

12.5 MW Gas Fired Power Plant Project Economic Analysis

April 2013



A. General

1.0 Back Ground

The Company owned 1 (one) existing 15 MW (ISO) Titan 130 dual fuel unit and it is available for immediate use (with guaranteed output of 12.5 MW), the unit is installed and commissioned in 2010 using 100% natural gas in Tangerang, Banten, Indonesia.

Actual condition is zero hours

Beside the GTG, the company is also have Steam Unit which can be modified to run the additional steam turbine with capacity of 2.3 MW

The total Combine Cycle Unit will produce 14.8 MW of electricity

2.0 Objective

The Company like to sell the Gas Turbine Titan 130 Turbomach, with condition Zero Hour include Spare parts and accessories transferable maintenance contract from Turbomach, for \$ 6,5 Million. For HRSG boiler 50 tons 1 unit manufacturing in 2012 complete set with accessories Exclude Water treatment supply system for \$ 2,6 Million. All price is Exclude Mom De Mom, Exclude any Tax, Exclude reinstall. The payment terms is fully paid against Sell contract signed.

A. Umum

1.0 Latar Belakang

Perusahaan memiliki 1 (satu) unit 15 MW (ISO) Titan 130 dual fuel dan siap untuk segera dipindahkan dan digunakan (dengan kapasitas bergaransi sebesar 12.5 MW), unit ini di pasang dan di jalankan pada tahun 2010 menggunakan 100% Gas Bumi di Tangerang, Banten, Indonesia. Kondisi saat ini nol jam operasi.

Selain GTG, Perusahaan juga memiliki unit untuk memproduksi uap yang dapat di modifikasi menjadi penggerak turbin uap tambahan sebesar 2.3MW

Total dari Combine Cycle Unit akan memproduksi listrik sebesar 14.8 MW

2.0 Tujuan

Perusahaan ingin menjual asset Gas Turbine type titan 130 merek Turbomach dengan kondisi Zero Hour sudah termasuk suku cadang dan perlengkapan pendukung dan maintenance kontrak bisa di pindahkan. Dengan harga sebesar 6,5 juta USD. Untuk HRSG boiler 50 tons 1 unit diproduksi tahun 2012 secara keseluruhan termasuk perlengkapan pendukungnya dan tidak termasuk system pengolahan air sebesar 2,6 juta USD. Semua penawaran harga tidak termasuk transportasi dan pemindahan, tidak termasuk pajak, tidak termasuk biaya pemasangan kembali. Cara pembayarannya dilunasi penuh terhadap penandatanganan kontrak jual beli.

Solar[®] Turbines

A Caterpillar Company

September 6, 2012

To:

Contract No.: LTSA 932-C-01

To Whom It May Concern:

With reference to our recent discussions that took place on August 28, 2012 concerning the possibility of transferring the current Full Maintenance Contract (LTSA 932-C-01) to another user should elect to sell its Gas Turbine package, we can confirm that such transfer is possible under the general conditions set by Solar Turbines / Turbomach SA for entering into a contractual relation.

Kind Regards,

Kristel Gordon
Customer Services Account Manager
Power Generation Asia

Attachments

Pictures

Lampiran

Gambar



Solar Turbines

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PREDICTED ENGINE PERFORMANCE

Customer		Model TITAN 130-20501 Axial
Job ID		Package Type GSC 50 Hz
Run By Umberto Vecchio	Date Run 16-May-12	Match STANDARD
Engine Performance Code REV. 3.54	Engine Performance Data REV. 0.3	Fuel System GAS
		Fuel Type CHOICE GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	metres	10		
Inlet Loss	mm H2O	100.0		
Exhaust Loss	mm H2O	250.0		
		1	2	3
Engine Inlet Temperature	deg C	30.0	30.0	30.0
Relative Humidity	%	80.0	80.0	80.0
Gearbox Efficiency		0.9850	0.9850	0.9850
Generator Efficiency		0.9800	0.9800	0.9800
Based On 1.0 Power Factor				
Specified Load*	kW	FULL	5000	4500
Net Output Power*	kW	12966	5000	4500
Fuel Flow	MW	39.24	22.09	21.04
Heat Rate*	kJ/kW-hr	10892	15904	16830
Therm Eff*	%	33.047	22.632	21.387
Engine Exhaust Flow	kg/hr	166134	164884	164804
PT Exit Temperature	deg C	517	364	354
Exhaust Temperature	deg C	517	364	354

Fuel Gas Composition (Volume Percent)	Methane (CH4)	96.08
	Ethane (C2H6)	1.06
	Propane (C3H8)	1.18
	I-Butane (C4H10)	0.07
	N-Butane (C4H10)	0.09
	I-Pentane (C5H12)	0.03
	N-Pentane (C5H12)	0.02
	Hexane (C6H14)	0.02
	Heptane (C7H16)	0.0100
	Carbon Dioxide (CO2)	0.36
	Nitrogen (N2)	1.08
	Sulfur Dioxide (SO2)	0.0001

Fuel Gas Properties	LHV (kJ/Nm3)	36446.3	Specific Gravity	0.5824	Wobbe Index at 60F	1213.6
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*Electric power measured at the generator terminals.

