Gas Turbine Performance — Report

Calculation summary | PlantCalcKit v1.0

DOCUMENT

Plant / project	**Example Plant**
Equipment tag / system	**GT-01**
Calculation / document no.	**CALC-GT-001**
Revision	**0**
Prepared by	**Your name**
Checked by	**—**
Date	**07-Nov-2026**
Calculation basis	Fuel: Pipeline natural gas · LHV basis · output at the generator terminals · Measured exhaust temperature (heat and mass balance, ideal-gas mixture, NASA-type polynomials) · generic correction coefficients to ISO 15 °C, 101.325 kPa, 60 % RH · base load
Status	**✓ Inputs OK · ℹ️ 19 default value(s) in use: fuel gas temperature, inlet pressure loss, exhaust pressure loss, generator and gearbox efficiency, casing, lube-oil and other heat loss, inlet loss included in the baseline, exhaust loss included in the baseline, output change per K of ambient temperature, heat-rate change per K of ambient temperature, output change per kPa of inlet pressure loss, heat-rate change per kPa of**

KEY INPUTS

Input	Unit	Value used
Ambient air temperature (compressor inlet)	°C	32.0
Ambient pressure (absolute)	kPa a	100.6
Relative humidity	%	55.0
Inlet pressure loss (filter house, silencer, duct)	kPa	1.00
Exhaust pressure loss (stack or HRSG)	kPa	2.00
Fuel mass flow	kg/h	7,900
Fuel gas temperature	°C	15.0
Measured output	kW	33,000
Generator and gearbox efficiency	%	98.50
Casing, lube-oil and other heat loss	%	1.00
Exhaust temperature (average, turbine outlet)	°C	525.0
Baseline output at ISO conditions	kW	40,000
Baseline heat rate at ISO conditions	kJ/kWh	10,800
Inlet loss included in the baseline	kPa	0.00
Exhaust loss included in the baseline	kPa	0.00
Output change per K of ambient temperature	%/K	-0.600
Heat-rate change per K of ambient temperature	%/K	0.180
Output change per kPa of inlet pressure loss	%/kPa	-1.500
Heat-rate change per kPa of inlet pressure loss	%/kPa	0.500
Output change per kPa of exhaust pressure loss	%/kPa	-0.500

Heat-rate change per kPa of exhaust pressure loss	%/kPa	0.500
Output change per g/kg of specific humidity	%/(g/kg)	0.035
Heat-rate change per g/kg of specific humidity	%/(g/kg)	0.020
Operating hours per year at about this condition	h/yr	8,000
Value of electricity	per MWh	80.00
Fuel price (energy basis chosen above)	per MMBTU	8.00
Evaporative cooler effectiveness	%	85.0
Extra inlet pressure loss of the cooler	kPa	0.25
Hours per year the cooler would run	h/yr	1,500

RESULTS — FUEL, PERFORMANCE AND EXHAUST

Result	Unit	Value
Lower heating value (LHV) of the fuel	kJ/kg	48,173
Higher heating value (HHV) of the fuel	kJ/kg	53,366
Heat input (LHV basis)	kW	105,712
Generator output	kW	33,000.0
Shaft (coupling) power	kW	33,502.5
Heat rate	kJ/kWh	11,532
Thermal efficiency	%	31.22
Specific fuel consumption	kg/kWh	0.2394
Air mass flow at the compressor inlet	kg/s	129.3
Exhaust mass flow	kg/s	131.5
Exhaust temperature	°C	525.0
Exhaust oxygen, dry	%	15.41
Exhaust specific heat at the exhaust temperature	kJ/kg·K	1.1579
Electrical output at the generator terminals	%	31.22
Generator and gearbox losses	%	0.48
Exhaust heat (net of the inlet air)	%	67.31
Casing, lube-oil and other losses	%	1.00

Single-user licence · plantcalckit.com/licence

RESULTS — CORRECTION TO ISO, DEGRADATION AND COST

Result	Unit	Value
Specific humidity of the ambient air	g/kg	16.62
Wet-bulb temperature	°C	24.6
Output corrected to ISO conditions	kW	37,820.4
Heat rate corrected to ISO conditions	kJ/kWh	11,001
Thermal efficiency corrected to ISO conditions	%	32.72
Expected output at the site conditions	kW	34,901.8
Output shortfall against the expected output	kW	+1,901.8
Output shortfall, % of expected	%	+5.45
Expected heat rate at the site conditions	kJ/kWh	11,321
Heat-rate excess against the expected value	kJ/kWh	+211
Heat-rate excess, % of expected	%	+1.86
Extra fuel energy per year for the output delivered	MWh/yr	15,478
Extra fuel mass per year	t/yr	1,157
Extra CO2 emitted per year	t/yr	3,117
Cost of the extra fuel per year	per yr	422,518
Output lost per year	MWh/yr	15,214
Lost revenue per year	per yr	1,217,122
Total yearly cost of the gap	per yr	1,639,640

