



FIELD SERVICE REPORT



Customer Name

**PTT EXPLORATION AND PRODUCTION PUBLIC
COMPANY LIMI**

Site Name

BONGKOT SOUTH

Work Scope

HOTGAS PATH INSPECTION

Technology

Aero Gas Turbine - Aero Gas Turbine

Submitted Date

25 April, 2019

Serial #

809253

Type of Intervention

CS TM

Site Activity Job #

2897800

This Preliminary Field Service Report is intended to provide you with a preliminary description of the activities performed by our FSEs at site. This Preliminary Field Service Report is not intended to provide you with recommendations or instructions on future use of your equipment. The purpose of the preliminary recommendations and/or instructions contained in this report, if any, is to highlight potentially material issues and other significant information for the operation of your equipment that our FSE has identified. The recommendations and/or instructions included herein are based solely on the information available to the FSE on site as of the date hereof. Final recommendations and/or instructions on future use of your machine and equipment, if any, will be issued in the Final Field Service Report. Such Final Field Service Report will be based on our analysis of all other information available to Baker Hughes, a GE Company. To the extent any recommendation and/or instruction is contained herein, you should rely on such recommendation and/or instruction only for the interim period until you receive from us the Final Field Service Report. From that moment on you should rely solely on the recommendation and/or instruction included in the Final Field Service Report. BHGE assumes no liability in connection with customer's failure to comply with the above.

BHGE Field Service Representative

Hasbullah Azmi Bin Hussin

Customer Representative

Mr.Peeradet Aroonsangob

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1. GENERAL INFORMATION

1.1 Customer Site Data

Site Address	GREATER BONGKOT SOUTH FIELD BLOCK B16 & B17, GULF OF THAILAND
Country	Thailand
Site DUNS Number	CAT802057

1.2 Customer Representative Data

Customer Representative	Mr.Peeradet Aroonsangob
Customer Contact Phone Number	+66851101578
Customer eMail - Required	peeradeta@pttep.com

1.3 BHGE Reference Contact

Project Manager Name	Majang, Alphian A
Field Project Engineer Name	
Service/Installation Manager Name	Relangi, Jagadeesh pratap (BHGE) Jagadeeshpratap.Relangi@bhge.com
Site Manager Name	
Report Written by - FSE Name	Hasbullah Azmi Bin Hussin

1.4 NIC/TIL

NIC/TIL Code	Description
NIC06.27	PGT25 POWER TURBINE MAITENANCE MANUAL UPDATE FOR HOT GAS PATH INSPECTION RECOMMENDATION
NIC11.02	PGT25 BASE POWER TURBINE: RUBBING BETWEEN ROTOR AND STATOR



2. MACHINE DATA

2.1 Equipment Data

Service Hours	32621
Starts Number	133
Trip Number	133
Fuel Type(s)	Gas fuel
Fuel System	Single Gas
Driven Equipment	Centrifugal Compressor
Combustion System (if any)	STANDARD
Type of Service/Application	

2.2 Machine Status

Status at FSE Arrival On Site	OUT OF SERVICE
Status at FSE Departure From Site	READY TO START
FSE Arrival Date On Site	16 April, 2019
FSE Departure Date From Site	26 April, 2019

2.3 Outage Service Period

From	18 April, 2019
To	25 April, 2019

2.4 Unit Reference Data

Original Job Number (Manufacturing)	1608018
Cod Date (installation unit date)	30 August, 1992
GE s/n	809253
Name Plate	05848
Customer Tag #	
Related s/n	5742164
OEM 1 s/n	
OEM 1 Brand	



3. OVERALL SUMMARY

3.1 Executive Summary

The purpose of this visit was to carry out Hot Gas Path Inspection on Power Turbine PGT25 only on SN5742164 at PMI Workshop in Songkhla, Thailand. The HGPI had been carried out in according Nuovo Pignone procedures as per NIC 06.27.