This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

Turbomach

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Process Steam Flow : 40'000 kg/h

Thermal Power Available : 27'426 kW

8 barG / Saturated Steam

Cond : 34'364 kg/h / 80°C

Make-up : 6'064 kg/h / 32°C

LHV Fuel : 47'940 kJ/kg

Std. Natural Gas : 38'017 kW

Air : 35°C

Evap. Cooler
(Not Applied)

35°C

G

12'264 kWe

TITAN 130

523 °C

0.23 kg/s

44.8 kg/s

523°C

Firing Temp.: '690°C

Std. Natural Gas : 9'061 kW

Waste Heat
Recovery Boiler

105°C

44.99 kg/s

153°C

Blowdown : '428 kg/h

Nominal Plant Efficiency : 84.3 %

Site Conditions : Std. Natural Gas, 10 m a.s.l., Inlet Duct Loss : 100mmH₂O, Exhaust Duct Loss : 250mmH₂O

FOR INFORMATION ONLY

Date

Project no.

ID08-1040

Drawing

Expected Nominal Performance

Turbomach

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Unit Specifications | Spesifikasi Mesin

Gas turbine specification

Manufacturer	SOLAR (TURBOMACH Company)
Model	titan 130 (T-20501)
Operation	continuous
Turbine design	open cycle, single shaft, cold-end drive
Compressor	14 stage, axial
Compression ratio	16:1
Combustion chamber	annular with 21 injector
Turbine	3 stage, axial-reaction
Turbine speed	11197 rpm
Nominal shaft power rating	15587 kW
Heat input	42613 kJ/s
Turbine air inlet flow	48.9 kg/s
Exhaust gas temperature	496°C
Exhaust gas mass flow	49.7 kg/s
Thrust bearing	tilting pad type

All performance data at ISO conditions

Miscellaneous

Compressor air inlet plenum including horizontal flange and flexible bellows

Insulating mats, covered by aluminum metal sheet

Gas turbine overall dimensions (including gearbox)	L	=	7277 mm
	W	=	1770 mm
	H	=	1880 mm

Gas turbine weight	approx.	9600 kg
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Nominal performance data

Gas turbine load	base load
Barometric pressure	1012 bar
Relative air humidity	80 %
Inlet duct pressure loss	100 mm H ₂ O
Exhaust duct pressure loss	150 mm H ₂ O
Fuel type	natural gas & diesel #2

Unit Specifications

TRAFINDO Transformer

Phase	: 3	type of cooling	: ONAN
Frequency	: 50 Hz	vector group	: YNd - 5
KVA	: 16500	temp rise oil / winding °C	: 60/65
Volt HV	: 20000	Transformer oil - liter	: 8080
LV	: 11000	Transformer weight	: 27500
Ampere HV	: 476,31	Impedance %	: 10
LV	: 866,03	Insulation class	: A
order No	: 09-0223		
serial No	: 091 300783		
year of			
manufacture	: 2009		
standard	: IEC 6007		
			BIL (KV) HV LI 125 AC 50 / LI 75 AC 28

Spesifikasi Mesin

UNINDO

Transformer No. 84069 Year 2008	: 3 phase 50 Hz
Nominal rating (KVA)	: 2000 2000
	Primary secondary
Victory group	: D Yn 5
Nominal voltage volt	: 21000
	20500
	20000 400
	19500
	19000
Nominal current (Amp)	: 57,7 2886,8
Impedance voltage	: 7 %
Cooling ONAN, type of oil	: mineral oil
Temp rise °C oil	: 60
Winding	: 65
Insulation Level	: 125 KV
Total weight	: 4395 kg
Oil weight	: 1155 kg

Unit Specifications

Air compressor

Product type : GA 37 + PA 10
 Serial no : WUX 305645
 Max working pressure : 10 bar
 Free air delivery : 95,1 L/s
 Nominal shaft power : 37 KW
 Nominal rotation shaft speed : 2960 r/min
 Gross weight : 1000 kg
 Year of construction : 2009 . 4 .

