

Title Inspection Report	Report No: INT-OAC-FRM-011-00030	Revision P3-0	Date 17 th June 2016	Status IFI
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INSPEC	ГІО	N R	EPORT	No: IN	T-QAC-FRM-01	1-00030	Date: June 2016	e 17, S	Pag	e 1 of 7
			CUSTOMER	DATA				INTERTE	K DA	ТА
Name:	Tar	nap D	ogalgaz Iletin	A.S.			Intertek Project	No.	410	37-6
Address:	2 C	Cukara	ambar Canna	a – Anka	ara, Turkey		Client P.O./I.O. Intertek:	to	TPI	-11
Attn:	Afs	shin M	aaf Pl	ione:	+44 (0) T	<mark>S</mark> 3713	Requisition N	Requisition No: -		
E-Mail :	afs	hin.m	aaf@w T	sions.co	om		Date of Order:		-	
Copies to:	Tur	rkey N	11				Intertek Contract Coordinator:		Per	<mark>⊤∰</mark> S ′alık
SUPPLIER/SUB-SUPPLIER DATA					INSP	ECTION II	NFOR	MATION		
Inspection Performed: 🛛 With Customer Supplier 🗌 With Sub-Supplier				Date(s) of Visit	(s):	14 ^{tr} 16	to 16 th June			
P.O. No: TNP-7 CNT-003	FPG-T	CPC-	Change No:		Requisition N REO-MEC-CS	o: WRP- G-016				
					100 v 1.00	0 010	Date of Previou	ıs Visit:		15 th June 16
Supplier	G	GEOG			I		Date of Next So	cheduled V	/isit:	20 th June 16
							P. O. Status:	Con	nplete	Incomplete
Supplier Job No: 1103406					Project Name:		U S			
Location:	V	/ia FIR	ENZE, VIA PE	RFETTI R	ICASOLI 11 , I	Г				
Primary Contac	ct: A	Alessar	ndro Ricci – GE	OG P.Q.N	1.		Materials/Items Inspected:			
Phone: +3	9 34 <mark>T</mark> ʻ	€(<mark>≧</mark> ∭	35	E-mail	: Biagi T	S la	PCL604 Compre	ssor Rotor		
Sub-supplier:		N	/Α							
Sub-Supplier J	ob No	: N	/Α							Witnessed
Location:		N	/A							Date: 18th June 2016
Primary Contac	ct:	N	/A				Pre-Inspection Summary Attac	Meeting hed:		🗌 Yes 🛛 No
Phone:			E-mail :				Summary Repo	ort Attache	ed:	🗌 Yes 🔀 No
INSPECTION DISPOSITION:				s) Identified	Placed on	Hold	Ot	her (Explain)		
INSPECTION	INSPECTION SUMMARY AND CONCLUSION:									
Inspection performed with satisfactory results in accordance to applicable specification and code NOI 061 Rev 1 GE to clarify discrepancy between run Out acceptance value indicated in ITN02183 and approved deviation in material requisition										
Material req	Aaterial requisition acceptance criteria									

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				S	SUMMAR	Y REP	ORT					
											-	
 For areas to be observed by radial probes the total run-out allowed is calculated as 6.25*(12000/RPM)^{1/2} or 6.35µm, whichever is greater. This figure is consistent with the amount of run-out that may be vectorially subtracted during MRT (see chapter 1, par. 2.6.8.11; cited eq. is in fact 1.2-6, not 1.2-8). For large rotors (bearing diameter ≥ 250mm), the maximum allowable value is 15 µm. 												
ITN acceptance criteria <u>Centrifugal Compressor</u>								1				
R ₹	RADIAL : the greater between $6,35$ 12000/RPM and where RPM is the maximum continuous speed (Revolutions Pe								Pt			
RE	COMMENDED	ACTION:										
Noi	ıe											
	PECTION		S	4+5+4	TR HC	AVEL URS :			DISTANCE □ MI ⊠ K	: M		
Тес	hnical Speciali	st: Ales	sandro aldi	Date:	17 th	June	Project Coordinat	or :	Gaia Bara	aldi		
I ecrifical Specialist: Bonaldi Date: 16 Project Coordinator : Gala Baraldi This report is made solely on the basis of the Client's instructions and/or information and materials supplied. It is not intended to be a recommendation for any particular course of action. Intertek does not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as is expressly contained in the terms and conditions governing Intertek's provision of services. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions.								a I				

1.0 ATTENDEES

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SUMMARY REPORT								

NAME	COMPANY REPRESENTED	TITLE
Alessandro Bonaldi	Tanap	Field Inspector on behalf of Tanap
Biagio Di Nicola	GE Oil & Gas	Project quality manager

2.0 MATERIALS

2.1 Generic Materials

TAG / EQUIP NO.	DESCRIPTION
CS1-K-22-101	PCL604 Centrifugal Compressor Rotor

2.2 <u>Materials Inspected</u>

PO ITEM NO.	TAG / SERIAL NO.	PRODUCT / MATERIAL / ITEM NAME	ORDERER QUANTITY	PRESENTED THIS VISIT	ACCEPTED THIS VISIT	QUANTITY ACCEPTED TO DATE
	CS1-K-22-101	PCL604 Centrifugal Compressor Rotor	4	1	1	1

3.0 DOCUMENTS USED

DOCUMENT NO.	REVISION		APPROVAL STATUS			
GEO-PLN-QAC-CS1- 002	P3-0	Quality Control Plan	lity Control Plan -			
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DOCUMENT NO.	REVISION		TITLE			APP ST	ROVA ATUS	L
ITN02177		Procedure for	Balancing impellers and rotors a	ssemblies				
	Latest edition	American Pet	roleum Standard 617					
GEO-SHT-MEC-CS1- 003	P3-1	Compressor E	Data Sheet			Re-IA	4	
ITN02230		Assembling p	rocedure for C/C compressor					
ITN02183	20	Electrical and	lectrical and Magnetic Run out on compressor rotor					
TN07070.01	7	Positive Mater	rial identification					
SSO2310911	1	Rotor assemb	bly					

4.0 SCOPE OF INSPECTION

ITP LINE NO.	ITP ACTIVITY DESCRIPTION	ITEMS	RESULTS	CLAUSE
02022002034	POSITIVE MATERIAL IDENTIFICATION	CS1-K-22-101	Satisfactory	6.0
02022002020	COMBINED RUN OUT	CS1-K-22-101	Satisfactory	6.0
02022002008	LOW SPEED DYNAMIC BALANCING - INCREMENTAL BALANCIN EVERY SINGLE MAIN ITEM ASSEMBLED	CS1-K-22-101	Satisfactory	6.0

5.0 EQUIPMENT AND INSTRUMENTATION USED (TO BE SUPPLIED BY SUPPLIER)

EQUIPMENT / INSTRUMENT DESCRIPTION	SERIAL NO	CALIBRATION CERT. NO.	EXPIRY DATE
Run out system	10_CS013		13-10-2016
Balancing machine PMI equipment Niton	10_684		Feb 2017 Calibrated at time of inspection
Gauss measurement equipment	TFT_RT1		3-9-2106

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6.0 **INSPECTION DETAILS**

6.1) QCP Reference:
QCP # GEO-PLN-QAC-CS1-002 rev. P3-0
6.2 Details of inspection performed (Use separate page if more detail is required)
6.2.1) material identification
Centrifugal Compressor PCL604 Rotor (material ASTM A322 type 4340) serial Number NP4171424: hard stamped
on Rotor itself and
1 st Stage Impeller SN NP4162486
2 nd Stage Impeller SN NP4163761
3 rd stage Impeller SN NP4163765
4 th Stage Impeller SN NP4163763
6.3) Balancing Check Low speed
Scope of inspection was to witness the progressive rotor Balancing starting from fist impeller until complete
assembled rotor
For reference below please find assembly sequence and incremental loads sketch

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SEQUENZA DI MONI INCREMI ASSEMBLY SEQUENCE LOADS S1 3999kg S1 471kg S1 552kg S1 552kg S1 552kg S1 552kg S1 552kg S1 737kg ATTENZIONE: SEGUI MONT ATTENTION: FOLLOW SEQU Note S1 is thrust beau Compressor MCS 640	AGGIO E CARICHI AND INCREMENTAL SKETCH 3 $404kg404kg3$ $404kg3$ $404kg3$ $404kg3$ $404kg3$ $404kg3$ $450kg3$ $450kg3$ 2 $570kg3$ 2 $570kg52$ $570kg$	Thrust bearing si	de					
<u>Shaft balancing</u>								
Max Allow. R	esidual Unbalance: 340 gr. x	mm at Trust Coll	ar balancing Plar	ne (Plane n	°1)			
• Max Allow. R	esidual Unbalance: 340 gr. x	mm at opposite	Trust Collar bala	ncing Plan	e (Plane n	°2)		

The residual unbalance was measured prior to start the test and following value had been noted:

- Residual Unbalance at plane N°1 933 gr.x mm. Phase angle 211°
- Residual Unbalance at plane N°2 869 gr.x mm. . Phase angle 242°

Low speed balancing check of the completely assembled Rotor carried out at 200 rpm, and the obtained results were as follows:

- Actual Residual Unbalance at plane N°1
 307 gr.x mm. Phase angle 193°
 - Actual Residual Unbalance at plane N°2 288 gr.x mm. . Phase angle 219°

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S	UMMARY REPORT					
2 nd Stage impeller Assembly NP4163761						
• Max Allow. Residual Unbalance: 400 gr. x	mm at Trust Collar balancing Plan	ne (Plane n	۵°2)			
• Max Allow. Residual Unbalance: 395 gr. x	mm at opposite Trust Collar balar	ncing Plan	e (Plane r	n°1)		
The residual unbalance was measured prior to sta	art the test and following value had	d been no	ted:			
• Residual Unbalance at plane N°2	7048 gr.x mm. – Phase angle 28	5°				
• Residual Unbalance at plane N°1	8869 gr.x mm – Phase angle 16	68°				
Low speed balancing check of the completely ass	embled Rotor carried out at 200 r	pm, and tł	ne obtain	ed res	ults	
were as follows:						
• Actual Residual Unbalance at plane N°2	249 gr.x mm. – Phase angl	e 268°				
• Actual Residual Unbalance at plane N°1	160 gr.x mm – Phase ang	gle 122°				
Obtained results were satisfactory.						
3 rd Stage impeller Assembly NP4163765						
• Max Allow. Residual Unbalance: 466 gr. x	mm at Trust Collar balancing Plan	ne (Plane n	1°1)			
• Max Allow. Residual Unbalance: 446 gr. x	mm at opposite Trust Collar balar	ncing Plan	e (Plane r	ר°2)		
The residual unbalance was measured prior to sta	art the test and following value had	d been not	ted:			
• Residual Unbalance at plane N°1	10329 gr.x mm. – Phase angle 2	79°				
• Residual Unbalance at plane N°2	7095 gr.x mm – Phase angle 28	35°				
Low speed balancing check of the completely ass	embled Rotor carried out at 200 r	pm, and th	ne obtain	ed res	ults	
were as follows:						
• Actual Residual Unbalance at plane N°1	295 gr.x mm. – Phase angl	e 98°				
• Actual Residual Unbalance at plane N°2	397 gr.x mm – Phase ang	gle 294°				
Obtained results were satisfactory.						
4 th Stage impeller Assembly NP4163763						

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• Ma	ax Allow. Re	esidual Unbalance: 547 gr. x	mm at Trust Collar balancing Plar	ne (Plane n	۱°1)	
• Ma	ax Allow. Re	esidual Unbalance: 473 gr. x	mm at opposite Trust Collar balar	ncing Plan	e (Plane n°	'2)
The residua	al unbalanc	e was measured prior to sta	rt the test and following value had	d been no	ted:	
• Res	sidual Unba	alance at plane N°1	7598 gr.x mm. – Phase angle 27	8°		
• Res	sidual Unba	alance at plane N°2	3984 gr.x mm – Phase angle 27	70°		
Low speed were as foll	balancing lows:	check of the completely ass	embled Rotor carried out at 200 rj	pm, and tł	ne obtaine	d results
• Act	tual Residu	al Unbalance at plane N°1	335 gr.x mm. – Phase angl	e 56°		
• Act	tual Residu	al Unbalance at plane N°2	170 gr.x mm – Phase ang	gle 305°		
Obtained r	esults were	e satisfactory.				
<u>1º Stage n</u>	mpeller As	sembly NP4162486			04)	
• Ma	ax Allow. Re	esidual Unbalance: 597 gr. x	mm at Trust Collar balancing Plan	ie (Plane n)°1)	
● Ma	ax Allow. Re	esidual Unbalance: 517 gr. x	mm at opposite Trust Collar balar	ncing Plan	e (Plane n'	2)
The residua	al unbalanc	e was measured prior to sta	rt the test and following value had	d been not	ted:	
• Res	sidual Unba	alance at plane N°1	9005 gr.x mm. – Phase angle 5°			
• Res	sidual Unba	alance at plane N°2	13000 gr.x mm – Phase angle 2	22°		
		·				
Low speed	balancing	check of the completely ass	embled Rotor carried out at 200 rj	pm, and tł	ne obtaine	d results
were as ion	tual Residu	al Linhalanaa at plana Ni ^o 1	E42 ary mm Dhase and	a 125°		
• Act	tual Residu	al Unbalance at plane N°2	505 gr.x mm. – Friase angr	e 155		
• Act Obtained r	esults were	e satisfactory	517 gr.x mm – Fnase ang	JIE 314		
Complete	Accombined	Potor (balancer and Thrust	Collar installed)			

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• Max Allow. Residual Unbalance: 730 gr. x mm at Trust Collar balancing Plane (Plane n°1)
• Max Allow. Residual Unbalance: 609 gr. x mm at opposite Trust Collar balancing Plane (Plane n°2)
The residual unbalance was measured prior to start the test and following value had been noted:
 Residual Unbalance at plane N°1 2585 gr.x mm. – Phase angle 325°
Residual Unbalance at plane N°2 2600 gr.x mm – Phase angle 332°
Low speed balancing check of the completely assembled Rotor carried out at 200 rpm, and the obtained results were as follows:
 Actual Residual Unbalance at plane N°1 266 gr.x mm. – Phase angle 168°
 Actual Residual Unbalance at plane N°2 503 gr.x mm. – Phase angle 253°
Obtained results were satisfactory
6.4) PMI
PMI was execute on shaft, balance drum, impeller in order to confirm material correctness.
Recoded values were found to be with required limits.
6.5) Run-out
Run-out check on Rotor was carried out using Bentley Nevada no contact probes, and the obtained results were as follows :
- Max allowed total Run Out (Electric + Magnetic + Mechanical) should not exceed 8.55 μm, as per approved API
deviation request
- Actual measured Run Out on thrust collar side : 6 19 um
- Actual measured Run Out on opposite thrust collar side
Obtained results were satisfactory.
Anyhow it was noted a discrepancy between acceptance criteria as per ITN indicated in OCP and approved
deviation request.

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SUMMARY REPORT							
In this regards GE and WP to clarify which is correct and should be applicable for future rotors							
Both Rotor shaft ends have been inspected for residual magnetism with satisfactory results:							
- Max. allowed residual magnetism: 5.0 Gauss at both shaft ends							
- Actual measured residual magnetism 0.8 Gauss at shaft ends thrust collar side							
- Actual measured residual magnetism: 0.6 Gauss at shaft ends opposite thrust collar side							
6.6) Documentation							
Balancing test report still to be produce by GE Quality Department							

7.0 NON-CONFORMANCES

NCR #	DESCRIPTION	DATE RAISED	DATE CLOSED
	None		

8.0 ATTACHMENTS TO THIS REPORT

Hydrotest Certificates
Pressure Gauge Calibration
Water Analysis

9.0 PHOTOGRAPHS

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