700	11,000	8,000 6000	3000	2000	5000	5000	2400	3800
Thermal Efficiency NCV	%	68%	64%	98%	About 65%	-	-	85%	85%	85%	85%
Steam Pressure	bar	-	150	62	15	5	-	8.5	35	10	10
Steam Temperature	°C	-	135-145	750-800	900		-	255	385	182	182

Description	Units	Hot water Watawala	Bio Mass, Watawala	Mahiyang anaya	Higurana Suger	Welioya tea Hot water	Welioya tea Bio Mass	Ranala Factory	Boiler at Avisawell a	Boiler At Pannala Textile Factory	Boiler At Ratmalana Textile Factory
Boiler tube type		Water tube	Water tube	Water tube	Fire tube	Water tube	Water tube	Water tube	Water tube	Water tube	Water tube
Feed Water Temperature	°C	24	24	28	27	22	22	26	27	27	28
Ambient Temperature	°C	26	26	31	30	25	25	30	30	30	32

Table 02: Collected Data for the Indirect Calculations

	Parameter	Unit	Coal Boiler 1	Coal Boiler 2	Bio Mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler 1	Coconut Husk Boiler 2	Coal Boiler 3	Fire Wood Boiler 1
	Year Of Installation of Boiler		1985	1994	2014	2014	2010	2014	2005	2007	2013
	<u>Flue Gas Analyse Data</u>										
1	Oxygen, O ₂ (%)	%	8.8	3.55	5.7	10.5	11.4	14.7	11.7	11.9	5.67
2	Excess Air (%)	%	73.0	85	37	98	127	238	130	110	150
3	Carbon Dioxide, CO ₂ (%)	%	9.0	14.87	13.4	10	9.4	7.1	11.4	8.2	3300
4	Carbon Monoxide, CO (mg/m ³)	mg/m ³	0	59	0.5	397	3	3375	1098	83.8	1.69
5	Sulphur Dioxide, SO ₂ (mg/m ³)	mg/m ³	637	0	0	464	13	893	244	408	0
6	Nitrogen Dioxide, NO _x (mg/m ³)	mg/m ³	251	60	278	432	376	86	107	344.6	0
7	Flue Gas Temp. (C)	°C	143	45	163	150	142	100	190	81	157
8	Average Fuel Consumption Rate	Kg/hr	240	3500	25000	14500	50000	24000	22500	120000	1700
9	Gross Calorific Value of Fuel	MJ/kg	22.00	22	13.397	13.397	13.397	19.58	19.58	26.79	18.5
11	Energy Input to the Boiler	MJ	1443.57	77000	334925	194256.5	669850	469920	440550	321480 0	31450
12	Cp of Flue Gas	kCal/kg	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	<u>Ultimate Analysis Data</u>										
13	Carbon percentage in fuel, C	%	60.00	60.00	62.00	61.28	60.50	40.00	40.00	61.20	61.0
14	Hydrogen percentage in fuel, H	%	3.80	3.80	4.10	5.12	4.20	6.00	6.00	4.00	6.00

	Parameter	Unit	Coal Boiler 1	Coal Boiler 2	Bio Mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler 1	Coconut Husk Boiler 2	Coal Boiler 3	Fire Wood Boiler 1
15	Nitrogen percentage in fuel, N	%	1.50	1.00	2.1	0.92	1.8	0.5	0.5	1.8	2.1
16	Oxygen percentage in fuel, O	%	6.20	6.20	5.8	4.53	5.8	38	38	4.1	5.8
17	Suphar percentage in fuel, S	%	0.50	0.50	0.5	0.08	0.6	0.3	0.3	0.4	0.5
			72.00	71.50	74.50	71.93	72.90	84.80	84.80	71.50	
18	mass of the CO ₂ +SO ₂ +N ₂ +O ₂ in flue Gas,m		0.83	0.84	0.83	0.85	0.83	0.47	0.47	0.86	0.81
19	Percentage of H in 1 kg of fuel	%/kg of Fuel	3.80	3.80	4.10	5.12	4.20	6.00	6.00	4.00	6.00
20	Gross Calorific Value of Fuel, GCV	kCal/kg	5400.00	5254.6	3199.739 48	3164	3078	4500	4500	6400	3200
21	Flue Gas Temperature, T _f	⁰ C	140.00	250.00	160.00	150.00	142.00	100.00	190.00	81.00	157
22	Ambient Temperature, T _a	⁰ C	35.00	30.00	30.00	26.00	30.00	30.00	30.00	33.00	34.5
29	Percentage moisture in kg of fuel, M	kg	7.00	15.00	30.00	11.70	13.10	10.00	10.00	7.20	25
30	C _p of the Superheated Steam	kCal/kg	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
35	Relative Humidity	%	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
36	Humidity Factor		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
43	fly ash amount of 1kg of coal	kg	0.30	0.3	0.3	0.147	0.2	0.16	0.16	0.3	1.3
44	GCV of fly ash	kCal/kg	108.00	105.09	63.99	63.28	61.56	90.00	90.00	128.00	64.00

