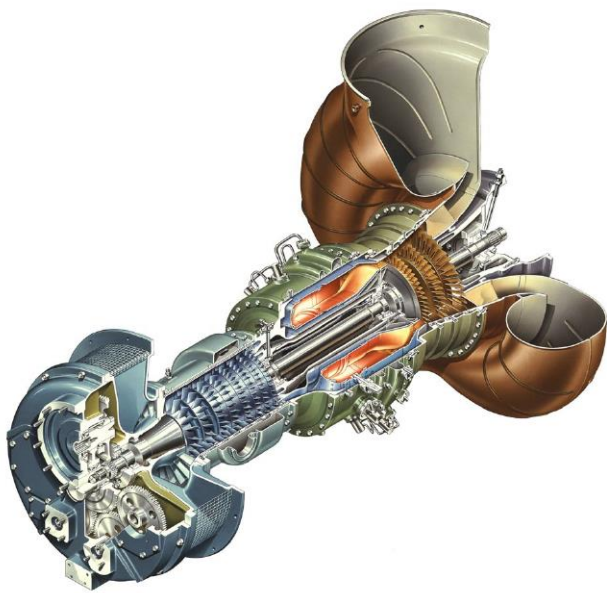


BORESCOPE INSPECTION REPORT



GAS TURBINE ENGINE
SATURN
HOT END DRIVE

Engine Serial Number
OHF10-S0767

Engine Rating
[Engine Rating]

Engine Serviceable
Yes

Inspection Performed By
Michael Werling

Inspection Date
Thursday, May 25, 2017

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BORESCOPE INSPECTION INFORMATION

Country	USA	Inspection Date	5/25/2017
Customer Name		Inspection Performed By	Michael Werling
Site Name		Reason For Inspection	4000 Hrs Inspection
District	DSNO	Borescope Equipment Used (Brand/Model)	
Work Order #		Borescope Inspection Procedure (WFM Task #)	131

PACKAGE INFORMATION

PD #	63001	Package S/N	DSG0254
Unit Customer Tag	Unit #2	Package Hours	49140
		Package Starts	681

ENGINE INFORMATION

Engine GP ¹ P/N		Gas Fuel Hours	
Engine GP S/N	OHF10-S0767	Liquid Fuel Hours	
Engine PT ² P/N		Total Hours	30732
Engine PT S/N		Total Starts	419
Engine Rating		Next Planned Overhaul	
Combustion Type	Conventional	Running Hours	
Fuel Type	Dual		
Inspection Last Date	Saturday, December 10, 2016	Gas Fuel Hours since last inspection	
		Liquid Fuel Hours since last inspection	
		Starts since last inspection	

NOTES

Borescope completed before Offline Compressor Wash.

¹ GP stands for "Gas Producer".

² PT Stands for "Power Turbine".

BORESCOPE INSPECTION CHECK LIST

Step	Description ³	Performed			Initials & Date
		Yes	No	N/A	
1	Complete Task Risk Assessment.	✓			MW May 25, 2017
2	Complete Job Safety Analysis.	✓			MW May 25, 2017
3	Ensure the shutdown Gas Turbine engine is cool.	✓			MW May 25, 2017
4	Prepare the package for a Borescope Inspection.	✓			MW May 25, 2017
5	Perform Borescope Inspection (Record images, measurements and comments on the Borescope Inspection Report).	✓			MW May 25, 2017
6	Return Gas Turbine engine to service.	✓			MW May 25, 2017
7	Complete the Borescope Inspection Report (Borescope report sections populated correctly, FSR signature, Customer signature).	✓			MW May 25, 2017
8	Print/Scan the document as a PDF. Archive the document under the WFM associated Major Assembly / Field Attachments section.	✓			MW May 25, 2017

³ For detailed step instructions, please refer to the Solar Turbines WFM (Work Force Management) internal procedure mentioned in the Equipment Information section.

