

CUSTOMER SERVICES MAINTENANCE REPORT

CUSTOMER	GATRO POWER PVT LIM...HUB CHOWKI
PACKAGE	10695T1
PACKAGE SOLAR PD	72851
ACTIVITY	Maintenance
LEVEL	Level A+B (Once per Year)
ENGINE MODEL	TAURUS 60
ENGINE SN	OHA22-T3018
RGB MODEL	E222150-102-950
RGB SN	GBI19-10442
GENERATOR MANUFACTURER	Leroy Somer
GENERATOR SN	602868-1
DATE (dd.mm.YYYY)	10.06.2023

Date: 10.06.2023

Solar Turbines
Switzerland Signature

Customer Signature

ACTIVITY LIST

Pre Shutdown - Package

- ☒ Check for Oil Leaks

Shutdown - Job

- ☒ Site Preparation - Toolbox Meeting - Obtain Permit to Work (If Required)
- ☒ Review WHA at Site / Check Applicable TRA/JSA's & Create If Necessary (WFM/SOJT) / Report any Incident or Unsafe Condition (INI)
- ☒ Verify Consumables, tools and Field Tools (FT)
- ☒ Site Preparation - LOTO

Shutdown - Control

- ☒ Check Overspeed Backup System
- ☒ OverSpeed Threshold Calibration Check - ↑ 9415 Hz
- ☒ Check and make sure that the HMI & Logger Data are recorded, complete and functioning
- ☒ Check Control System Device Fans (If Applicable)
- ☒ Check Electrical Cubicle and Panels Cleanliness. Electrical connection visual inspection for cleanliness and security
- ☒ Check that Signals and Grounding Systems Electrical Terminals are Tight in Package Control Room & Terminal Boxes, Plant Ground terminals, ...
- ☒ Check Air Conditioner Operation
- ☒ Safety Functions Test
- ☒ Instrument Air Pressure Switch
Comment: 5.5 bar is low setting
- ☒ Low Gas Fuel Pressure
Comment: 12 bar is the low setting
- ☒ High Gas Fuel Pressure
Comment: 18 bar is the new pressure gauge setting .
- ☒ Gas Pressure Low During Valve Check
Comment: 1 bar is the low setting
- ☒ Gas Pressure High During Valve Check
Comment: 11 bar is the high setting
- ☒ Ignition Gas Pressure High (Main & Pilot)
Comment: 1 bar setting was observed
- ☒ Emergency Stop Control Cubicle
- ☒ Fire Extinguishing System
- ☒ Gas Detection System Device
- ☒ Checks of 400VAC Power Supply Panel
- ☒ Restore and Measure the 400VAC Power Supply 403 VAC
- ☒ Check 24VDC Battery Supply System (If Applicable)
- ☒ Verification cleanliness of terminal connection on each battery
- ☒ Battery #1 6.1 (0 min) 6.15 (15 min) 6.17 (30 min) 6.15 (45 min) 6.12 (60 min)

ACTIVITY LIST

☒ Battery #2	6.1 (0 min)	6.14 (15 min)	6.12 (30 min)	6.114 (45 min)	6.08 (60 min)
☒ Battery #3	6.1 (0 min)	6.18 (15 min)	6.17 (30 min)	6.16 (45 min)	6.13 (60 min)
☒ Battery #4	6.1 (0 min)	6.19 (15 min)	6.17 (30 min)	6.16 (45 min)	6.14 (60 min)
☒ Batteries Current	45.3 (0 min)	45.5 (15 min)	45.6 (30 min)	45.9 (45 min)	45.9 (60 min)
☒ Battery Type	Lead acid - battires				
☒ Check Peltier Modules Functionality (if inside the package)	# Comment: Peltier Module for all panels found to be in good condition and working fine .				
☒ HMI restart and View Logger functional/operational review					