	Parameter	Unit	Coal Boiler 1	Coal Boiler 2	Bio Mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler 1	Coconut Husk Boiler 2	Coal Boiler 3	Fire Wood Boiler 1
48	bottom ash amount of 1kg of coal	kg	0.03	0.025	0.1	0.163	0.01	0.01	0.01	0.01	1.01
49	GCV of the bottom ash	kCal/kg	216.00	210.18	127.99	126.56	123.12	180.00	180.00	256.00	128
50	Operation pressure	bar	10	10	71	44	51.4	10.34	10	13	10
51	Operating Temperature	⁰ C	290	260	288	440	275	260	290	320	240
52	Steam Generation rate	kg/hr	1440	15000	30000	14500	50000	3000	3200	18000	
53	Feed water Temperature	⁰ C	26	26		24	27	25	25	26	60

Appendix C: Calculation Data

Table 03: Boiler efficiency with moisture content

Moisture Content of fuel/(%)	Efficiency/(%)								Fire Wood Boiler
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	
0.0	86.64	81.01	77.78	68.80	72.52	77.78	84.22	91.19	75.63
2.5	86.34	80.69	77.28	68.29	72.01	77.49	83.86	90.95	75.13
5.0	86.05	80.36	76.78	67.78	71.49	77.44	83.49	90.72	74.64
7.5	85.75	80.04	76.27	67.27	70.98	77.23	83.13	90.48	74.14
10.0	85.46	79.72	75.77	66.76	70.46	77.06	82.76	90.25	73.64
12.5	85.16	79.39	75.27	66.25	69.95	76.89	82.40	90.01	73.14
15.0	84.87	79.07	74.76	65.74	69.43	76.72	82.03	89.78	72.64
17.5	84.57	78.74	74.26	65.23	68.92	76.55	81.67	89.54	72.14
20.0	84.28	78.42	73.76	64.72	68.40	76.38	81.30	89.31	71.64
22.5	83.98	78.10	73.26	64.21	67.89	76.21	80.94	89.07	71.14
25.0	83.69	77.77	72.75	63.70	67.37	76.04	80.57	88.84	70.64
27.5	83.39	77.45	72.25	63.19	66.86	75.87	80.21	88.60	70.14
30.0	83.10	77.12	71.75	62.68	66.34	75.70	79.84	88.37	69.65
32.5	82.80	76.80	71.24	62.17	65.83	75.53	79.48	88.13	69.15
35.0	82.51	76.48	70.74	61.66	65.31	75.36	79.11	87.90	68.65
37.5	82.21	76.15	70.24	61.15	64.80	75.19	78.75	87.66	68.15
40.0	81.92	75.83	69.73	60.64	64.28	75.02	78.38	87.43	67.65

Table 04: Boiler efficiency with Carbon content

Carbon Content/(%)	Efficiency /(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
35	86.93	82.40	73.84	70.23	72.27	86.19	83.73	90.33	71.48
40	86.65	81.94	73.36	69.71	71.65	85.57	82.76	90.22	71.32
45	86.41	81.54	72.93	69.25	71.12	85.01	81.88	90.12	71.16
50	86.14	81.10	72.47	68.75	70.53	84.41	80.94	90.01	71.00
55	85.88	80.67	72.01	68.26	69.96	83.82	80.02	89.91	70.83
60	85.62	80.24	71.56	67.77	69.38	83.23	79.09	89.80	70.67
65	85.36	79.81	71.10	67.28	68.81	82.64	78.17	89.70	70.51
70	85.10	79.38	70.65	66.79	68.23	82.05	77.24	89.59	70.35
75	84.84	78.95	70.19	66.30	67.66	81.46	76.32	89.49	70.19

Table 05: Boiler efficiency with Installation year

Plant Name	Year Of Installation	Efficiency Value/(%)
Coal Boiler 1	1985	85.8
Coal Boiler 2	1994	80.5
Coconut Husk Boiler 2	2005	82.8
Coal Boiler 3	2007	89.9
Paddy Husk Boiler 2	2010	69.8
Fire Wood Boiler	2013	70.64
Bio Mass Boiler	2014	72.1
Paddy Husk Boiler 1	2014	68.1
Coconut Husk Boiler 1	2014	85.6

