

PT. MEI – MERAK COAL FIRED POWER PLANT

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Date: 17/05/2022
(17/05/2022 – 09.00 AM to
18/05/2022 – 09.00 AM)

Tuesday

CUSTOMER OFFTAKE

	UNIT 1	UNIT 2
Total Electricity Sold (MWh)	1,241.96	1,282.89
Average Power (MW)	51.75	53.45
Total Steam Sold (t)	1026.60	
Average Steam Flow (t/h)	42.77	
Total Condensate Returned (t)	709.00	
Average Condensate Returned Flow (t/h)	29.54	

PLANT OPERATION

	UNIT 1	UNIT 2
Unit Operation Status	Unit in Service	Unit in Service
Max MW	60.30	60.30
Min MW	48.10	47.10
Gross Energy Generated (MWh)	1,420.76	1,392.49
Aux. Power Consumption (MWh)	178.80	109.60
Total Electricity Imported (MWh)	0.00	0.00
Gross Heat Rate (kJ/kWh)	13,102.99	13,041.84
Net Heat Rate (kJ/kWh)	14,989.37	14,156.03
Daily Capacity Factor (%)	98.66	96.70
Daily Availability Factor (%)	100.00	100.00
Coal Brand	KALIMANTAN	KALIMANTAN
Coal Consumption (ton)	1,257.63	1,233.01
HSD Consumption (liters)	0.00	0.00
Limestone Consumption (ton)	32.02	
Make up Water (ton)	192.50	108.70
Demin Water Production (ton)	419.10	
Raw Water Consumption for WTP (ton)	481.40	
Service Water Consumption (ton)	235.20	
Raw Water from Sauh Bahtra Consumption (ton)	843.70	
Fly Ash Disposal wet (trucks)	0.00	
Fly Ash Disposal wet (ton)	0.00	
Fly ash sold dry (Truck)	16.00	
Fly ash sold dry (ton)	251.00	
Bottom Ash Disposal (Trucks)	1.00	
Bottom Ash Disposal (ton)	43.89	
Bottom Ash Dumping to Pond (Trucks)	0.00	
Bottom Ash Dumping to Pond (Ton)	0.00	
Fly ash dumping to pond (Truck)	0.00	
Fly ash dumping to pond (Ton)	0.00	
Purified Water to Seal Pit (ton)	399.43	

Note : Unit #1 was derated from 60 MW to 49 MW since 18.24 Hrs till 19.05 due to flow guide bolt coal feeder 1B loosed and Unit #2 was derated from 50 MW to 48 MW 09.10 Hrs till 10.55 due to coal feeder 2B stopped (C&I replaced HMI) and tripped due to rubber clamp carried to coal feeder, total loss power of both unit at 11.02 MWH