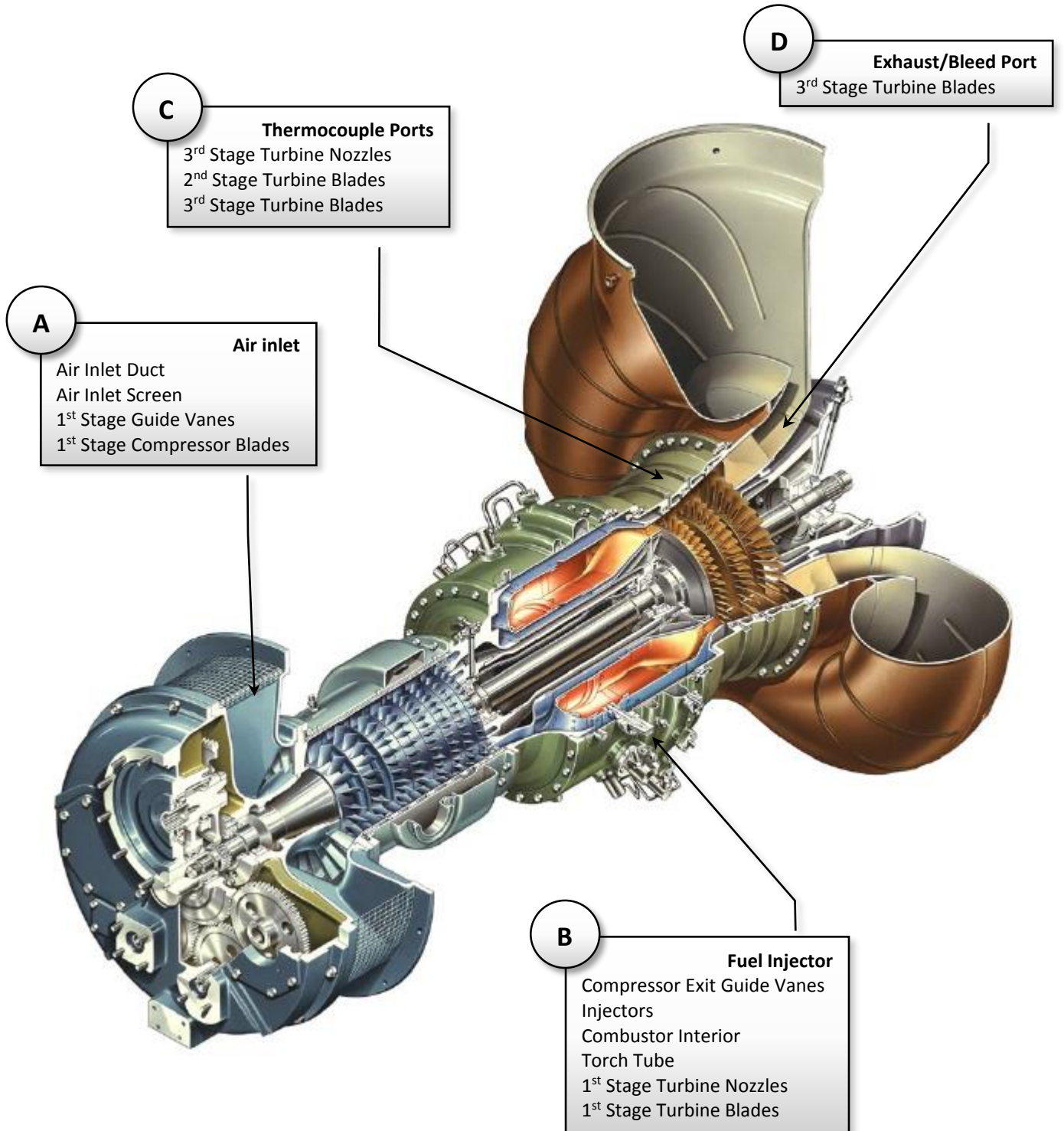
EQUIPMENT DATA PLATE

Gas Turbine

Power Turbine



BORESCOPE INSPECTION LOCATIONS



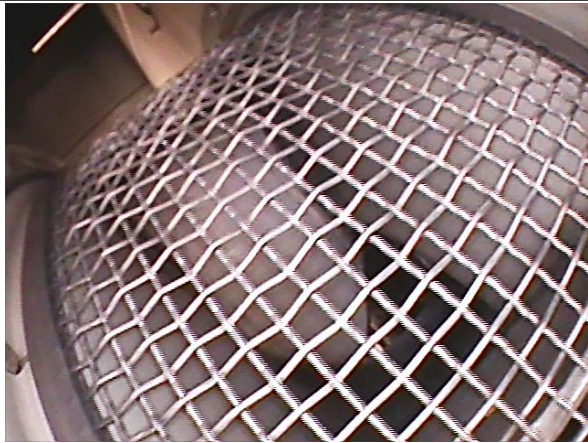


BORESCOPE INSPECTION SUMMARY


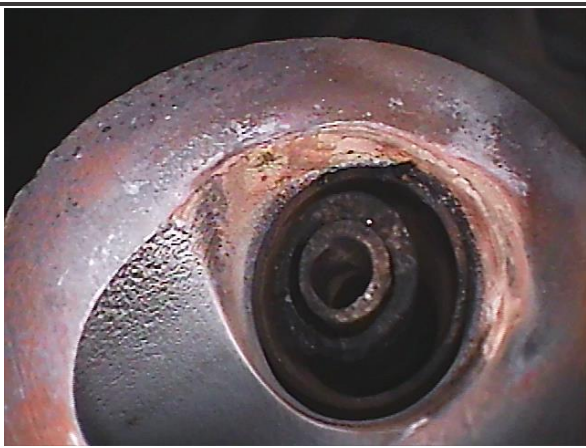

Access Port	Location	Inspection for	Normal Condition	Minor	Moderate	Severe	Comments
<u>A</u>	Air Inlet Screen	a)Potential FOD b)Cracks, damaged mesh	✓				
<u>A</u>	1st Stg Guide Vanes	a)Nicks, dents, Qty and size b)Excess fouling c)Corrosive pitting. Affected Area	✓				
<u>A</u>	1st Stg Blades	a)Nicks and dents. Qty & size b)Excess fouling c)Corrosive pitting, Area d)Tip rub, Gap & curling	✓				
<u>B</u>	Compressor Exit Guide Vanes	a)Nicks and dents. Quantity and size b)Excess of fouling c)Corrosive pitting. Affected area	✓				
<u>B</u>	Injectors	a)Pilot center erosion b)Fuel hole contaminated, blocked c)Cracks d)Liquid: broken fuel spoke		✓			Carbon build up on injectors
<u>B</u>	Combustor Interior	a)Crack, Qty and size b)Thermal erosion c)Hot spots d)Buckling or warpage	✓				
<u>B</u>	Torch Tube	a)Thermal erosion	✓				


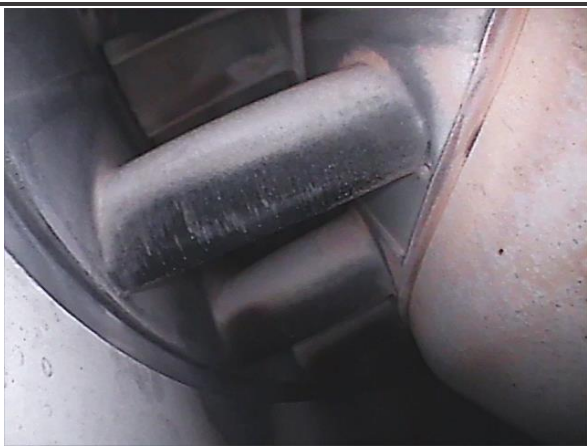

Access Port	Location	Inspection for	Normal Condition	Minor	Moderate	Severe	Comments
<u>B</u>	1st Stg Turbine Nozzles	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area	✓				