Shutdown - Package

☒ Check Quality of Air Assist (Verify No Liquids Present in Block)			
☒ If condensate is present, check the air assist line downstream for possible presence of dirt in solenoid valves			
☒ Gas Detection System - General Tasks . Normally once per year, to do 2 times/year only where applicable			
☒ Gas Type (Methan, Propane, Butane, ...)		Mehtane	-
☒ Visual inspection and cleaning of the gas sensors			
☒ Site Thresholds Alarms	10 (Alarm 1)	20 (Alarm 2)	
Limits (Alarm / Shutdown)			
☒ Verify Warning/Alarm Limits of Gas Monitoring System (2 times/year only where applicable)			
☒ Alarm setting on Gas Monitor Unit/HMI - I	10 (Alarm 1)	20 (Alarm 2)	
☒ Gas Sensor 1 Serial Number			325672/201 - 7
☒ Test Gas Sensor 1. Alarm activation threshold		10	% LEL
☒ Test Gas Sensor 1. Shutdown activation threshold		20	% LEL
☒ Test 50% LEL concentration Gas Sensor 1		39	% LEL
☒ Check Enclosure Air Filters & Cleaning System (If Applicable)			
☒ Check Combustion Air Filters (Air Inlet) & Cleaning System (If Applicable)			
☒ Inspect combustion air inlet duct from air filters to engine inlet mesh. Report condition to FM/Supervisor			
☒ Visual Inspection of Solenoid Valves & Pressure Switch Connections			
# Comment: Some of the connectors are broken and are tied with cable tie , it is recommended to replace them .			
☒ Check Functionality of Enclosure Shutters (Opening command -> Feedback)			
☒ Check Outdoor Packages for Signs of External Water Leaks (If Applicable)			
# Comment: Water leaks have been observed through out the package doors, lots of rust have accumulated on the doors .			
☒ Review the good hardware condition and operation of all lifting pistons for gull wing doors			
# Comment: The door piston and hinges are extremely rusted and needed to be replaced .			
☒ Verify security pin presence and its integrity for all lifting pistons of all gull wing doors			
☒ If required or necessary, add grease to the coupling			
# Comment: Engine was recently changed , it has only accumulated 2700 hours , coupling grease was changed .			
☒ Inspect all Flexible hoses (metal and rubber)			

Shutdown - Fuel(s)

- ☒ Inspect GAS FUEL Main & Pilot Control Valves and other equipment; Check for Contamination (If Applicable)
Comment: Purple oil is observed through out the gas line .
- ☒ Report to Local Support (RFE/FM) if contaminants are present in the any part of the fuel line (valves, pipes, torch line, manifolds, ...)
Comment: Purple oil has been observed through out the gas system .
- ☒ Replace GAS FUEL Filter & O-ring/Gasket (If Applicable)
- ☒ Report to Local Support (RFE/FM) if contaminants are present in the fuel filter
Comment: Reported to the FM the filters are in very bad state .
- ☒ Liquid Fuel System Fuel Filters Replacement (If Applicable)
Comment: The liquid fuel filter on the left bank was in fine condition , it is recommended to replace the filter on the right bank when the operational staus of the turbine in known .
- ☒ Replacement of Low Pressure diesel fuel filter
Comment: Small particle of unkown partilces were observed , however due to long time stagnation of Liquid fuel the lines and filters should be purged before operation of the turbine .
- ☒ Replacement of External Low Pressure Diesel Fuel Filter (option)
Comment: Inspected and cleaned and installed .

- ☒ Check Cleanliness of Turbine Compressor
- ☒ Visual inspection of the OFF-Line washing hardware (lance tip, water tank cleanliness, ...)
- ☒ Visual inspection of the ON-Line washing hardware paying particular attention to the water wash nozzles
- ☒ Annual Borescope Inspection
- ☒ Check Bleed Valve Actuator Functionality
- ☒ Replace Torch Igniter Spark Plug (2.4 mm electrode gap)
- ☒ Visual Inspection of VGV Levers, Rod End & Arms Lubrication

