

# **OPERATIVE MONTHLY REPORT**

Unit: Cogeneration S1

## 5-964A-KA-01 - GAS TURBINE

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#### INDEX

1 0	VERVIEW OF UNIT STATUS	3
1.1	Cogeneration - Highlights	3
2 0	PERATIONAL PARAMETERS	4
2.1	Trips/Failed Starts Description	4
2.2	Issue Status Description	4
3 IS	SUE STATUS UPDATE	6
4 A	NNEX	9
4.1	General Notes	9
4.2	Cogeneration S1 process data10	C
4.3	Cogeneration S1 vibration data13	3

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Tel. 0566/58619 - Fax 0566/50056	PROJECT		PAG.	2 di 13
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#### **OVERVIEW OF UNIT STATUS** 1

The aim is to provide an overview of the monitored units over the period: 01/04/2021 -31/04/2021. The main operational data are reported together with the list of new issues and pending action items to support site team and improve plant availability, reliability and performance.

MACHINE	TYPE	SERIAL NUMBER	JOB	MANUFACTURER	CUSTOMER TAG
TUGA	SC1-10	-	-	-	S1-G
GEN	46M8-6	-	-	-	S1-G



Unit data

Unit layout

Cogeneration	S1 – Highl	lights and	performances

	Section	Description
	AxCo efficiency	No evident degradation has been observed on the Axial compressor efficiency. Make reference to the annex section for axco efficiency trends and charts in function of Load, Inlet temp, Corrected Speed and IGV
a)	Power	Following site needs, the unit was operated at medium-High range reaching baseload conditions for around 10% of time (see figure 1).
rmance	Heat rate	<ul> <li>In figure 5 and 6 are reported the high variability of Power and HR in function of Inlet temp and IGV angle.</li> <li>In baseload, the GT efficiency is around 30-31%</li> </ul>
Perfo	Combustion	Service request was opened for the events of flame out. RCA report shared with Customer
	Exhaust Section	Exhaust spread is constantly around 30 C in baseload conditions See figure 9 for the polar distribution
	Vibration	Low Values in amplitude for GT/GB/GEN seismic and GT radial vibrations, with the only anomaly due to spread between the two Seismic readings VE194 A and B

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#### 2 OPERATIONAL PARAMETERS

The following tables contain the main counters over the monitored period:

Operational Data	Cogeneration			
TAG	01/04/2021 00:00:00	31/04/2021 23:59:00	DELTA	
HOURS	2805.2	3549.2	744	
STARTS	88	88	0	
TRIPS	74	74	0	

#### 2.1 <u>Trips/Failed Starts Description</u>

This section reports information about Trips and Failed Starts occurred during the report period.

			Event Da	ate	
Customer ID	Event Type	Event ID	Date	Time	Event Description
Cogeneration S1	-	-	-	-	-

#### 2.2 Issue Status Description

SR Number	Title	STATUS	Comments
1	High Exhaust Spread	Complete	Live values implemented
2	Load rejection	Complete	Recommend to check all other projects with Basler protection relay if the 21-1 low impedance setting are calculated and set correctly as preventive action. This proposal has feedbacked to design team in meeting.
3	Flame Out issue	Complete	RCA report has been completed and shared with customer. Open subcase 39801 to follow up the investigation on the pending points of flameout in NS and load rejection.
4	DCP rectifier Issue	Under investigation	Wait for Customer RCA
5	MLO fan Flickering	Solution available Mitigation ongoing (fan in manual ctrl)	To be applied Next outage
6	IO Pack over temp	Solution available	FSE to change the constant at site based on Expert solution in the next shutdown opportunity.
7	Start procedure after Blackout	Solution available	To be applied Next outage

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### **OPERATIVE MONTHLY REPORT**

REV. DATE 11/1

11/10/2022

8	Oil leak on NDE Jacking oil pump	Solution available	Part purchased
9	MLO DP Tank fault	Solution available	Transmitter in fault
10	both combustor pressure in fault	Under investigation	T.I. under definition with action plan and solution.
11	Inlet system-pre filter	Under investigation	T.I. under definition with action plan and solution
12	BB3/BB4 deviation issue	Under investigation	T.I. under definition with action plan and solution

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Tel. 0566/58619 - Fax 0566/50056	PROJECT		PAG.	5 di 13	
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#### 3 ISSUE STATUS UPDATE

This section provides a follow up of the issues affecting the monitored units. All issues are summarized in the next paragraphs.

In the following table issues still affecting the units are divided per anomaly category.

		Issue per Anomaly Category												
Customer ID	Open Issues	Auxiliary	Combustion	Control System	Data Quality	Enclosure	Filters	Instrument Failure	Leakages	Mechanical / Actuation	Lubrication	Other	Performance	Rotordynamic / Vibration
Cogeneration S1	4	-	1	1	-	-	-	1	-	-	-	1	-	-

In the next section, issues are categorized according to their "Status": status is "NEW" or "OUTSTANDING" if analysis is ongoing or corrective actions are pending and still need implementation; status is "CLOSED" if an issue has been fixed during the report period.

#### **Issue Status:**



Issues opened in the current monitored period Issues which have been opened in the past months and are still unresolved Issues solved during the period considered in this report

#### List of issues

Issue ID	Issue Status / Aging (days)	System	Anomaly Category	Description	Event ID	Service Request
25706	OPEN 74	MLO Tank	Control System	MLO pump Flickering	112	5
25640	OPEN 62	Starting system	Instrument Failure	Lube oil tank pressure #B [PDT-322/B]	123	7
25205	OPEN 93	Combustion	Other	Start procedure after Black out	124	11
24963	OPEN 110	MLO Cooling system	Combustion	Flame out TRIP	134	13

Following tables provide detailed information about all the issues which are not related to instrument failure or data quality.