<u>B</u>	1st Stg Turbine Blades	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth & area c)FOD, Area d)Tip rub, gap width	✓				
<u>C</u>	2nd Stg Turbine Nozzles	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area	✓				
<u>C</u>	2nd Stg Turbine Blades	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area d)Tip rub, gap width	✓				
<u>C</u>	3rd Stg Turbine Blades	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area		✓			Coating missing




Access Port	Location	Inspection for	Normal Condition	Minor	Moderate	Severe	Comments
<u>D</u>	3rd Stg Turbine Nozzles	a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area d)Tip rub, gap width	✓				
<u>X</u>	2nd Stage Vanes		✓				
<u>X</u>	Exhaust Bellows	TBD				✓	Exhaust Bellows has cracks. Replace ASAP




BORESCOPE INSPECTION PICTURES

Access location Description	Picture	Inspection for	Severity / Comments
A Air Inlet Screen		a) Potential FOD b) Cracks, damaged mesh	Normal Condition Not applicable
A 1st Stg Guide Vanes		a) Nicks, dents, Qty and size b) Excess fouling c) Corrosive pitting. Affected Area	Normal Condition Contamination, minor
A 1st Stg Blades		a) Nicks and dents. Qty & size b) Excess fouling c) Corrosive pitting, Area d) Tip rub, Gap & curling	Normal Condition Contamination, minor

