Unit 50

STEAM GENERATOR PERFORMANCE TEST (INDIRECT METHOD)

Calculation

TEST COAL ANALYSIS	Symbol	Units	Calculation
HHV AF at constant pressure	Hf	Btu/lb	9219.02
LHV AF at constant pressure	Hfnet	Btu/lb	8601.65
ASH ANALYSIS	Symbol	Units	Calculation
Unburned Combustible in Refuse	Wcr'	% Combustible	0.15058
Heating Value in Refuse	Hdr'	Btu/lb refuse	21.8341
Dry Refuse	Wdr'	Lb/Lb AF fuel	0.0260
Carbon Burned	Cb	Lb/Lb AF fuel	0.5352
AIR TEMPERATURE	Symbol	Units	Calculation
AH Inlet Air Temperature Primary Average	tA8P	deg F	104.90
AH Inlet Air Temperature Secondary Average	tA8S	deg F	86.95
Weighted Average AH Inlet Air Temperature	tA8	deg F	90.97
GAS TEMPERATURE	Symbol	Units	Calculation
AH Inlet Gas Temperature Average	tG14	deg F	758.72
AH Outlet Gas Temperature Average	tG15	deg F	292.26
MOISTURE IN AIR AT FAN INLET	Symbol	Units	Calculation
Partial Pressure of Vapor in Wet Air	PmA	in Hg	0.6803
Moisture in Dry Air	Wma'	Lb/Lb dry air	0.0145
AH INLET GAS ANALYSIS (PTC 19.1)	Symbol	Units	Calculation
O2 Average	O2	% dry-vol	3.7555
Theoretical dry air	Ao'	Lb/Lb AF fuel	6.8471
Excees air	Ax'14	%	21.461
Flue gas components			
O2, fg	O2, fg	cu.ft/Lb AF fuel	4.012
SO2, fg	SO2, fg	cu.ft/Lb AF fuel	0.013
CO2, fg	CO2, fg	cu.ft/Lb AF fuel	16.761
N2, fg	N2, fg	cu.ft/Lb AF fuel	86.025
Total, fg	tot, fg	cu.ft/Lb AF fuel	106.810
O2	O2	% dry-vol	3.756
SO2	SO2	% dry-vol	0.012
CO2	CO2	% dry-vol	15.692
N2 (by difference)	N2	% dry-vol	80.540
AH OUTLET GAS ANALYSIS (PTC 19.1)	Symbol	Units	Calculation
O2 Average	o2	% dry-vol	5.01
Theoretical dry air	Ao'	Lb/Lb AF fuel	6.8471
Excees air	Ax'14	%	30.892
Flue gas components			
O2, fg	o2, fg	cu.ft/Lb AF fuel	5.775
SO2, fg	so2, fg	cu.ft/Lb AF fuel	0.013
CO2, fg	co2, fg	cu.ft/Lb AF fuel	16.761
N2, fg	n2, fg	cu.ft/Lb AF fuel	92.696
Total, fg	tot, fg	cu.ft/Lb AF fuel	115.244
O2	o2	% dry-vol	5.011
SO2	so2	% dry-vol	0.011

CO Average	co	% dry-vol	0.000
CO2	co2	% dry-vol	14.544
N2 (by difference)	n2	% dry-vol	80.434

Cont'd

GAS AND AIR WEIGHTS	Symbol	Units	Calculation
Dry Gas Entering Air Heater	Wg'14	Lb/Lb AF fuel	8.7172
Dry Gas Leaving Air Heater	Wg'15	Lb/Lb AF fuel	9.3646
Dry Air for Combustion	Wa'	Lb/Lb AF fuel	8.3346
Moisture in Gas Entering Air Heater	Wmg	Lb/Lb AF fuel	0.7086
Wet Gas Entering Air Heater	Wg14	Lb/Lb AF fuel	9.4258
Wet Gas Leaving Air Heater	Wg15	Lb/Lb AF fuel	10.0826
Wet Gas for Combustion	Wa	Lb/Lb AF fuel	8.4553
SPECIFIED HEAT LOSSES			
Radiation loss per PTC4.1,figure 8, page 67	lB	% eff. loss	0.1700
Unmeasured losses per specification	lum	% eff. loss	0.1700

HEAT LOSS CALCULATION	**Symbol**	**Units**	**Calculation**	**Losses (%)**
Dry Gas	LG	Btu/Lb AF fuel	455.9604	4.95
Moisture in Fuel	Lmf	Btu/Lb AF fuel	275.9584	2.99
Combustion of H2 in Fuel	LH	Btu/Lb AF fuel	394.5184	4.28
Moisture in Air	LmA	Btu/Lb AF fuel	11.1482	0.12
Combustible in Refuse	Luc	Btu/Lb AF fuel	0.5685	0.01
Formation of CO	Lco	Btu/Lb AF fuel	0.0000	0.00
Radiation	LB	Btu/Lb AF fuel	15.6723	0.17
Unmeasured losses	Lum	Btu/Lb AF fuel	15.6723	0.17
Total	L	Btu/Lb AF fuel	1169.4986	12.69
MEASURED EFFICIENCY	Symbol	Units	Calculation	
Measured efficiency (HHV)	Eb-hhv	%	87.3143	
Measured efficiency (LHV)	Eb-lhv	%	93.5811	