☒ Oil Cooling System visual inspection & checks # Comment: The radiator installed on the lube oil cooling is found to have leak marks on the radiator it self , it is recommended to inspect the radiator .			
☒ Main Tank Oil Level Control (Level Switch/Level Transmitter)			
☒ Lube oil tank Heater			
☒ Visual Inspection of components and cabling			
☒ Heater #1 Current	5.3 (U)	5.1 (V)	5.2 (W)
☒ Take Oil Sample for Analysis			

☒ Generator Inspection and Visual Checks according contract agreement (to review with FM/FSS) and Generator O&M manual		
☒ Check if Oil leakages are present # Comment: Oil leakage on drive end bearing housing is observed .		
☒ Check Condition of Exciter and Cable tightness		
☒ Check Condition of Diodes and tightness		
☒ Visual Inspection of Rotor		
☒ Check That Terminals Are Tight		
☒ Check Generator Carbon Brush on DE Side		
☒ Generator Insulation Resistance Test		
☒ Check tightness of the high voltage cables		
☒ Generator Stand-by Heater		
☒ Current	2.1	Amps
☒ Voltage	230	VAC
☒ Inspect Coupling shear bolts for wear or damage		

- ☒ Visual Inspection of Fire Protection System
Comment: - Fire fighting test was started , it was found the panel buttons were not responding (Acknowledge, reset and auto Manual Blocking) .
- ☒ Verify the operation of each fire detector and smoke detector
Comment: Fire fighting detectors working well along with the smoke detector .
- ☒ Verify the line interruption of each detector, push button, limit switch, weight switch
- ☒ Verify the line interruption of the extinguishing coil
- ☒ Verify the automatic system disabling when opening the enclosure door(s)
- ☒ Verify the manual system disabling with the key on the front of the panel
- ☒ Verify the horn and alarm light on enclosure
- ☒ Simulate the extinguishing by acting on fire detectors (all doors closed)
- ☒ Simulate the extinguishing by pressing the extinguishing button (all doors closed)
- ☒ Verify alarm by activating Fire Detectors w/o consequent extinguishing agent discharge (door(s) open)
- ☒ Verify the extinguishing agent discharge by pressing the external button(s) (door(s) open)

ACTIVITY LIST

- ☒ Verify correct sequence of air evacuation (shutters opening after CO2 discharge)
Comment: Shutters are not opening after CO2 discharge .
- ☒ Verify HMI indication of panel fault alarm
- ☒ Verify HMI indication of fire detection warning
- ☒ Verify HMI indication of Fire Extinguishing System disabled
- ☒ Verify HMI indication of loss of extinguishing medium warning
- ☒ Verify the HMI indication of Fire Extinguishing System Activated
- ☒ Fire Extinguishing System backup Battery to replace
Comment: The fire fighting batteries are in good health and were replaced in 2022 .
- ☒ Record Software version 1092 -

Restart - Package

- ☒ Check for Oil Leaks
- ☒ Check for Air Leaks (Compressed Air; Engine Plugs, Flanges, T5 Thermocouples, ...)
- ☒ Check for Fuel(s) Leaks
- ☒ Check Speed Sensors, with Turbine at Full Speed
- ☒ Speed Pick-up Frequency used by the Governor (1) 8715 Hz
- ☒ Speed Pick-up Voltage used by the Governor (1) 16.5 VAC
- ☒ Speed Pick-up Frequency used by the Governor (2) 8715 Hz
- ☒ Speed Pick-up Voltage used by the Governor (2) 3.14 VAC
- ☒ Enclosure Ventilation motor fans current measure. CLOSE ALL DOORS prior completing this task
- ☒ Inlet Motor current - #1 **5.8 (U)** 5.5 (V) 5.7 (W)
- ☒ Inlet Motor current - #2 **4.9 (U)** 5.1 (V) 4.9 (W)
- ☒ Outlet Motor Current - **5.0 (U)** 4.8 (V) 4.8 (W)
#1
- ☒ Outlet Motor Current - **5.1 (U)** 5.0 (V) 4.9 (W)
#2
- ☒ Record Enclosure Filters dP (if Applicable) 50 mmH2O

Restart - Engine (Gas Fuel)