WHAT-IF — EVAPORATIVE INLET AIR COOLER

Result	Unit	Value
Air temperature after the cooler	°C	25.7
Output with the cooler	kW	34,286.2
Output gain	kW	+1,286.2
Water evaporated	kg/h	1,220
Value of the extra output per year	per yr	27,088

FINDINGS AND RECOMMENDATIONS

⛔ **Act now**

Output is 5.4 % (1,902 kW) below the expected output for these conditions; corrected to ISO it is -5.4 % against the baseline. The gap costs about USD 1,639,640 per year (fuel and lost sales). Check compressor fouling first (inlet filter condition, offline water wash), then inlet losses, bleed or anti-icing valves, and the fuel and output measurements.

⚠️ **Correct soon**

Heat rate is 1.9 % above the expected value (211 kJ/kWh). Fuel flow and heating value uncertainty is about 1 %: confirm the trend over several readings.

◆ **Opportunity**

An evaporative inlet cooler (85 % effective) would cool the air from 32.0 to 25.7 °C and add about 1,286 kW (3.9 %) at these conditions, worth about USD 27,088 per year over 1,500 h, using about 1.2 t/h of water.

ℹ️ **Note**

Corrected to ISO conditions: output 37,820 kW, heat rate 11,001 kJ/kWh, efficiency 32.7 %. The correction uses generic factors; use your maker curves for a guarantee-grade comparison.

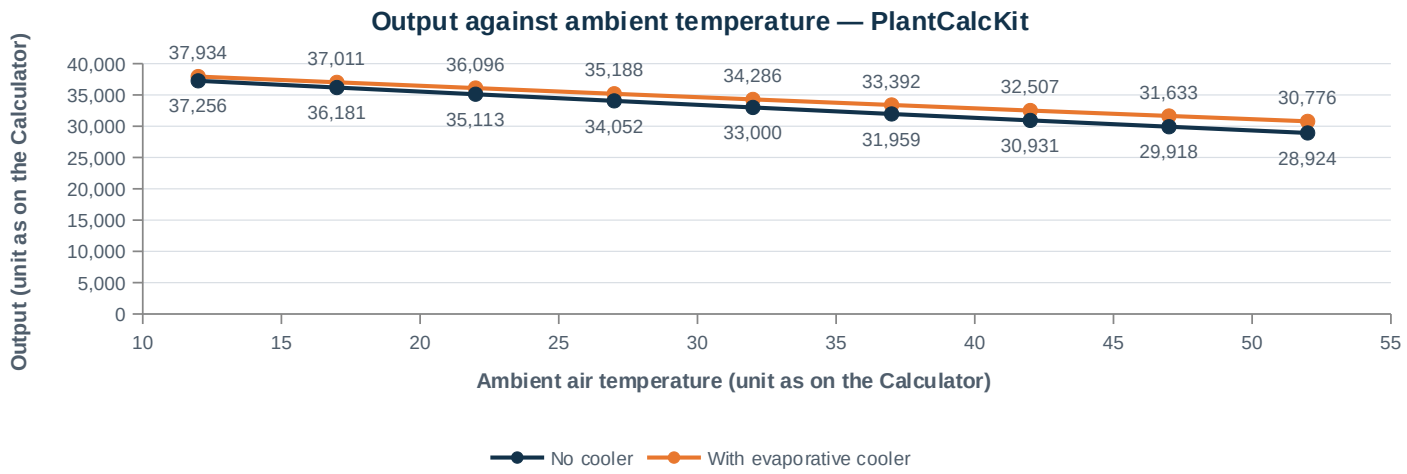
WHAT-IF — AMBIENT TEMPERATURE

Case	Ambient	Output, no cooler	Output, cooler	Cooler gain	Air after cooler
Ambient -20 K	12.0	37,256	37,934	+678	8.3
Ambient -15 K	17.0	36,181	37,011	+830	12.7
Ambient -10 K	22.0	35,113	36,096	+983	17.0
Ambient -5 K	27.0	34,052	35,188	+1,136	21.4
Ambient as entered	32.0	33,000	34,286	+1,286	25.7
Ambient +5 K	37.0	31,959	33,392	+1,433	30.1
Ambient +10 K	42.0	30,931	32,507	+1,576	34.5
Ambient +15 K	47.0	29,918	31,633	+1,715	38.9
Ambient +20 K	52.0	28,924	30,776	+1,852	43.4

WHAT-IF — COOLER EFFECTIVENESS

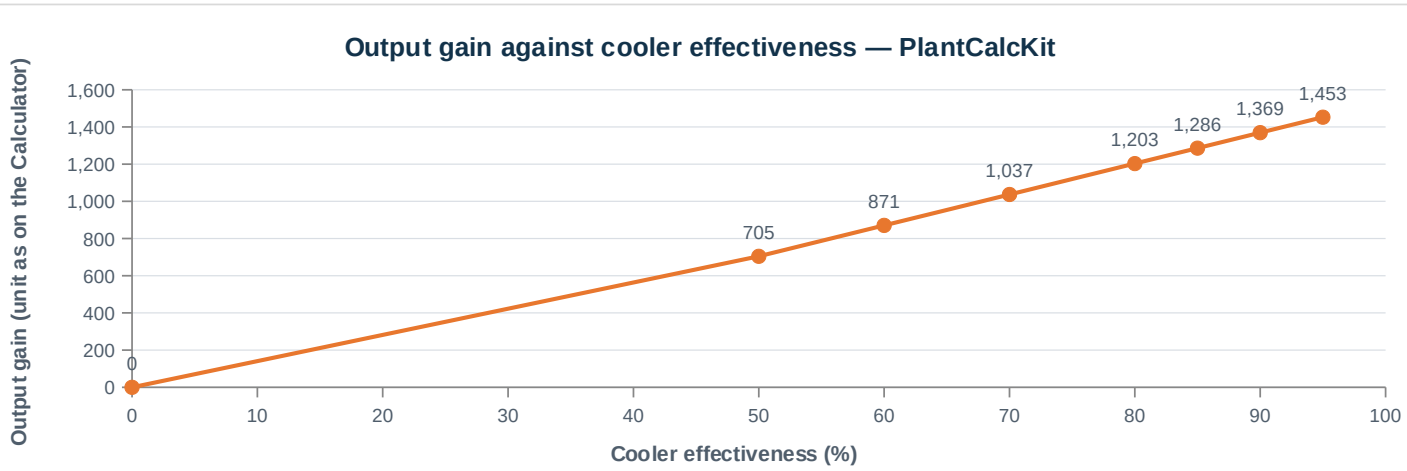
Case	Effectiveness %	Air after cooler	Output	Gain	Gain %
No cooler	0	32.0	33,000	0	0.00
Cooler effectiveness 50 %	50	28.3	33,705	+705	+2.13
Cooler effectiveness 60 %	60	27.6	33,871	+871	+2.64
Cooler effectiveness 70 %	70	26.8	34,037	+1,037	+3.14
Cooler effectiveness 80 %	80	26.1	34,203	+1,203	+3.65
Cooler effectiveness 85 %	85	25.7	34,286	+1,286	+3.90
Cooler effectiveness 90 %	90	25.3	34,369	+1,369	+4.15
Cooler effectiveness 95 %	95	25.0	34,453	+1,453	+4.40

CHARTS



Observations — ambient temperature

[Write your observations here]

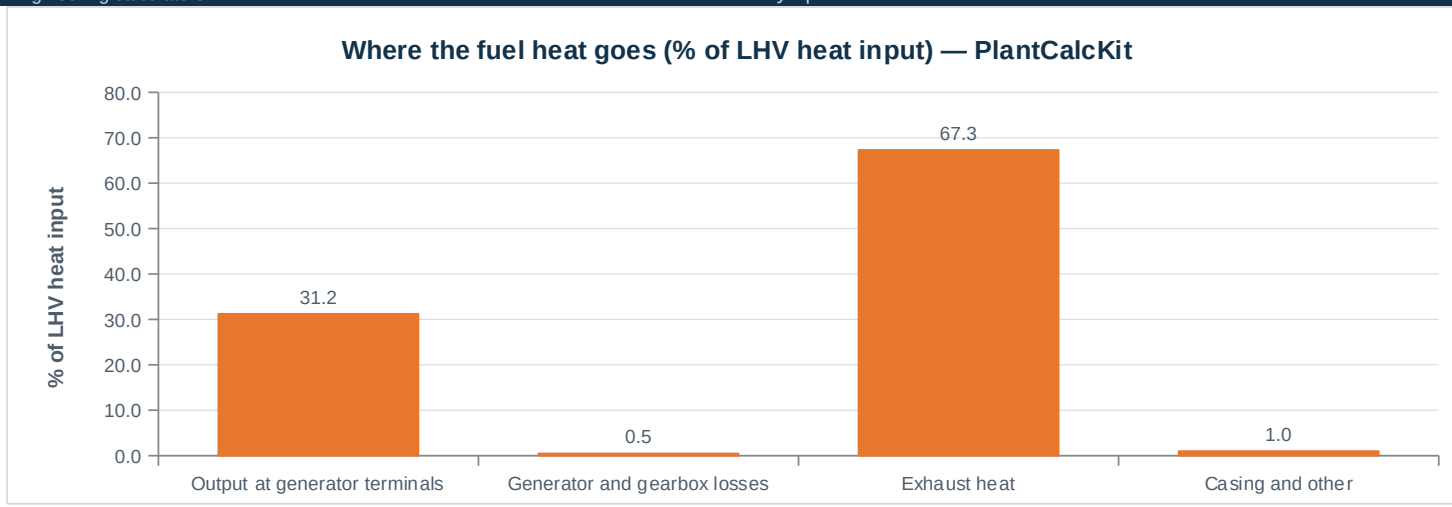


Observations — cooler effectiveness

[Write your observations here]

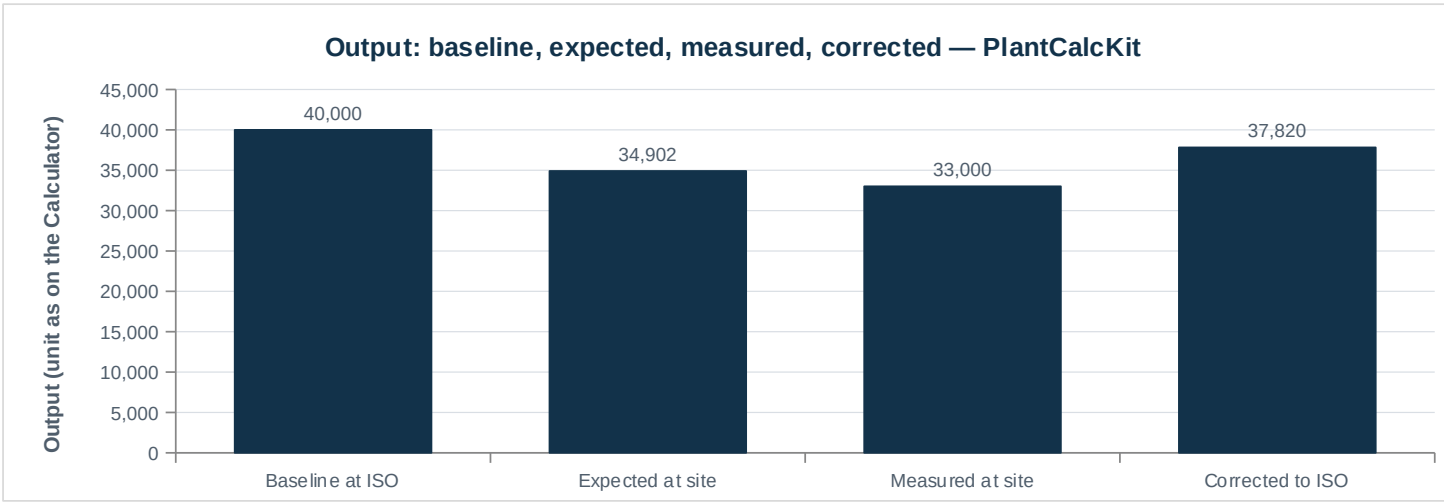
Gas Turbine Performance — Report

Calculation summary | PlantCalcKit v1.0



Observations — heat balance

[Write your observations here]



Observations — output comparison

[Write your observations here]

© 2026 PlantCalcKit · plantcalckit.com · hello@plantcalckit.com — For engineering estimates; verify against site data.