Table 06: Boiler efficiency with Exhaust Temperature

Exhaust Temperature	Ambient temperature	Coal Boiler 1		Coal Boiler 2		Bio mass Boiler 1		Paddy Husk Boiler 1		Paddy Husk Boiler 2		Coconut Husk Boiler1		Coconut Husk Boiler2		Coal Boiler 3		Fire Wood Boiler	
		Efficiency Ambient 1	Efficiency Exhaust 1	Efficiency Ambient 2	Efficiency Exhaust 2	Efficiency Ambient 3	Efficiency Exhaust 3	Efficiency Ambient 4	Efficiency Exhaust 4	Efficiency Ambient 5	Efficiency Exhaust 5	Efficiency Ambient 6	Efficiency Exhaust 6	Efficiency Ambient 7	Efficiency Exhaust 7	Efficiency Ambient 8	Efficiency Exhaust 8	Efficiency Exhaust 9	Efficiency Ambient 9
100	20	84.70	88.8	80.00	88.7	70.70	78.40	67.10	75.80	68.20	76.80	85.00	85.6	82.30	86.7	88.70	88.20	76.70	69.10
120	22	84.90	87.3	80.10	87.6	70.90	76.30	67.50	72.70	68.50	73.50	85.10	84.4	82.40	85.8	88.90	86.50	75.60	69.30
140	24	85.00	85.8	80.20	86.5	71.10	74.20	67.80	69.60	68.80	70.20	85.20	83.2	82.50	84.9	89.10	84.40	74.60	69.60
160	26	85.17	84.3	80.30	85.4	71.30	72.10	68.17	66.50	69.10	66.90	85.30	82	82.60	84	89.30	82.57	72.50	69.80
180	28	85.32	82.8	80.40	84.3	71.50	70.00	68.52	63.40	69.40	63.60	85.40	80.8	82.70	83.1	89.50	80.67	71.45	70.00
200	30	85.47	81.3	80.50	83.2	71.70	67.90	68.87	60.30	69.70	60.30	85.50	79.6	82.80	82.2	89.70	78.77	70.09	70.25
220	32	85.62	79.8	80.60	82.1	71.90	65.80	69.22	57.20	70.00	57.00	85.60	78.4	82.90	81.3	89.90	76.87	68.73	70.48
240	34	85.77	78.3	80.70	81	72.10	63.70	69.57	54.10	70.30	53.70	85.70	77.2	83.00	80.4	90.10	74.97	67.37	70.71
260	36	85.92	76.8	80.80	79.9	72.30	61.60	69.92	51.00	70.60	50.40	85.80	76	83.10	79.5	90.30	73.07	66.01	70.94
280	38	86.07	75.3	80.90	78.8	72.50	59.50	70.27	47.90	70.90	47.10	85.90	74.8	83.20	78.6	90.50	71.17	64.65	71.17
300	40	86.22	73.8	81.00	77.7	72.70	57.40	70.62	44.80	71.20	43.80	86.00	73.6	83.30	77.7	90.70	69.27	63.29	71.40
320	42	86.37	72.3	81.10	76.6	72.90	55.30	70.97	41.70	71.50	40.50	86.10	72.4	83.40	76.8	90.90	67.37	61.93	71.63

Table 07:Boiler efficiency with Excess Air Percentage

Excess Air Supplied Percentage/(%)	Efficiency/(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
0	88.9	82.4	75.4	77.2	79.4	87.9	85.7	92.2	73.8
25	87.8	80.1	73.2	74.9	77.4	87.7	85.1	91.7	71.7
50	86.8	77.8	70.9	72.7	75.4	87.4	84.5	91.3	69.6
75	85.7	75.5	68.6	70.4	73.4	87.2	83.9	90.9	67.5
100	84.65	73.2	66.35	68.15	71.4	86.95	83.3	90.45	65.4
125	83.59	70.9	64.08	65.89	69.4	86.71	82.7	90.02	63.3
150	82.53	68.6	61.81	63.63	67.4	86.47	82.1	89.59	61.2
175	81.47	66.3	59.54	61.37	65.4	86.23	81.5	89.16	59.1
200	80.41	64	57.27	59.11	63.4	85.99	80.9	88.73	57
225	79.35	61.7	55	56.85	61.4	85.75	80.3	88.3	54.9
250	78.29	59.4	52.73	54.59	59.4	85.51	79.7	87.87	52.8