- ☒ Engine GAS Operation: Data Recording at MAX LOAD
- ☒ Date 31/05/2023 -
- ☒ Time 05:00 -
- ☒ Package Starts 276 -
- ☒ Package Hours 141683 -
- ☒ Turbine Starts 41 -
- ☒ Turbine Hours 2772 -
- ☒ Gas Hours 2755 -
- ☒ RGB Hours 2772 -
- ☒ Generator Hours 141683 -
- ☒ Active Power 2280 kW
- ☒ Reactive Power 914 kVAR
- ☒ Power Factor 0.92 cos phi

ACTIVITY LIST

☒ NGP			100	%
☒ PCD			8.21	bar
☒ T1			31	°C
☒ Gas Fuel Pressure			17.3	bar
☒ Gas Fuel Temp			44.1	°C
☒ Gas Fuel Flow			814kg/hr	Nm3/hr
☒ Pbaro			1003	mbar
☒ Inlet dP			33	mmH2O
☒ T5 TC1			485	C
☒ T5 TC2			495	C
☒ T5 TC3			486	C
☒ T5 TC4			474	C
☒ T5 TC5			499	C
☒ T5 TC6			482	C
☒ T5 Average			486	°C
☒ Enclosure Temperature			46	°C
☒ Lube Oil Temperature			58	°C
☒ Lube Oil Pressure			4	bar
☒ Turbine Brg 2/3 Drain Temp			84	°C
☒ IGV Position (HMI)				%
☒ IGV Position (Physical)			5	Deg
☒ BV Position (Verify Closed)				-
☒ T7 Average			431	°C
☒ Turbine casing vibration			1	mms
☒ Gearbox Vibration Y			3.2	G
☒ Generator vibration Y (DE)			0.5	mms
☒ Fuel transfer from Gas to Liquid Fuel				

Restart - Vibrations

- ☒ Complete Vibration Survey. Print Report from CSI & Upload route

Restart - Oil

☒ Check Lube Oil Tank Level			1000	lt
☒ Oil Type			Caltex GST46	-
☒ Oil Hours			2750	-
☒ Oil Cooler motor fans current measure (If Applicable)				
☒ Oil Cooler Motor Current 1	9.7 (U)	9.9 (V)	9.9 (W)	
☒ Oil Cooler Motor Current 2	9.9 (U)	10.2 (V)	10.2 (W)	

Restart - Generator

- ☒ Record Generator Bearing Oil Level (e.g. 1/3, 1/2, 2/3 of Sightglass)

2/3

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ACTIVITY LIST

☒	Generator Data Collection		
☒	Active Power	0 (Idle)	2214 (Full Load)
☒	Reactive Power	0 (Idle)	914 (Full Load)
☒	Power Factor	-1 (Idle)	0.92 (Full Load)
☒	Generator Excitation Current	1.8 (Idle)	2.8 (Full Load)
☒	R-S Voltage	11.1 (Idle)	11 (Full Load)
☒	S-T Voltage	11.1 (Idle)	11 (Full Load)
☒	R-T Voltage	11.1 (Idle)	11 (Full Load)
☒	L1 Current	0 (Idle)	125 (Full Load)
☒	L2 Current	0 (Idle)	122 (Full Load)
☒	L3 Current	0 (Idle)	123 (Full Load)
☒	Gen L1 Winding Temp	50 (Idle)	60 (Full Load)
☒	Gen L2 Winding Temp	50 (Idle)	60 (Full Load)
☒	Gen L3 Winding Temp	50 (Idle)	60 (Full Load)
☒	Gen DE Brg Temp	68 (Idle)	71 (Full Load)
☒	Gen NDE Brg Temp	64 (Idle)	67 (Full Load)

Any - Job

- ☒ Update Customer Documentation in Case of Any Modifications (Electrical Schematics, Part Lists, etc.)
- ☒ Review, Update and eventually Complete Site Data in FieldMobile/FieldBase

Any - Control

- ☒ Save Configuration Files (CFG, DBM, RTB, & Governor) & Document Version
- ☒ Check Remote Monitoring System (TSAT Connection/IIM Functionality)