Access location Description	Picture	Inspection for	Severity / Comments
<p>B</p> <p>Compressor Exit Guide Vanes</p>		<p>a)Nicks and dents. Quantity and size</p> <p>b)Excess of fouling</p> <p>c)Corrosive pitting. Affected area</p>	<p>Normal Condition</p>
<p>B</p> <p>Injectors</p>		<p>a)Pilot center erosion</p> <p>b)Fuel hole contaminated, blocked</p> <p>c)Cracks</p> <p>d)Liquid: broken fuel spoke</p>	<p>Minor</p> <p>Carbon build up</p> <p>Carbon build up on injectors</p>
<p>B</p> <p>Combustor Interior</p>		<p>a)Crack, Qty and size</p> <p>b)Thermal erosion</p> <p>c)Hot spots</p> <p>d)Buckling or warpage</p>	<p>Normal Condition</p> <p>Burn spots</p>

Access location Description	Picture	Inspection for	Severity / Comments
B Torch Tube		a) Thermal erosion	Normal Condition
B 1st Stg Turbine Nozzles		a) Cracks, Qty, length, orientation b) Thermal erosion, Depth and area c) FOD, Area	Normal Condition Burn spots
B 1st Stg Turbine Blades		a) Cracks, Qty, length, orientation b) Thermal erosion, Depth & area c) FOD, Area d) Tip rub, gap width	Normal Condition Blade tip rub, gap width

Access location Description	Picture	Inspection for	Severity / Comments
<p>C</p> <p>2nd Stg Turbine Nozzles</p>		<p>a)Cracks, Qty, length, orientation</p> <p>b)Thermal erosion, Depth and area</p> <p>c)FOD, Area</p>	<p>Normal Condition</p>
<p>C</p> <p>2nd Stg Turbine Blades</p>		<p>a)Cracks, Qty, length, orientation</p> <p>b)Thermal erosion, Depth and area</p> <p>c)FOD, Area</p> <p>d)Tip rub, gap width</p>	<p>Normal Condition</p>
<p>C</p> <p>3rd Stg Turbine Blades</p>		<p>a)Cracks, Qty, length, orientation</p> <p>b)Thermal erosion, Depth and area</p> <p>c)FOD, Area</p>	<p>Minor</p> <p>Missing coating</p> <p>Coating missing</p>

Access location Description	Picture	Inspection for	Severity / Comments
D 3rd Stg Turbine Nozzles		a)Cracks, Qty, length, orientation b)Thermal erosion, Depth and area c)FOD, Area d)Tip rub, gap width	Normal Condition
X 2nd Stage Vanes			Normal Condition Contamination, minor
X Exhaust Bellows		TBD	Severe Corrosion Exhaust Bellows has cracks. Replace ASAP

C O N C L U S I O N

Contamination on first few stages of compressor section; some burn spots in combustor and on first stage nozzles; exhaust bellows has crack and needs to be replaced.

R E C O M M E N D A T I O N

Replace exhaust bellows; detergent wash regularly; follow Solar's recommended maintenance practices.

**BORESCOPE INSPECTION OF GAS TURBINE ENGINE
GENERAL OBJECTIVES**

The gas turbine borescope inspection is an internal inspection performed by a trained specialist who assesses the condition of the gas turbine components. This inspection is performed using an instrument specifically designed to examine the gas path, via the access ports positioned along the engine, from the air inlet to the exhaust.

These inspections are one of the primary diagnostic methods for maintaining turbo-machinery. Both rigid and flexible fiberscopes are used in conjunction with especially formed guide tubes to inspect the internal stationary and rotating components. Primary goals are to detect early signs of wear or impending failure. The major benefits of the inspection include equipment condition awareness and effective scheduling of any necessary maintenance interventions. In addition, greater reliability / longevity can be achieved through internal inspections, as well as reducing the potential of severe equipment damage.

The operating gas turbine engine components, by design, are exposed to high thermal and mechanical constraints. Internal inspections are thus necessary to determine if wear or thermal erosion has occurred. In addition, these inspections will quantify if any foreign object damage (FOD) or corrosion has occurred, as well as assessing internal components for thermal deterioration, cracking or distortion.

While every effort is made to examine all accessible parts of the engine, some areas are not accessible through a borescope inspection. Therefore, a borescope inspection should not be considered to be the ultimate method to assess an engine's health.

This borescope inspection has been performed following a Hierarchical Task Analysis procedure exposed in TL 21.7/100.

SOLAR TURBINES INSPECTOR SIGNATURE / DATEInspector Name: **Michael Werling**

Inspector Email Address:

Inspector Phone Number: