


Saipem Singapore  I.T.Ex. S.r.l. Quality Services	Project GAJAH BARU Final Client PREMIER OIL	INSPECTION REPORT		
		IR No.: IR-DD-004	Rev. No.: 0	Date: 12 Oct 2009

P.O. to Supplier: Premier Oil PO Not Provided	Supplier Job No.: Solar PD: 3F521
Supplier: Solar Turbines	Supplier Location: San Diego, CA, USA
P.O. to Sub-Sup.: NA	Sub-Supplier Job No.: NA
Sub-Supplier: NA	Sub-Supplier Location: NA
Date of visit From: 12 Oct 2009 To: 12 Oct 2009 Reference Week: 12 October 2009	

Std., Codes and Rules:	ASME PTC-22 Gas Turbine Engines Performance Test Code (With Exceptions)
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Client Specification and Drawings:	None provided at this time
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Vendor -Spec. - Dwgs - Proc.:	<ul style="list-style-type: none"> • Engine Acceptance Test Customer Observe Agenda 12 Oct 2009 • Acceptance Test Requirements ES 2141 Rev: AC Date 08/06/2009 • ES2141 Table PT30505 MARS 100-15002 122F MATCH
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QCP N°:	Inspection & Test Plan GB-COMP PD# 3F521	Rev.:	E	Date	21 May 2009
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Type of Inspection (*):	I	Stage / Intermediate
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(*): Use **(I)** Stage / Intermediate, **(S)** Survey, **(F)** Final, **(CO)** Close Out, **(A)** Audit

Item	Sub item	Qty.	Unit	Item Description	Result (1)
01	GB-COMP #1	01	No. 1	Mars 100 Gas Turbine Engine S/N: 1236M	S
-	-	-	-		
-	-	-	-		

Additional Reference Docs. Attached to this IR	Test description	Test (3)	QCP/ITP item	Result (1)	Doc (2)
<input type="checkbox"/> Inspection Release Note No. (Not Applicable this visit) <input type="checkbox"/> Non Conformance Report No. (Not Applicable this visit) <input type="checkbox"/> Punch List No. (Not Applicable this visit) <input checked="" type="checkbox"/> Other Documents Preliminary Engine Test Data	Engine Performance Test	H	05.07	S	Yes


(1) For Test Results use:	S: satisfactory; N: non conform; P: pending; NR: not ready
(2) For Document Attached use:	Yes or No
(3) For Test Intervention Code use:	(H) Hold Point (W) Witness (TDR) Test Data Review. (M) Monitoring

Agency Inspector's signature and stamp:
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Agency Project Expediting & Inspection Coord.:
 I.T.Ex. QUALITY SERVICES APEIC: Mr. S. Stomeo

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SECTION I INSPECTION VISIT DETAILS - REMARKS:

I-a Contact Persons:

Name	Company	Tasks
Marcella Gastelum-Reyes	Solar Turbines	Assistant Project Manager
Tri Yudo Utomo	Indoturbine	Customer Service Accounts Executive
Herman Primo L.W.	BPMIGAS	Sr. Manager Operation Facilities Maint.
Ron Williams	DNV	Surveyor
Daniel Davenport	On behalf of ITEX for Saipem	QA Inspector

I-b Used Documents (Approval Status):

Construction Rule/STD (Reference no. & Revision):	Status
<i>Documents description</i> ASME PTC-22	<i>Revision</i> Latest
	<i>Approval yes/no – Date of approval</i>

Project's Documents (Reference no. & Revision):	Status
<i>Documents description</i> NA	<i>Revision</i>
	<i>Approval yes/no – Date of approval</i>

Vendors Documents (Reference no. & Revision):	Status
<i>Documents description</i> Acceptance Test Requirements ES 2141	<i>Revision</i> AC
	<i>Approval yes/no – Date of approval</i> 06 Aug 2009
ITP GB-COMP PD# 3F521	E
	21 May 2009 (Solar Provided)
Engine Acceptance Test Customer Observe Agenda	NA
	12 Oct 2009

Remarks:

No project related documents have been provided by the client to this inspector at this time. All referenced drawings, documents, ITP's and test procedures were provided by Solar Turbines.

I-c Vendor's Testing Instruments Calibration:

Test Cell 10 calibration placard was provided showing current calibration status of all facility test equipment. See page one of the **Preliminary Engine Test Data** for copy of placard.

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I-d Inspection Details – Monitoring – Witnessed Test / Activities – Reviewed Documents:

SUMMARY OF INSPECTION:

(ITP Item 05.07) Engine Performance Test: Customer witness of the engine performance testing on GB-COMP Unit #1 Solar PD#: 3F521 Mars 100 Gas Turbine Engine Serial Number: 1236M to include full load performance run and emissions testing.

INSPECTION DETAILS:


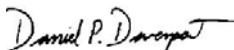

On 12 October 2009, this inspector travelled to Solar Turbines in San Diego, CA to witness an Engine Performance Test for a Mars 100S-15000 Gas Turbine Engine (S/N: 1236M) for solar PD 3F521. Once at the facility this inspector met with Steffen Thompson (Solar Test Engineer), Tri Yudo Utomo (Indoturbine Customer Service Accounts Executive), Herman Primo L.W. (BPMIGAS Sr. Manager Operation Facilities Maintenance), and Ron Williams (DNV Surveyor). A customer meeting was then held to discuss safety procedures in the test cell area and an overview the testing that was to take place. A copy of the Engine Acceptance Test, Mars Two-Shaft Engine, Customer Observe Agenda (Project 3F521) was then provided for review. Mr. Thompson discussed each item of the customer observe agenda in detail and answered all questions from each of the test witness representatives. Upon conclusion of the customer meeting, all parties travelled to Solar Turbines test cell 10 for witness of testing operations.


Full Load Performance:

The purpose of this operation is to demonstrate the engines performance under a full load condition while running on natural gas in accordance with Acceptance Standard: ES-2141 Rev. AC. The engine was brought to 103.63% NGP (Compressor and Gas Producer RPM %) and 97.78% NPT (Power Turbine RPM %). Once all engine parameters stabilized a data point was taken. (100 data snapshots @ 1 per second for 100 Seconds, 100 snapshots average = Data Point) This data point encompasses all monitored engine parameters. A print out of all the data was then generated. All parties returned to the customer conference room to review the engine full load performance data. All recorded data was then verified against Solar Turbines Engine Acceptance Test Requirements ES-2141 Rev. AC Dated: 8/6/2009. Per table PT30505 Mars 100-15002 (Gas) of ES2141 Rev AC, the engine's TRIT, Horse Power, NGP, NPT and Thermal Efficiency were all within appropriate specified ranges. The power of the engine was 846 HP (5.98%) above the Solar Performance Requirement. The engine under the conditions the data point was taken must meet 14,154 HP, the recorded performance on this first data point was 15,000 HP (Corrected for test cell conditions). Emissions data was also recorded during this data point. Per the contractual requirement NOx emissions can not be above 30 ppm, CO can not be above 40 ppm, and UHC can not be above 20 ppm. The NOx recorded for this data point was 9 ppm, the CO was recorded at 2 ppm, and the UHC was recorded at 2 ppm. Other data reviewed included bearing lubrication temperature, flow, and pressure for the number 1,2,3,4 and 5 bearing, Inlet Guide Vane angle, T5 Average (Engine Operating Temperature), and Turbine Rotor Inlet Temperature. Vibration spectrum plots for all engine bearings were also reviewed and found to be under the maximum displacement of 2.0 mils. This operation was verified to be acceptable and within all specified limits.

Part Load Emissions Point:

The purpose of this operation is to demonstrate the engines emissions at a partial load condition (50% Load at 92% NGP) while running on natural gas. Once all parameters stabilized a data point was taken. A print out of all the data was then reviewed by this Inspector and Steffen Thompson. Per table 6A, run #9 the engine was

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run at 92.06% NGP and 76.64% NPT with a gas pilot fuel flow of 5.00%. Per the contract requirement NOx emissions can not be above 30 ppm, CO can not be above 40 ppm, and UHC can not be above 20 ppm. The NOx recorded for this data point was 5 ppm, the CO was recorded at 2 ppm, and the UHC was recorded at 2 ppm. This operation was verified to be acceptable and within all specified limits. Two other partial load emissions data points were taken as well. This data is not required per contractual requirements however the data was provided with the preliminary test data for record and review. All emissions at the two additional partial load points were well within the contractual requirements as well.

ACTION REQUIRED

None

CONCLUSION:

The Engine Performance Test for GB-COMP (3F521) Saipem / Premier Oil Mars 100 Gas Turbine Engine S/N 1236M is now complete. All aspects of the customer witness were found to be acceptable. All testing was verified to be completed in accordance with Solar Turbines Engine Acceptance Test Requirements ES-2141 Rev. AC Dated: 8/6/2009. See attached **Preliminary Engine Test Data** for observed testing data.

SECTION II INSPECTION VISIT RESULTS / CONCLUSIONS:

II-a Positive Inspected Materials / Activities / Performance / etc.:

GB-COMP Unit #1 Gas turbine engine performance test is now complete.

II-b Negative Inspected Materials / Activities / Performance / etc.:

During the in process leak check performed by solar test cell technicians, it was confirmed that two manifold to injector "pigtail" fuel lines had a minute leak. The leak had no impact on engine performance and did not delay performance testing. Upon completion of the testing the engine was shut down and the leaking stainless steel fuel lines were replaced. A follow up leak check has been performed by solar turbines personnel. This item will be re-inspected during the package testing by this inspector to confirm no further leaking is present.