Made by ATLAS COPCO compressor. Co Ltd

Comp air P Max : 13 bar (e)
 Ambient max : 50 °C
 Refrig type : R410A
 Refr P. Max Height : 43 bar °C

Made by ATLAS COPCO. Co Ltd

AIR TANK

Air receiver tank type : cylindrical – vertical
 Volume : 5000 liter
 Serial Number : 001/DPT/VII/2009
 Working pressure : 10 kg/cm²

Air dryer

Type : FD 120
 Year : 2009
 Weight : 157 kg

BOILER HRSG (Optional)

Manufactured by Mackenzie industries SDN. BHD

Design code ASME SEC 1-2007. ADDENDA 2009 B

Design pressure : 3000 KPa
 Design temp : 262.5 deg C
 Hydro-test pressure : 4500 KPa
 Boiler capacity : 50000 kg/hr
 Approval no :
 Year build : 2011
 Boiler serial no : 110063
 Manufacture no : MB 10009
 Inspection authority : LLOYD'D REGISTER VERIFICATION
 Hydro-test no : 11/036

Activity

Tanggal : 28/11/2012

Hari : Rabu.

Jam	Turbine Generator		Gas Compressor		Air Compressor		Air Dry (°C)	TI (°C)	Keterangan
	Running Load (MW)	Running Press (Bar)			Pressure	Temperature			
Shift I (Wahyu & Deni)									
08	9,9	mw	23,3	Bar	7,5	98 °C	2,3	34	Turbine status Running
09	10	mw	23,3	Bar	7,4	93	2,1	35	
10	9,9	mw	23,2	Bar	7,1	75	1,8	34	• Drain oil filter Gas Compressor.
11	9,9	mw	23,3	Bar	7,2	83	2,3	35	• Drain Air Comp & Air Dryer.
12	9,9	mw	23,2	Bar	7,5	97	2,1	36	• Cleaning Area Room Control turbine & HSE
13	9,7	mw	23,3	Bar	7,5	96	2,3	36	• Shower at cooler turbine.
14	10,2	mw	23,2	Bar	7,4	94	2,3	36,8	• cleaning dari ganggangan Air d. Area
15	9,7	mw	23,3	Bar	7,2	82	2,1	35	Turbine & HSE.
Shift II (Wahyu & Deni & Heri & Muslim) Longshift.									
16	9,9	mw	23,3	Bar	7,4	90	2,1	35	
17	9,9	mw	23,3	Bar	7,3	89	2,1	33	
18	9,7	mw	23,3	Bar	7,4	93	2,1	33	
19	9,9	mw	23,3	Bar	7,2	77	2,1	33	
20	9,9	mw	23,3	Bar	7,3	80	2,1	33	- Turbine status Running
21	10,1	mw	23,3	Bar	7,8	93	2,1	31	
22	10	mw		Bar	7,6	107	2,3	31	-
23	9,8	mw	23,3	Bar	7,5	9,3	2,1	31	-
Shift III (Heri & Muslim)									
24	9,8	mw	23,3	Bar	7,3	85	2,1	31	Turbine Status Running
01	10,1	mw	23,3	Bar	7,2	81	2,1	31	
02	10,2	mw	23,3	Bar	7,2	80	1,8	31	* Shower at Cooler turbine.
03	10	mw	23,3	Bar	7,3	80	2,1	31	* Drain Oil Filter Gas Turbine.
04	10	mw	23,3	Bar	7,1	73	1,0	31	* Cleaning Filter Karcher
05	9,8	mw	23,9	Bar	7,2	80	1,8	31	* cek & Drain Air Comp & Air Dryer.
06	9,9	mw	23,3	Bar	7,0	78	1,8	31	* cleaning filter karcher.
07	9,9	mw	23,3	Bar	7,1	77	1,8	31	

11:29

NB : Shift 1 → power

10,1	mw	$T_s = 711\text{ }^{\circ}\text{C}$
10,2	mw	$T_s = 717\text{ }^{\circ}\text{C}$
10,1	mw	$T_s = 710\text{ }^{\circ}\text{C}$
10,1	mw	$T_s = 718\text{ }^{\circ}\text{C}$
10,2	mw	$T_s = 723\text{ }^{\circ}\text{C}$
10,2	mw	$T_s = 720\text{ }^{\circ}\text{C}$
10,3	mw	$T_s = 724\text{ }^{\circ}\text{C}$
10,3	mw	$T_s = 725\text{ }^{\circ}\text{C}$
10,3	mw	$T_s = 726\text{ }^{\circ}\text{C}$

Shift II 04:03

→ 9.7 MW → power increase 10 MW → Gas fuel press = 22.9 Bar.