HEAT AND MASS BALANCE			Unit#1	
PROJECT: MEI 2 X 60 MW CFB Power Plant				
	REV:0	Design	Site test on 17/05/2022	Design
% OF BOILER LOAD	UNITS	100 BMCR	100 TMCR	100 BMCR
MAIN STEAM FLOW PARAMETERS				
STEAM FLOW @ MSSV	Kg/hr	241000	247834	241000
STEAM PRESSURE @ MSSV	Kg/cm ² (a)	98.90	94.12	98.90
STEAM TEMPERATURE @ MSSV	°C	538	532.08	535
FEED WATER TEMPERATURE @ ECO INLET	°C	236.6	237.09	236.6
FEED WATER PRESSURE @ ECO INLET	Kg/cm ² (a)	115.40	115.40	115.40
SPECIFIC ENTHALPY FEED WATER	Kcal/Kg	243.944	244.499	243.944
SPECIFIC ENTHALPY OF O/L STEM TEMP	Kcal/Kg	829.510	827.177	827.709
BOILER HEAT DUTY	Mkcal/hr	141.121	144.408	140.687
RE HEATER FLOW PARAMETERS				
STEAM FLOW AT RH I/L HEADER	Kg/hr	0	0	0
STEAM PRESSURE AT RH I/L HEADER	Kg/cm ² (a)	0.00	0.00	0.00
STEAM TEMPERATURE AT RH I/L HEADER	°C	0	0	0
STEAM PRESSURE AT RH O/L HEADER	Kg/cm ² (a)	0.00	0.00	0.00
STEAM TEMPERATURE AT RH O/L HEADER	°C	540.0	540.0	540.0
SITE CONDITIONS				
AIR I/L TEMPERATURE AT APH	°C	27	27.9	27
AMBIENT AIR TEMPERATURE	°C	27	28.93	27
RELATIVE HUMIDITY	%	79	78.29	79
PLANT ELEVATION ABOVE MSL	m	4.5	4.5	4.5
DESIGN CRITERIA				
FUEL		100% PETCOKE	100% PETCOKE	100% PETCOKE
UNBURN CARBON LOSS(BY HEAT VALUE)	%	0.5	0.5	0.5
EXCESS AIR	%	20	20	20
FLUE GAS O/L TEMPERATURE	°C	155	152	155
FURNACE GAS TEMPATURE	°C	889	826	889
LIME STONE MOLAR RATIO	%	0.37	0.00	0.37
LIME STONE PURITY	%	58	0	58
SULPHUR RETENTION	%	90	0	90
% OF BED ASH	%	30	30	30
% OF FLY ASH	%	70	70	70
AIR MOISTURE (STCHIOMETERIC AIR)	Kg/Kg AIR	0.0178	0.0200	0.0178
TOTAL BOILER HEAT DUTY	Mkcal/hr	141.121	144.408	140.687

HEAT AND MASS BALANCE			Unit#1	
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% OF BOILER LOAD	UNITS	100 BMCR	100 TMCR	100 BMCR
ULTIMATE FUEL ANALYSIS(% BY WEIGHT)				
CARBON	%	45.08	37.47	45.08
HYDROGEN	%	3.03	2.32	3.03
NITROGEN	%	0.62	1.48	0.62
SULPHUR	%	0.26	0.35	0.26
MOISTURE	%	35.00	38.88	35.00
ASH	%	3.25	5.79	3.25
OXYGEN	%	12.77	13.71	12.77
TOTAL	%	100	100	100
GCV -REPORTED	Kcal/kg	4166	3535	4166
GCV -CONSIDERED	Kcal/kg	4166	3535	4166
GCV -DULONG	Kcal/kg	4131	3234	4131
UNBURN CARBON % BY WEIGHT	%	0.2588	0.2078	0.2588
GCV FORMULA CHECK				
AS RECEIVED HHV	BTU/LB	7499	6363	7499
AS RECEIVED LHV	BTU/LB	6857	5748	6857
HHV CALC (EPA)	BTU/LB	7565	5979	7565
LHV CALC (EPA)	BTU/LB	6924	5364	6924
HHV CALC (DUL)	BTU/LB	7481	5859	7481
LHV CALC (DUL)	BTU/LB	6840	5244	6840
HHV CALC (VON D)	BTU/LB	7730	6205	7730
LHV CALC (VON D)	BTU/LB	7089	5590	7089
HHV DIFF(EPA)	%	0.9	-6.0	0.9
LHV DIFF(EPA)	%	1.0	-6.7	1.0
HHV DIFF(DUL)	%	-0.2	-7.9	-0.2
LHV DIFF(DUL)	%	-0.3	-8.8	-0.3
HHV DIFF(VON D)	%	3.1	-2.5	3.1
LHV DIFF(VON D)	%	3.4	-2.7	3.4
AIR REQUIRMENT				
FOR CARBON	Kg/Kg	1.1942	0.9928	1.1942
FOR HYDROGEN	Kg/Kg	0.2405	0.1839	0.2405
FOR SULPHUR	Kg/Kg	0.0026	0.0035	0.0026
FOR OXYGEN	Kg/Kg	0.1277	0.1371	0.1277
TOTAL O2 REQUIRED FOR COMBUSTION	Kg/Kg	1.3108	1.0431	1.3108
DRY THEORITICAL AIR (STCHIOMETERIC)PRODU	Kg/kg	5.6622	4.5058	5.6622
DRY COMBUSTION AIR WITH EXCESS	Kg/kg	6.7946	5.4070	6.7946
WET THEORITICAL AIR (STCHIOMETERIC)PRODU	Kg/kg	5.7631	4.5960	5.7631
WET COMBUSTION AIR WITH EXCESS	Kg/kg	6.9157	5.5152	6.9157
PRODUCT OF COMBUSTION				
CO ₂	Kg/kg	1.6436	1.3654	1.6436

HEAT AND MASS BALANCE			Unit#1	
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	REV:0	Design	Site test on 17/05/2022	Design
% OF BOILER LOAD	UNITS	100 BMCR	100 TMCR	100 BMCR
H2O DUE TO AIR MOISTURE	Kg/kg	0.1211	0.1082	0.1211
H2O DUE TO FUEL MOISTURE	Kg/kg	0.3500	0.3888	0.3500
H2O DUE TO COMBUSTION OF H ₂	Kg/kg	0.2708	0.2071	0.2708
H ₂ O (TOTAL)	Kg/kg	0.7418	0.7042	0.7418
SO ₂	Kg/kg	0.0005	0.0070	0.0005
O ₂	Kg/kg	0.2622	0.2086	0.2622
N ₂	Kg/kg	5.2279	4.1701	5.2279
DRY FLUE GAS PRODUCED	Kg/kg	7.134	5.751	7.134
WET FLUE GAS PRODUCED	Kg/kg	7.876	6.455	7.876
WET FLUE GAS COMPOSITION(% BY VOLUME)				
CO ₂	%	13.664	13.753	13.664
H ₂ O	%	15.064	17.327	15.064
SO ₂	%	0.003	0.048	0.003
O ₂	%	2.998	2.890	2.998
N ₂	%	68.272	65.982	68.272
MOLECULAR WEIGHT		28.8159	28.6154	28.8159
FLUE GAS DENSITY	Kg/Nm ³	1.2864	1.2775	1.2864
DRY FLUE GAS COMPOSITION(% BY VOLUME)				
CO ₂	%	16.087	16.635	16.087
H ₂ O	%	0.000	0.000	0.000
SO ₂	%	0.0030	0.0590	0.0030
O ₂	%	3.529	3.495	3.529
N ₂	%	80.380	79.811	80.380
MOLECULAR WEIGHT		30.7304	30.8371	30.7304
FLUE GAS DENSITY	Kg/Nm ³	1.3719	1.3767	1.3719

HEAT AND MASS BALANCE			Unit#1	
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	REV:0	Design	Site test on 17/05/2022	Design
% OF BOILER LOAD	UNITS	100 BMCR	100 TMCR	100 BMCR
CROSS CHECKING				
WET COMBUSTION AIR+ (100-(%ASH+%UNBURN CARBON IN WEIGHT))/100=WET FLUE GAS	Kg/Kg FUEL	7.8806	6.4552	7.8806
FLUE GAS DENSITY AT 0°C	Kg/Nm ³	1.2864	1.2775	1.2864
DENSITY CORRECTION FACTOR FOR ALTITUDE	-	0.9995	0.9995	0.9995
CORRECTED DENSITY DUE TO ALTITUDE AT 0°C	Kg/Nm ³	1.2858	1.2769	1.2858
DRY FLUE GAS VOLUME	Kg/Nm ³	5.2001	4.1774	5.2001
SO2 EMISSION (UNCONTROLLED)				
ACTUAL O2 (DRY)	%	3.53	3.50	3.53
EMISSION O2 (DRY)	%	7.00	7.00	7.00
SO ₂	Kg/kg	0.00520	0.00700	0.00520
SO ₂ IN FLUE GAS (DRY)	mg/Nm ³	770	1340	770
	PPM	280	467	280
SO ₂ IN FLUE GAS (WET)	PPM	230	386	230
SO2 EMISSION (CONTROLLED)				
EMISSION O2	%	7.00	7.00	7.00
SO ₂	Kg/kg	0.00050	0.00700	0.00050
DRY FLUE GAS VOLUME	Nm ³ /Kg	5.2001	4.1774	5.2001
MOLES OF FLUE GAS(DRY)		0.23215	0.1865	0.23215
MOLES OF FLUE GAS(WET)		0.27332	0.22558	0.27332
MOLES OF SO ₂		0.000008	0.000109	0.000008
SO ₂ IN FLUE GAS (DRY)	mg/Nm ³	77	1340	77
	PPM	28	467	28
SO ₂ IN FLUE GAS (WET)	PPM	23	386	23
TOTAL ASH GENERATED	Kg/Kg	0.0443	0.0600	0.0443

HEAT AND MASS BALANCE			Unit#1	
PROJECT: MEI 2 X 60 MW CFB Power Plant				
	REV:0	Design	Site test on 17/05/2022	Design
% OF BOILER LOAD	UNITS	100 BMCR	100 TMCR	100 BMCR
BOILER HEAT INPUT	Mkcal/Hr	168.46	174.26	167.94
FUEL QUANTITY	Kg/hr	40438	49295	40313
AIR QUANTITY	Kg/hr	279657	271872	278793
FLUE GAS QUANTITY	Kg/hr	318490	318199	317505
TOTAL ASH GENERATION	Kg/hr	1791	2958	1786
LOI (WT OF CARBON IN TOTAL ASH)	%	5.842	3.463	5.842
ABMA AIR REQUIRED	Kg/Gcal	1385.01	1298.61	1385.01
	Lb/Mbtu	769.45	721.45	769.45
LIME STONE QUANTITY	Kg/hr	186	0	185
ESP IDC (WITH 70% TOTAL FLY ASH)	gm/Nm ³	5.06	8.31	5.06
HEAT BALANCE				
Total Heat Input	Gcal/hr	168.463	174.258	167.945
1)For Steam		141.121	144.408	140.687
2)For Unburn Carbon Loss		0.8423	0.8246	0.8397
3)For Fly Ash		0.0322	0.0523	0.0321
4)For Bottom Ash		0.1157	0.1770	0.1154
5)For Flue Gas				
(i)Dry Flue Gas		8.8622	8.4400	8.8349
(ii)Moisture in Air		0.2884	0.3044	0.2875
(iii)Moisture in Fuel & Combustion of H2		16.0581	18.7239	16.0087
Total		25.2086	27.4683	25.1311
6)For Radiation		0.4532	0.4646	0.4524
7)For Lime Stone		-0.2937	0.0000	-0.2928
8)For Manufacturers Margin		0.8423	0.8713	0.8397
Total Heat Output	Gcal/hr	168.322	174.266	167.805
MASS BALANCE				
Fuel Flow		40438	49295	40313
Combustion Air		279657	271872	278793
Lime Stone		186	0	185
Total Input	Kg/hr	320281	321167	319291
Flue gas Produced		318490	318199	317505
Ash Generation		1791	2958	1786
Total Output	Kg/hr	320281	321157	319291
Combustion Air	Nm ³ /hr	216394	210370	215725
Flue gas Produced	Nm ³ /hr	247698	249196	246932
Ash in fuel	%	53.40	53.40	53.40
Ash Generation	Kg/hr	22071	26427	22003
ESP IDC (WITH 70% TOTAL FLY ASH)	gm/Nm ³	62.37	74.23	62.37