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leeu		MLO nump Elickoring							
15500									
Customer ID	Cogeneration S1	Event ID	STATUS OPEN						
Anomaly Category System	Control System	Service Request 5	START DATE 18/03/2020						
<b>Problem Staten</b>	nent:								
The cooler fan # 2 w From the data availa functional description reach 62 DegC. It has also observed	The cooler fan # 2 was not running despite in under mode. From the data available, has been remarked a series of ON and OFF for both Cooler fan under auto mode around 57DEgC as per functional description, starting the second fan in case in 1 minute the temp doesn't go under 57C, and immediately if the MLO header temp reach 62 DegC. It has also observed both fan running with MLO header temp below 57C								
Recommended	Actions:								
As first recommendation, put in manual mode the fan#2 and SR will be open to review the logic.									
Update: SR90376306: Logic Confirmed temporar March 19 <sup>th</sup> : Fan coc MLO temp ( ICenter	modification prepared. y solution with Cooler#2 ler#1 in flickering: reco implemented new dedi	Implementation during the next outage ? in manual mmend to put also fan#1 in manual control, Recomme cated set of rules to advice operator in case too low M	and to monitor during the night hours the ILO header temp.						

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11/10/2022

Issue ID: 2	Start procedure after Black out							
Customer ID Cogeneration S1 Anomaly Other Category System	Event ID Service Request 11	STATUS OPEN START DATE 28/02/2020						
Problem Statement: On February 28th, 2020 at about 13:29 a tri During the normal operating conditions, a si Unit operated for 3 minutes maintaining the When the load requested reached and over and speed, by generating a reduction of spe was activated. With unit in No load in 0.62 seconds, with the During the ESD, turning gear was not activated pressure went below the limit for the activated	p was detected on LT5 cogeneration unit due to an externat udden drop down from the external power was observed 4 Frequency around 49.9 Hz reame 4.3 MW at 97 DegF of inlet temperature, the GTG was eed and consequently a reduction of Frequency till reach 48 he staging valve 15 and 13 already closed, the ESD was con ated due to MCC failure including the auxiliary pump. Emergion.	I issue on the National grid minutes before the ESD. as not more able to maintain load 3.2 Hz, when the generator breaker mpleted. gency pump not started when the LO						
Recommended Actions: AS per communication with BH FSE, the tur Procedure from Functional description (see min crank before to start) was shared. Emergency pump no started when the press It is recommended to verify the battery rack	<b>Recommended Actions:</b> AS per communication with BH FSE, the turning gear was not activated during the ESD due to the general black out. Procedure from Functional description (see slide attached) was shared with indication to follow the two steps (10 min in turning ON and 10 min crank before to start) was shared. Emergency pump no started when the pressure went below the L limit.							
Update: SR90375804: Logic modification prepared. pump manually firstly to obtain permissive For Slow roll sequence: Procedure will be o	Operator will can start slow roll manually without needing to	o reset L94X, but need to start JO						
For Slow roll sequence: Procedure will be done by crank motor VFD. In case of incomplete turning during cool down, the extended slow roll (15min) and cracking (10min) will run to avoid potential high vibration due to rotor bow. Emergency pump: Data form the MLO header pressure confirmed the start of emergency pump (pressure up to 0.92bar). No feedback L72QEZ was triggered, but was triggered during the following start – To monitor and check wiring connection loop in next opportunity Fluctuation on L70R/L70L during load control : . Recommend to increase the value of the filtering constant on Droop calculation K30DROOP_TAU to 1.0.								

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#### 4 ANNEX

#### 4.1 General Notes

- 1. All performance evaluations performed with the instrumentation installed, based on the current reading status in terms of calibration and the last fuel gas composition available.
- 2. Performance output charts are based on the following applied filtering data:
  - TNH > 99%
  - 10' Sampling
- 3. Baseload conditions are based on:
  - Temperature control condition (ref to REGULATOR=6)
  - IGV opening greater than -0.2 degrees.

For the cogeneration LT5, ICenter calculates Heat Rate in function of the following signals:

- Fuel mass flow (WIS1\_FGX [FIT-100]).
- Power (DPOWER\_1 selected value of XY-1151 and XY-1152).
- LHV of the fuel using gas received from site (below table)

GAS	
Component	% mol
Methane	93.776
Ethane	2.355
Propane	0.503
i-Buthane	0.129
n-Buthane	0.098
i-Penthane	0.010
n-Penthane	0.020
Hexane	0.020
C.Dioxide	2.006
Nitrogen	1.083

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Figure 1 – Cogeneration S1 Load Distribution during report period

The following charts are reporting power and HR vs Inlet temperatures with expected curves based on the Standard S1 with the following conditions:

- Ambient Pressure =1.01 Bar
- Inlet and Discharge Losses= 0 mmH2OD,
- Relative Humidity=60%.

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Figure 4 - Cogeneration S1

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GAS TURBINE								
		1X						
Probe	Direct [µm]	[µm]	Phase [°]	Side [DE/NDE]				
XE-102A	40.1	37.1	260	DE				
XE-102B	28.8	24	14	DE				
XE-103A	14.6	5.9	181	NDE				
XE-103B	13.1	4.6	249	NDE				

Table 1 – Turbine avg vibration values



Figure 5 – DE side radial probe trend [µm pp]



Figure 6 - NDE side radial probe trend [µm pp]

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