Table 08: Boiler efficiency with Hydrogen Percentage in Fuel

Hydrogen percentage in Fuel/(%)	Efficiency/(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
0	89.90	85.50	79.60	77.60	77.80	93.10	90.90	93.30	81.4
1	88.80	83.90	77.80	75.80	75.90	91.90	89.60	92.50	79.6
2	87.70	82.70	75.90	73.90	74.00	90.60	88.20	91.60	77.9
3	86.70	81.50	74.10	72.00	72.10	89.40	86.80	90.70	76.1
4	85.60	80.10	72.25	70.15	70.20	88.15	85.45	89.85	74.35
5	84.53	78.78	70.41	68.28	68.30	86.91	84.08	88.98	72.59
6	83.46	77.46	68.57	66.41	66.40	85.67	82.71	88.11	70.83
7	82.39	76.14	66.73	64.54	64.50	84.43	81.34	87.24	69.07
8	81.32	74.82	64.89	62.67	62.60	83.19	79.97	86.37	67.31
9	80.25	73.50	63.05	60.80	60.70	81.95	78.60	85.50	65.55
10	79.18	72.18	61.21	58.93	58.80	80.71	77.23	84.63	63.79

Table 09: Boiler efficiency with Oxygen Percentage in flue gas

Oxygen Percentage in Flue Gas/(%)	Boiler Efficiency/(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
0	88.90	82.40	75.40	77.20	79.40	87.90	85.70	92.20	73.8
1	88.70	81.90	75.00	76.80	79.00	87.90	85.60	92.10	73.4
2	88.50	81.40	74.50	76.30	78.60	87.80	85.40	92.00	72.9
3	88.20	80.90	73.90	75.70	78.10	87.80	85.30	91.90	72.4
4	88.00	80.40	73.45	75.25	77.70	87.75	85.15	91.80	71.95
5	87.77	79.90	72.95	74.75	77.27	87.71	85.01	91.70	71.48
6	87.54	79.40	72.45	74.25	76.84	87.67	84.87	91.60	71.01
7	87.31	78.90	71.95	73.75	76.41	87.63	84.73	91.50	70.54
8	87.08	78.40	71.45	73.25	75.98	87.59	84.59	91.40	70.07
9	86.85	77.90	70.95	72.75	75.55	87.55	84.45	91.30	69.6
10	86.62	77.40	70.45	72.25	75.12	87.51	84.31	91.20	69.13
11	86.39	76.90	69.95	71.75	74.69	87.47	84.17	91.10	68.66
12	86.16	76.40	69.45	71.25	74.26	87.43	84.03	91.00	68.19
13	85.93	75.90	68.95	70.75	73.83	87.39	83.89	90.90	67.72
14	85.70	75.40	68.45	70.25	73.40	87.35	83.75	90.80	67.25
15	85.47	74.90	67.95	69.75	72.97	87.31	83.61	90.70	66.78

Table 10: Boiler efficiency with Cp Value of Flue gas

Cp value of Flue Gas/(%)	Efficiency/(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
0.1	90.00	86.80	79.10	78.40	79.80	87.60	86.10	92.20	77.2
0.2	86.80	82.00	73.70	70.50	72.10	86.00	83.50	90.40	72.2
0.3	83.60	77.20	68.30	62.50	64.40	84.50	81.00	88.60	67.1
0.4	80.40	72.40	62.90	54.57	56.70	82.93	78.43	86.80	62.1
0.23	85.80	80.50	72.10	68.10	69.80	85.60	82.80	89.90	70.7

Table 11: Boiler efficiency with Cp value of the superheated steam

Cp value of Flue Gas/(%)	Efficiency/(%)								
	Coal Boiler 1	Coal Boiler 2	Bio mass Boiler 1	Paddy Husk Boiler 1	Paddy Husk Boiler 2	Coconut Husk Boiler1	Coconut Husk Boiler2	Coal Boiler 3	Fire Wood Boiler
0.2	86.00	81.00	72.70	68.60	70.30	85.80	83.30	90.00	71.4
0.3	85.90	80.80	72.50	68.40	70.10	85.70	83.10	89.90	71.1
0.4	85.90	80.60	72.20	68.20	69.90	85.60	82.90	89.90	70.8
0.5	85.80	80.40	71.90	68.00	69.70	85.50	82.60	89.90	70.5
0.6	85.70	80.20	71.70	67.70	69.50	85.40	82.40	89.80	70.2
0.45	85.80	80.50	72.10	68.10	69.80	85.60	82.80	89.90	70.7