The work scope consists in these major activities:

- Removal & Inspection of 1°stage nozzle assembly
- Removal & Inspection of 1°stage turbine casing
- Removal & Inspection of 2°stage nozzle (pieces part exposition)
- Removal & Inspection of 2°stage turbine casing
- Inspection of 1°stage rotor blades
- Inspection of 2°stage rotor blades
- Installation of 1°stage rotor blades
- Installation of new 2°stage rotor blades
- Installation of old 2°stage turbine casing
- Installation of new 2°stage nozzle
- Installation of old 1°stage turbine casing
- Re-installation of old 1 °stage nozzle
- Bearing #1 removal & inspection
- Bearing #2 removal & inspection

3.2 Conclusion & Recommendation

M port cover and Plug not installed. To install M port cover and plug at site.

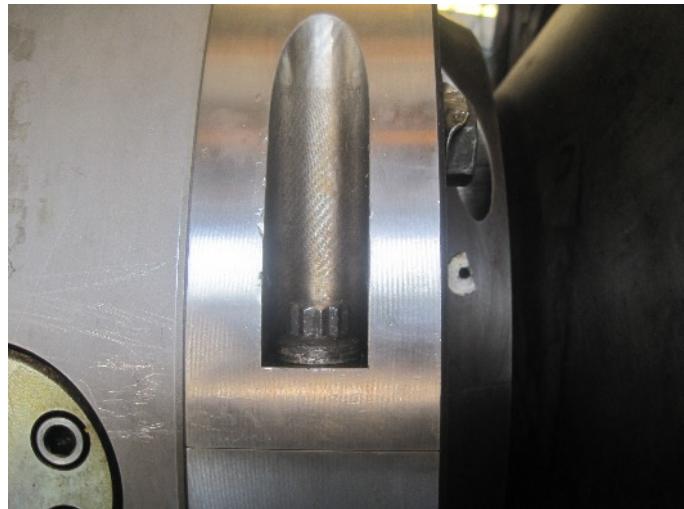
To install Pin FPE 04040 Qty: 6 at Air / Oil Seal Housing once available at site.

To check the axial clearance between rotor and stator ("iron to iron procedure") at site when PT replacement carried out.

To check of radial position between rotor and stator M1-M2-M3 when PT installation carried out.



M Port Plug and Cover to install



Pin for Air / Oil Seal Housing

4. ACTIVITY REPORT**16, APRIL 2019****MOBILIZATION****Progress: 50%**

- Mobilization from KUL to BKK

17, APRIL 2019**MOBILIZATION****Progress: 100%**

- Thailand UWP application
- Travel from BKK to HDY
- Travel from Hatyai to Songhkla

18, APRIL 2019**HOT GAS PATH INSPECTION****Progress: 10%**

- Arrived at PTT Workshop Songhkla
- Kick off meeting with PTTEP Engineer
- Material Inspection and special tools available at site
- PT Container removed and transfer onto maintenance trolley
- Removal of Stage 1 Nozzle completed. Broken bolt was found at bonding baffle area, repair required to remove the broken bolt.
- Clearance check carried out as per SOM22777 on 2nd Stage Casing

Dimension F=1.61 mm.

Clearance between 2nd Stage Bucket and 2nd Stage Casing found to be within the tolerance.



Dimension C=2.25 mm.

Clearance between 1st Stage Bucket and 1st Stage Casing found to be within the tolerance



PT in Transportation Container



PT in Transportation Container



PT transferred onto maintenance dolly



Stage 1 Nozzle removal

19, APRIL 2019

HOT GAS PATH INSPECTION

Progress: 25%

- Removal of Stage 1 Casing completed. Broken bolts was observed at M port cover.
- Removal of Stage 2 Nozzle completed and no abnormalities was observed
- Removal of Stage 2 Casing completed
- Removal of Stage 1 Bucket completed. Inspection carried out on main defects that can be detected on the rotor buckets are the following.
 1. Crack
 2. Dent
 3. Loss of material
 4. Corrosion



Findings: Forward Angelwings / Seal was wear and sign of rubbing.

- Removal of Stage 2 Bucket completed. Inspection carried out on main defects that can be detected on the rotor buckets are the following.

