Pre bid Engineering services for Tamil Nadu Newsprint & Papers Limited

Client: Enmas Andritz Private Limited, Chennai

Project: 125 TPH AFBC BOILER, TNPL

Scope Of Work:

i) AFBC Boiler Heat and Mass balance sheet

ii) 125 TPH AFBC Boiler Thermal design calculation

HEAT AND MASS BALANCE			
PROJECT: TAMIL NADU NEWSPRINT AND PAPERS LIMITED- NEW BOILER			26.10.2023
ENGINEER: PRAKASH.A	REV:0	Imported coal	Imported coal
BOILER LOAD	%	100	60
MAIN STEAM FLOW PARAMETERS			
STEAM CAPACITY	Kg/hr	125000	75000
STEAM PRESSURE	Kg/cm^(a)	105	105
STEAM TEMPERATURE	°C	525	525
FEED WATER TEMPERATURE	°C	135	135
FEED WATER TEMPERATURE AFTER HEATER	°C	175	175
SPECIFIC ENTHALPY OF FEED WATER		137.47	137.47
SPECIFIC ENTHALPY OF FEED WATER AFTER HEATER	Kcal/Kg	178.44	178.44
SPECIFIC ENTHALPY OF O/L STEM TEMP	Kcal/Kg	820.60	820.60
BOILER HEAT DUTY	Mkcal/hr	80.271	48.162
SITE CONDITIONS			
AIR TEMPERATURE AT AHR I/L	°C	43	43
AMBIENT AIR TEMPERATURE	°C	35	35
RELATIVE HUMIDITY	%	35	35
COMBUSTION AIR TEMPERATURE	°C	182	180
PLANT ELEVATION ABOVE MSL	m	150	150
AIR MOISTURE (STOICHIOMETRIC AIR)	Kg/Kg AIR	0.0133	0.0133
DESIGN CRITERIA			
FUEL		Imported coal	Imported coal
UNBURNT CARBON LOSS (BY HEAT VALUE)	%	4.00	4.00
EXCESS AIR	%	25	50
FLUE GAS O/L TEMPERATURE TO STACK	°C	135	120
BED TEMPERATURE	°C	900	850
LIME STONE MOLAR RATIO	%	0	0
LIME STONE PURITY	%	1	1
SULPHUR RETENTION	%	0	0
MOISTURE IN LIME STONE	%	0.00	0.00
BOILER EFFICIENCY ESTIMATED	%	82.91	82.43
% OF BED ASH	%	30	30
% OF FLY ASH	%	70	70

HEAT AND MASS BALANCE			
PROJECT: TAMIL NADU NEWSPRINT AND PAPERS LIMITED- NEW BOILER			26.10.2023
ENGINEER: PRAKASH.A	REV:0	Imported coal	Imported coal
BOILER LOAD	%	100	60
HEAT LOSSES:			
1)CARBON LOSS	%	4.000	4.000
2)SENSIBLE HEAT LOSS DUE TO			
a) FLY ASH	%	0.029	0.026
b) BED ASH	%	0.117	0.110
3)HEAT LOSS DUE TO MOISTURE IN AIR	%	0.089	0.096
4)HEAT LOSS DUE TO MOISTURE IN FUEL	%	4.454	4.424
5)HEAT LOSS DUE TO H2 IN FUEL	%	4.444	4.414
6)DRY FLUE GAS LOSS	%	3.626	3.899
7)RADIATION LOSS	%	0.336	0.605
8)CALCINATION LOSS	%	0.000	0.000
9)SULPHATION GAIN	%	0.000	0.000
10)MANUFACTURES MARGIN	%	0.000	0.000
TOTAL LOSSES	%	17.094	17.574
BOILER EFFICIENCY ESTIMATED	%	82.91	82.43
BOILER HEAT INPUT	Mkcal/hr	96.817	58.428
FUEL QUANTITY	Kg/hr	22257	13432
AIR QUANTITY	Kg/hr	154544	111921
FLUE GAS QUANTITY	Kg/hr	175051	124300
ASH GENERATION	Kg/hr	1758	1061
LOSS OF IGNITION (WT OF CARBON IN TOTAL ASH)	%	27.361	27.361
LIME STONE QUNTITY	Kg/hr	0	0
ESP IDC (WITH 70% TOTAL FLY ASH)	gm/Nm^3	8.871	7.534
HEAT BALANCE			
Total Heat Input	Mkcal/hr	96.817	58.428
1)For Steam	Mkcal/hr	80.271	48.162
2)For Unburnt Carbon Loss	Mkcal/hr	3.8727	2.3371
3)For Fly Ash	Mkcal/hr	0.0283	0.0154
4)For Bottom Ash	Mkcal/hr	0.1130	0.0642
5)For Flue Gas			
(i)Dry Flue Gas	Mkcal/hr	3.5108	2.2780
(ii)Moisture in Air	Mkcal/hr	0.0857	0.0560
(iii)Moisture in Fuel & Combustion of H2	Mkcal/hr	8.6146	5.1638
Total	Mkcal/hr	12.2110	7.4978
6)For Radiation	Mkcal/hr	0.3253	0.3534
7) For Lime Stone Moisture	Mkcal/hr	0.0000	0.0000
8)For Lime Stone	Mkcal/hr	0.0000	0.0000

PROJECT: TAMIL NADU NEWSPRINT AND PAPERS LIMITED- NEW BOILER			
ENGINEER: PRAKASH.A	REV:0	Imported coal	
BOILER LOAD	UNITS	100	60
TOTAL SUPERHEATER			
STEAM FLOW	Kg/hr	125000	75000
DRUM OPERATING PRESSURE	Kg/cm^(a)	122.0	111.1
SATURATION TEMP	°C	324	324
STEAM I/L TEMPERATURE	°C	324	324
STEAM I/L PRESSURE	Kg/cm^(a)	122.0	111.1
STEAM O/L TEMPERATURE	°C	525	525
STEAMO/L PRESSURE	Kg/cm^(a)	105.00	105.00
I/L SPECIFIC VOLUME -Sv	m^3/kg	0.0143	0.0172
SPECIFIC ENTHALPY OF I/L STEAM	Kcal/Kg	641.6	656.6
I/L SPECIFIC VOLUME -Sv	m^3/kg	0.0332	0.0332
SPECIFIC ENTHALPY OF I/L STEAM	Kcal/Kg	820.6	820.6
TOTAL SH DUTY (WITHOUT DSH)	MKcal/hr	22.3730	12.1370
TOTAL SH DUTY (WITH DSH)	MKcal/hr	20.7715	12.9000
TOTAL SH DUTY	%	93	106
PRIMARY SUPERHEATER			
STEAM FLOW	Kg/hr	122888	73780
STEAM I/L TEMPERATURE	°C	324	324
STEAM I/L PRESSURE	Kg/cm^(a)	118.38	118.03
STEAM O/L TEMPERATURE	°C	360	360
STEAM O/L PRESSURE	Kg/cm^(a)	117.28	117.15
I/L SPECIFIC VOLUME -Sv	m^3/kg	0.0150	0.0153
SPECIFIC ENTHALPY OF I/L STEAM	Kcal/Kg	646.18	648.44
O/L SPECIFIC VOLUME -Sv	m^3/kg	0.0193	0.0198
SPECIFIC ENTHALPY OF O/L STEAM	Kcal/Kg	695.99	703.98
GAS FLOW	Kg/hr	175051	124300
FLUE GAS I/L TEMP	°C	479	404
FLUE GAS O/L TEMP	°C	353	349
AVG FLUE GAS TEMP	°C	415	407
AVG CP	Kcal/kg °C	0.2833	0.2795
FLUE GAS DENSITY	Kg/Nm^3	1.2617	1.2808
TUBE SIZE DIAMETER	mm	50.8	50.8
THICKNESS	mm	4.50	4.50
ST	mm	100	100
SL	mm	70	70
NW	Nos	55	55
NO	Nos	44	44
NO OF TUBES PER ASSEMBLY	Nos	1	1
END CLEARANCE IN WIDTH DIRECTION	mm	50.0	50
END CLEARANCE IN DEPTH DIRECTION	mm	200	200
STEAM SIDE NPP	Nos	55	55
SH SIZE WIDTH	m	5.820	5.820
DEPTH	m	3.010	3.010
EFFECTIVE HEIGHT	m	4.225	4.225
HTA COIL PROVIDED	m²	1830.83	1830.83
REAQUIRED HTA	m²	1814.83	1819.84
MARGIN AVAILABLE	%	1%	1%
STEAM MASS VELOCITY	Kgm²s	452	275
GAS SIDE DUTY (a)	Mkcal/hr	6.188	4.084
STEAM SIDE DUTY (a)	MKcal/hr	6.188	4.084
U A LMTD	MKcal/hr	6.189	4.031
CONVECTIVE SUPERHEATER DUTY	%	27.39	33.99
TYPE OF FLUID FLOW		COUNTER	
LMTD	°C	82	53
	°F	112	95
AVG STEAM TEMP	°C	342	345
	°F	648	653
LMTG	°C	404	398
	°F	759	748
FLUE GAS FLOW AREA	m²	11.84	11.84
	Ft²	128.455	128.455
GAS MASS VELOCITY	Lb/Ft² hr	3003	2133
FLUE GAS VELOCITY	m/sec	6.129	5.709
ST/OD		1.969	1.969
SL/OD		1.378	1.378
REYNOLDS NUMBER		6481	4811
CONSTANTS CORRESPONDING ST/OD & SL/OD			
CONSTANTS C VALUE		0.701	0.701
CONSTANTS N VALUE		0.112	0.112