SECTION III NEXT VISIT (if applicable to the Project):

III-a: Next Visit

Next scheduled visit will be for an in-process inspection of package mechanical assembly and review of alignment data. An inspection date is to be determined at this time.

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SECTION IV ANY OTHER BUSINESS – ADDITIONAL REMARKS

IV-a: A.O.B. – Additional Remarks

The latest client approved ITP is requested by this inspector so all client approved required customer witness points are properly covered.

SECTION V EXPEDITING – MANUFACTURING & TESTING PROGRESS STATUS

Package assembly is currently under way. Major test to be completed include:

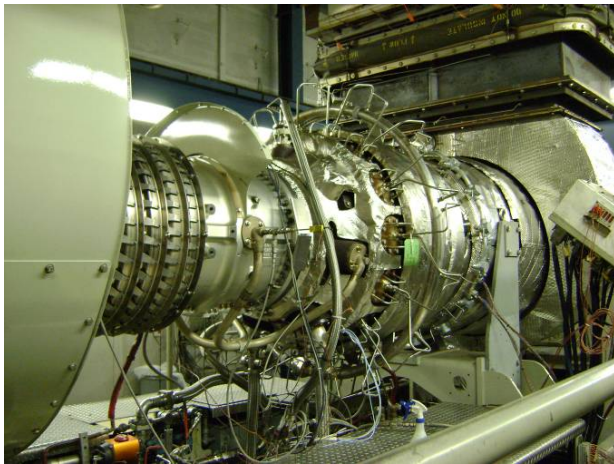
- Package Assembly Inspection
- Package Acceptance Testing
- Enclosure Testing
- Final Inspection
- Shipping / Packaging Inspection

SECTION VI IR ENCLOSURES

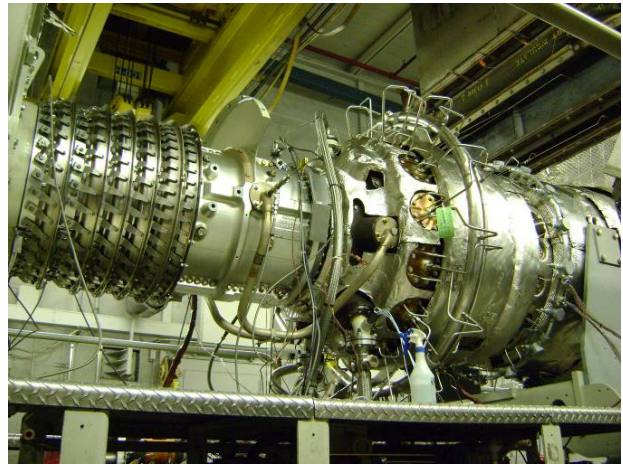
Attachments:

[\(1\) Preliminary Engine Test Data 12 Oct 2009](#)

SECTION VII PHOTOS



Mars 100 Gas Turbine S/N: 1236M #1



Mars 100 Gas Turbine S/N: 1236M #2

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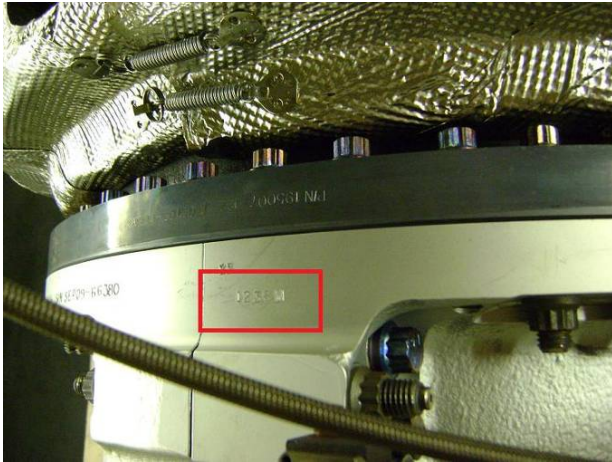
INSPECTION REPORT

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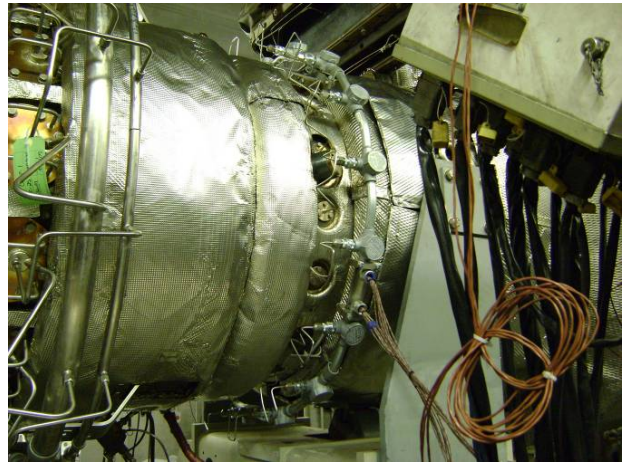
Rev. No.:
0

Date:
12 Oct 2009

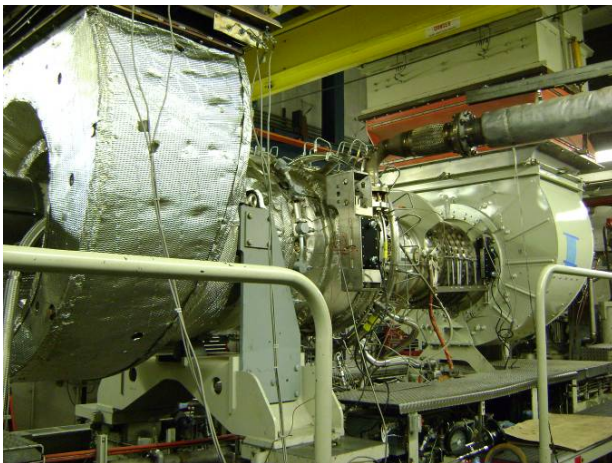
SECTION VII PHOTOS



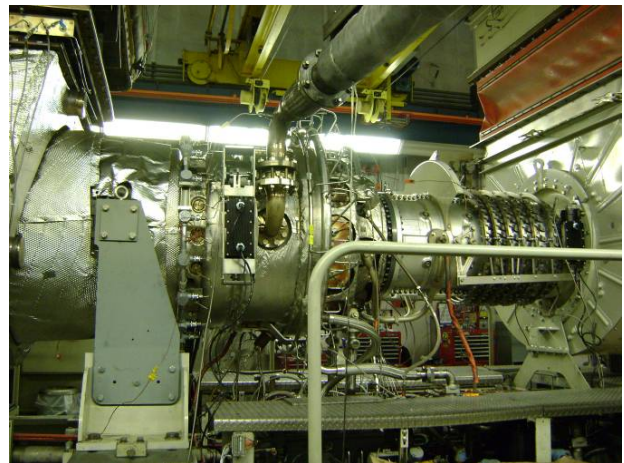
Engine Serial Number Verification



Engine T5 Thermocouples



Mars 100 Installed on Test Cell 10



Engine Running At Full Load

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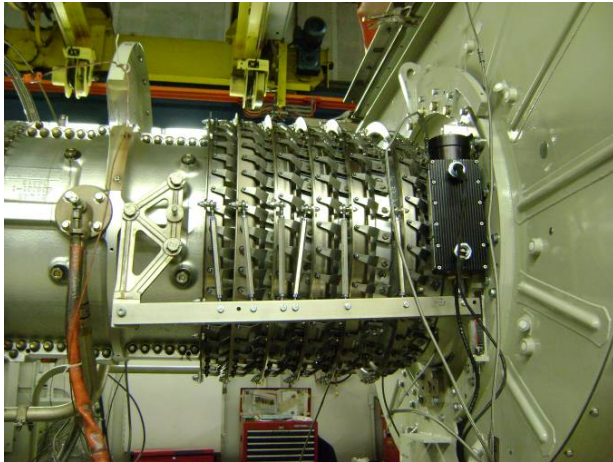


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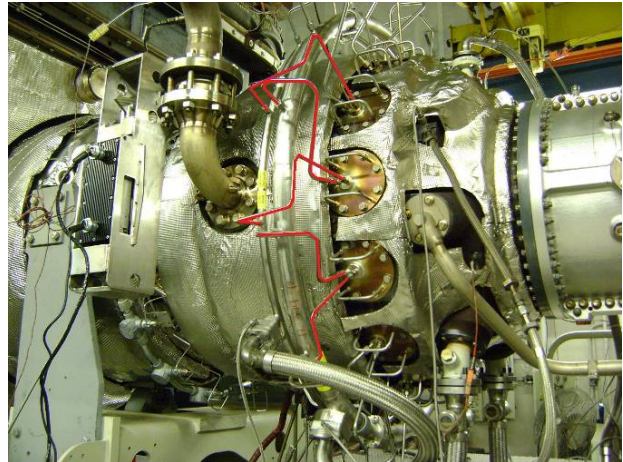
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SECTION VII	PHOTOS
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Variable Geometry Actuator Assembly



Manifold to Injector "Pigtails" Highlighted

End of report

IR Distribution (by APEIC):

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<input checked="" type="checkbox"/> Post Order (Saipem Singapore) E-mail: Fabien.Robot@saipem.com.sg	<input checked="" type="checkbox"/> ITEX Network Folder: Electronic	<input checked="" type="checkbox"/> ITEX Project File Folder: Paper

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