1. Crack

2. Dent

3. Loss of material

4. Corrosion

Findings: Aft Angelwings / Seal was wear and sign of rubbing.

- Carried out visual inspection on Stage 1 and 2 Casing for any evidence of deposits sign of foreign objects impacts, dents, nicks, cracks and other abnormalities typical of service items.

- 1st Stage Casing Dimensional check carried out and found within the tolerance.

Dimension = 1519 mm

- 2nd Stage Casing Dimensional check carried out and found within the tolerance.

Dimension = 1519 mm

- #2 Bearing removal completed



Stage 1 Casing removal



Removal of Stage 2 Nozzle



Removal of Stage 2 Casing



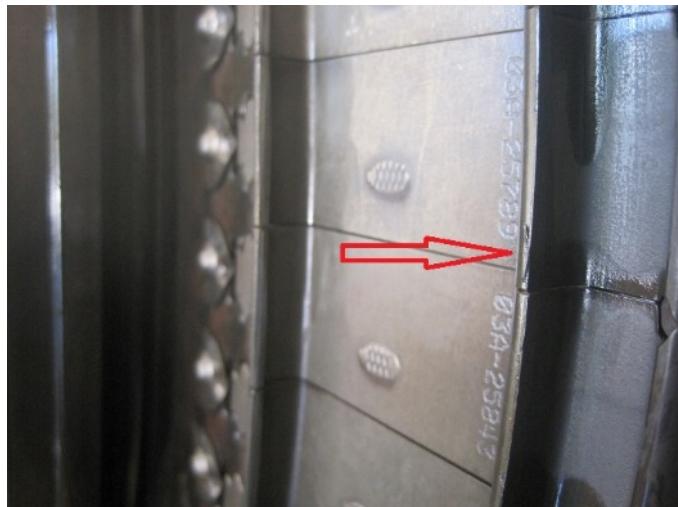
Stage 1 Bucket removal



Signed of rubbing on Stage 1 Bucket Forward Seal



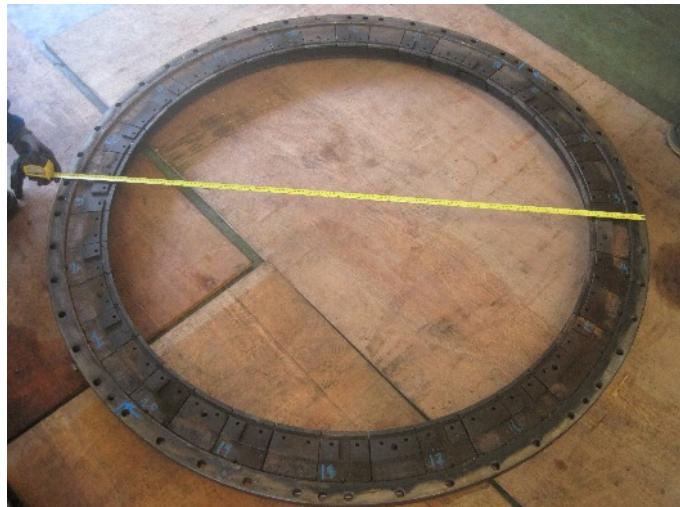
Stage 2 Bucket removal



Signed of rubbing on Stage 2 Bucket Aft Seal



Stage 1 Casing Dimensional Check



Stage 2 Casing Dimensional Check



#2 Bearing Housing removed



#2 Journal Bearing



Active Thrust Bearing



Inactive Thrust Bearing

20, APRIL 2019

HOT GAS PATH INSPECTION

Progress: 40%

- No#2 Bearing Inspection carried out and found satisfactory
- Dimensional check carried out on #2 bearing and found within the tolerances.

Shaft Diameter – 179.77 mm

Journal Bearing Pad thickness average – 24.0 mm

Journal Bearing Diameter – 228.05 mm

$$\#228.05 - 179.77 - 24.0 - 24.0 = 0.28 / 2 = \text{Dimension T} = 0.14 \text{ mm}$$

- Radial clearance is 0.14 mm (limit specific 0.126/0.160 mm as per DRW SOM 22777)

- Thrust Bearing Axial Clearance Check carried and found within the tolerance 0.66 mm
- Dye Penetrant Test and UT carried out on #2 Journal Bearing Pad and Thrust Bearing Pad and found satisfactory



- Dye Penetrant Test on Bucket Disc completed
- #2 Journal Bearing and Thrust bearing reinstallation completed
- Final inspection of lower casing for cleanliness before #2 Journal bearing and Thrust bearing cover installed with new O-ring seals
- Air/Oil Labyrinth seal removal completed
- Dye Penetrant Test on Stage 1 Nozzle ongoing.



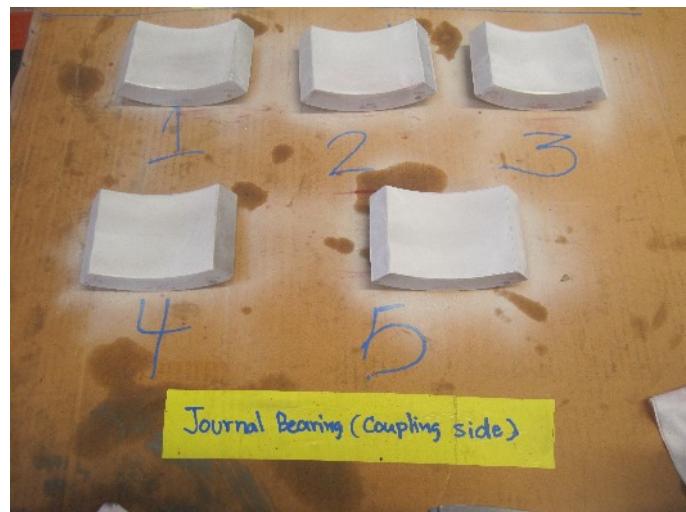
#2 Journal Bearing Pad measurement



Active Thrust Bearing Pad measurement



Inactive Thrust Bearing Pad measurement



Journal Bearing Dye Penetrant Test



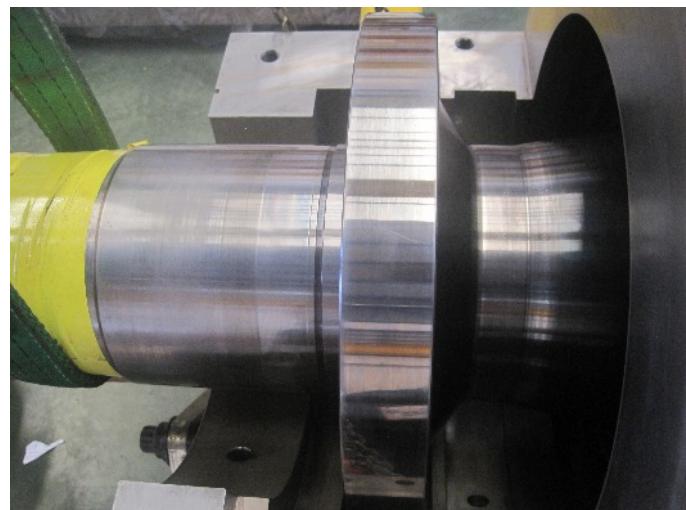
Active Thrust Bearing Pad Dye Penetrant Test



Inactive Thrust Bearing Pad Dye Penetrant Test



Bearing UT Test



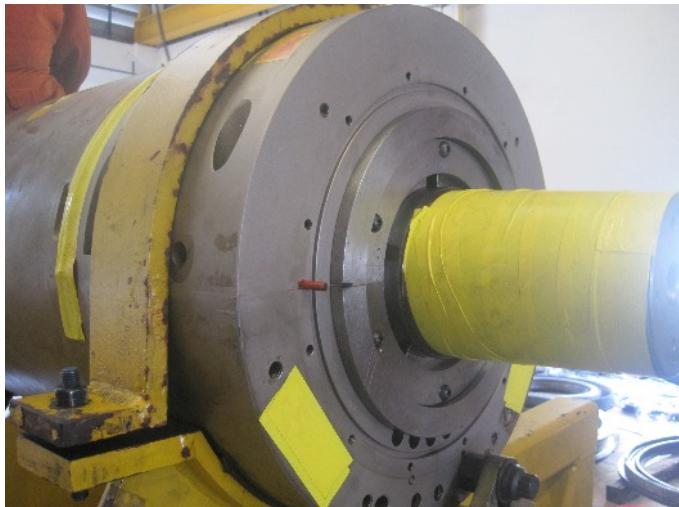
Shaft and Thrust Collar inspected and cleaned



#2 Bearing installation



#2 Bearing installation



#2 Bearing Housing installed



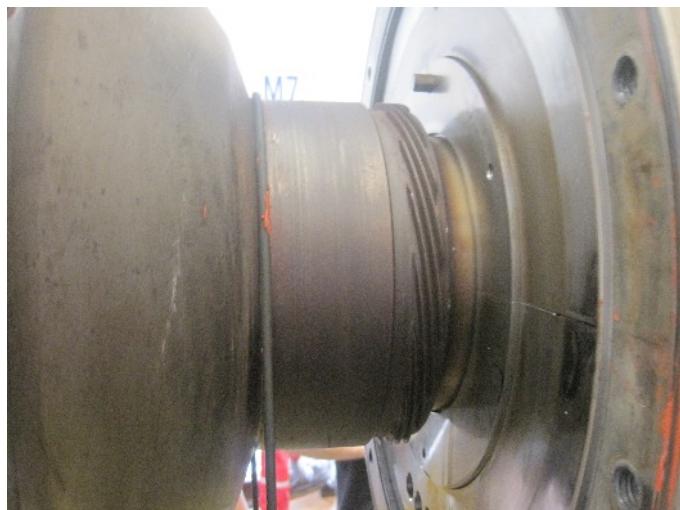
Dye Penetrant on Stage 1 Bucket Disc



Dye Penetrant on Stage 2 Bucket Disc



Air / Oil Seal removal



Air / Oil Seal removed



Stage 1 Nozzle Dye Penetrant Test

21, APRIL 2019

HOT GAS PATH INSPECTIOPN

Progress: 60%

- Customer decided to have a day off
- Dye Penetrant crew to support GBS GG scope of work.

22, APRIL 2019

HOT GAS PATH INSPECTION

Progress: 60%

- Dye Penetrant Test on Stage 1 Nozzle completed and found satisfactory
- Dye Penetrant Test on Stage 1 and 2 Casing ongoing
- Air / Oil Seal clearance check carried out and found satisfactory.

Shaft Diameter (O) - 219.95 mm

Shaft Diameter (P) - 219.75 mm



Forward Oil Seal ID (O) – 221.12 mm

Rear Oil Seal ID (P) – 220.52 mm

Dimension O = 221.12 – 219.95 = 1.16 / 2 = 0.58 mm

Dimension P = 220.52 – 219.75 = 0.77 / 2 = 0.38 mm

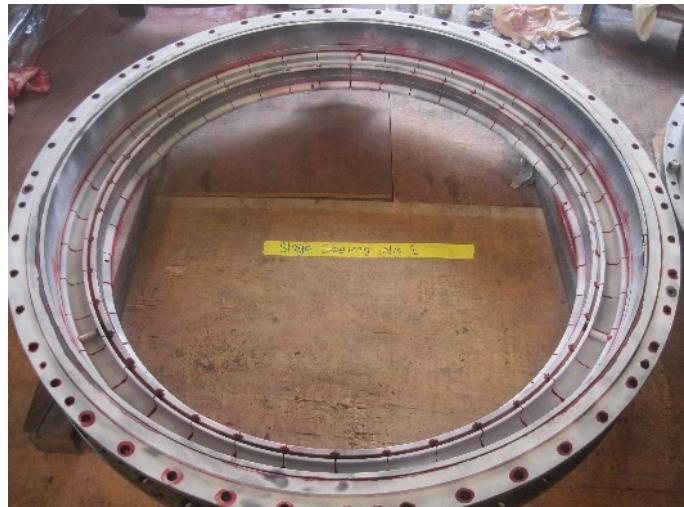
- Oil Seal installation completed
- Removal of #1 Bearing completed
- Clearance check for #1 Bearing carried out and found within the tolerance.

Dimension R = 0.125 mm

- #1 Journal bearing pad thickness measurement carried out.
Pad thickness = 24.05 mm
- Dye Penetrant Test and UT carried out on #1 Journal Bearing Pad and found satisfactory
- #1 Bearing installation completed
- Repair work on broken bolts on Stage 1 Nozzle ongoing
- Repair work on Stage 1 Casing broken bolt ongoing



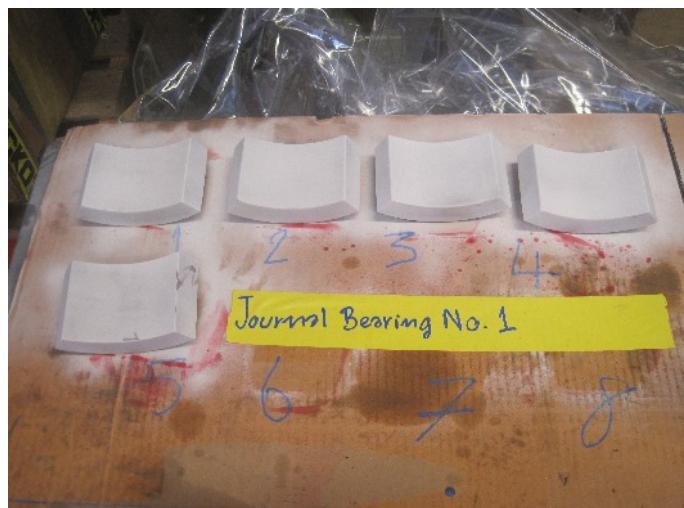
Dye Penetrant Test on Stage 1 Nozzle



Dye Penetrant Test on Stage 1 Casing



Dye Penetrant Test on Stage 2 Casing



Dye Penetrant Test on #1 Journal Bearing Pad



UT Test on #1 Journal Bearing Pad



Dimensional Check on #1 Journal Bearing Pad



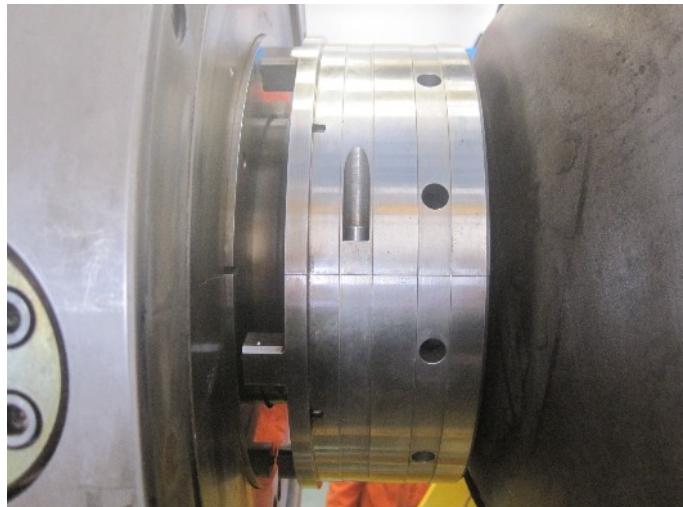
Air / Oil Seal measurement check



Air / Oil Seal measurement check



Shaft measurement check



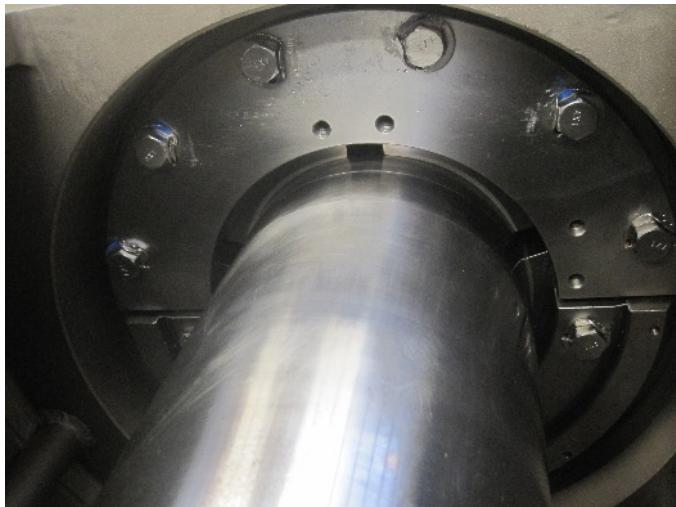
Air /Oil Seal reinstalled



Air / Oil Seal reinstalled



#1 Journal Bearing reinstalled



#1 Bearing installation completed

23, APRIL 2019**HOT GAS PATH INSPECTION****Progress: 80%**

- Dye Penetrant Test on Stage 1 Casing completed and found satisfactory.
- Dye Penetrant Test on Stage 2 Casing completed and found satisfactory.
- Dye Penetrant Test on old Stage 1 Bucket completed and found satisfactory.
- Repair on broken bolts on Stage 1 Nozzle and Stage 1 Casing completed
- Installation of new Stage 2 Bucket completed, dye penetrant test carried out on the twist lock and found satisfactory.
- Installation of old Stage 1 Bucket completed, dye penetrant test carried out on the twist lock and found satisfactory.



Stage 2 Casing Dye Penetrant Test



Stage 2 Casing Dye Penetrant Test



Stage 1 Casing Dye Penetrant Test



Stage 2 Casing Dye Penetrant Test



Stage 1 Bucket Dye Penetrant Test



Stage 1 Bucket Dye Penetrant Test



New Stage 2 Bucket preparation



New Stage 2 Bucket installed



Dye Penetrant Test on the Twist Lock



Old Stage 1 Bucket reinstalled



Dye Penetrant Test on the Twist Lock

24, APRIL 2019**HOT GAS PATH INSPECTION****Progress: 90%**

- Installation of Stage 2 Casing completed
- Installation of New Stage 2 Nozzle completed
- Clearance check carried out between Stage 2 Bucket and Stage 2 CasingShroud and found satisfactory



Dimension F = 1.6 mm



Stage 2 Casing installation



Stage 2 Nozzle installation



Stage 2 Nozzle installation



Stage 2 Nozzle installation

25, APRIL 2019

HOT GAS PATH INSPECTION

Progress: 100%

- Stage 1 Casing reinstallation completed.
- Clearance check between Stage1 Bucket and Stage 1 Casing Shroud found satisfactory



Dimension C = 1.6 mm

- Stage 1 Nozzle installation completed.
- Rotor Axial clearance check completed and found within the limit. Rotor position was set on center.

Dimension S = 0.60 mm

- Verify that the Rotor is free to rotate and found satisfactory
- PT transfer to transportation container
- PT preservation carried out.



Stage 1 Casing installation



Stage 1 Nozzle installation



Rotor Axial Clearance Check



Clearance check



PT Transferred onto transportation container



PT Transferred onto transportation container

26, APRIL 2019**DEMOBILIZATION****Progress: 100%**

- Travel from Songkhla to Hatyai
- Demobilization from HDY to KUL



5. PARTS IN/OUT

GE Oil & Gas Global Services		REPLACED PART LIST				
DESCRIPTION	CODE OUT	CODE IN	SERIAL # OUT	SERIAL # IN	DRAWING OUT	IN QUANTITY
2ND STAGE BUCKET	SMU48309	SMU48309		190713A		1
2ND STAGE BUCKET		SMO1734796		NP5224024		1
SEAL RING	SHT53838	SHT53838				1
GASKET	KFZ314340603	KFZ314340603				1
RING	KHA405205301	KHA405205301				1