Unit 60

STEAM GENERATOR PERFORMANCE TEST (INDIRECT METHOD)

Calculation

TEST COAL ANALYSIS	Symbol	Units	Calculation
HHV AF at constant pressure	Hf	Btu/lb	9405.32
LHV AF at constant pressure	Hfnet	Btu/lb	8837.71
ASH ANALYSIS	Symbol	Units	Calculation
Unburned Combustible in Refuse	Wcr'	% Combustible	0.24371
Heating Value in Refuse	Hdr'	Btu/lb refuse	35.33795
Dry Refuse	Wdr'	Lb/Lb AF fuel	0.0407
Carbon Burned	Cb	Lb/Lb AF fuel	0.5461
AIR TEMPERATURE	Symbol	Units	Calculation
AH Inlet Air Temperature Primary Average	tA8P	deg F	103.55
AH Inlet Air Temperature Secondary Average	tA8S	deg F	83.53
Weighted Average AH Inlet Air Temperature	tA8	deg F	88.10
GAS TEMPERATURE	Symbol	Units	Calculation
AH Inlet Gas Temperature Average	tG14	deg F	736.12
AH Outlet Gas Temperature Average	tG15	deg F	291.83
MOISTURE IN AIR AT FAN INLET	Symbol	Units	Calculation
Partial Pressure of Vapor in Wet Air	PmA	in Hg	0.8569
Moisture in Dry Air	Wma'	Lb/Lb dry air	0.0184
AH INLET GAS ANALYSIS (PTC 19.1)	Symbol	Units	Calculation
O2 Average	O2	% dry-vol	4.235
Theoretical dry air	Ao'	Lb/Lb AF fuel	6.9140
Excees air	Ax'14	%	24.966
Flue gas components			
O2, fg	O2, fg	cu.ft/Lb AF fuel	4.713
SO2, fg	SO2, fg	cu.ft/Lb AF fuel	0.047
CO2, fg	CO2, fg	cu.ft/Lb AF fuel	17.104
N2, fg	N2, fg	cu.ft/Lb AF fuel	89.395
Total, fg	tot, fg	cu.ft/Lb AF fuel	111.258
O2	O2	% dry-vol	4.236
SO2	SO2	% dry-vol	0.042
CO2	CO2	% dry-vol	15.373
N2 (by difference)	N2	% dry-vol	80.349
AH OUTLET GAS ANALYSIS (PTC 19.1)	Symbol	Units	Calculation
O2 Average	o2	% dry-vol	5.075
Theoretical dry air	Ao'	Lb/Lb AF fuel	6.9140
Excees air	Ax'14	%	31.507
Flue gas components			
O2, fg	o2, fg	cu.ft/Lb AF fuel	5.947
SO2, fg	so2, fg	cu.ft/Lb AF fuel	0.047
CO2, fg	co2, fg	cu.ft/Lb AF fuel	17.104
N2, fg	n2, fg	cu.ft/Lb AF fuel	94.067
Total, fg	tot, fg	cu.ft/Lb AF fuel	117.165
O2	o2	% dry-vol	5.076
SO2	so2	% dry-vol	0.040

CO Average	co	% dry-vol	0.003
CO2	co2	% dry-vol	14.598
N2 (by difference)	n2	% dry-vol	80.282

Cont'd

GAS AND AIR WEIGHTS	Symbol	Units	Calculation
Dry Gas Entering Air Heater	Wg'14	Lb/Lb AF fuel	9.0867
Dry Gas Leaving Air Heater	Wg'15	Lb/Lb AF fuel	9.5388
Dry Air for Combustion	Wa'	Lb/Lb AF fuel	8.6764
Moisture in Gas Entering Air Heater	Wmg	Lb/Lb AF fuel	0.6998
Wet Gas Entering Air Heater	Wg14	Lb/Lb AF fuel	9.7864
Wet Gas Leaving Air Heater	Wg15	Lb/Lb AF fuel	10.2468
Wet Gas for Combustion	Wa	Lb/Lb AF fuel	8.8356
SPECIFIED HEAT LOSSES			
Radiation loss per PTC4.1,figure 8, page 67	lB	% eff. loss	0.1700
Unmeasured losses per specification	lum	% eff. loss	0.1700

HEAT LOSS CALCULATION	**Symbol**	**Units**	**Calculation**	**Losses (%)**
Dry Gas	LG	Btu/Lb AF fuel	462.0073	4.91
Moisture in Fuel	Lmf	Btu/Lb AF fuel	256.4658	2.73
Combustion of H2 in Fuel	LH	Btu/Lb AF fuel	359.5060	3.82
Moisture in Air	LmA	Btu/Lb AF fuel	14.6327	0.16
Combustible in Refuse	Luc	Btu/Lb AF fuel	1.4382	0.02
Formation of CO	Lco	Btu/Lb AF fuel	1.2863	0.01
Radiation	LB	Btu/Lb AF fuel	15.9890	0.17
Unmeasured losses	Lum	Btu/Lb AF fuel	15.9890	0.17
Total	L	Btu/Lb AF fuel	1127.3144	11.99
MEASURED EFFICIENCY	Symbol	Units	Calculation	
Measured efficiency (HHV)	Eb-hhv	%	88.0141	
Measured efficiency (LHV)	Eb-lhv	%	93.6669	