

INSPECTION REPORT

TITLE	W501D5 GAS TURBINE UNIT ROTOR INSPECTION		
OWNER	EMISSIONS GROUP	PERIOD	2016. 07. 18 ~ 08. 30
EQUIPMENT	W501D5 GT Unit Rotor	Service Order No.	1608001

2016. 08. 23





W501D5 GAS TURBINE UNIT ROTOR INSPECTION REPORT

This report provides the results of the robustness assessment for **W501D5 GT Unit Rotor** that was used by POSCO Energy Inc., which was inspected by KPS GT Technology Service Center for the purpose of oversea transfer. Detailed inspection procedures include the Turbine Blades Withdrawal, Blast Cleaning, Nondestructive Testing(NDT) with Magnetic Particle Testing(MT), Turbine & Compressor Disc Gap Check, and Unit Rotor Runout & Balance Check.

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I. Introduction

Incheon POSCO Energy Inc. requested robustness assessment for their used unit, W501D5 GT Unit Rotor to KPS GT Technology Service Center. Inspection was done during 2016.08.05.~08.18 for the purpose of oversea transfer.

Major inspection procedures are withdrawal of 1~4 rows of the Turbine Blades, Unit Rotor Blast Cleaning, Nondestructive Testing(NDT) with Magnetic Particle Testing(MT), Turbine & Compressor Disc Gap measurement, Unit Rotor Runout measurement, and Shop Balancing. This report provides the details of the related inspections.

II. Inspection Title : W501D5 GAS TURBINE UNIT ROTOR INSPECTION

III. Inspection Period : 2016. 7. 18 ~ 8. 30

IV. Major Inspection Procedures

1.0 Unit Rotor Ratings and Records

- 1.1 Manufacturer/Model : Westinghouse/W501D5
- 1.2 Rated Capacity / RPM : 100MW / 3600rpm
- 1.3 Stage : Turbine 4 Row, Compressor 19 Row
- 1.4 Recent Major Inspection(Class II B Inspection) : 2007. 03. 14~08.15
- 1.5 Operation Hours : 52,729Hours
- 1.6 Starts/Stops : 3,681

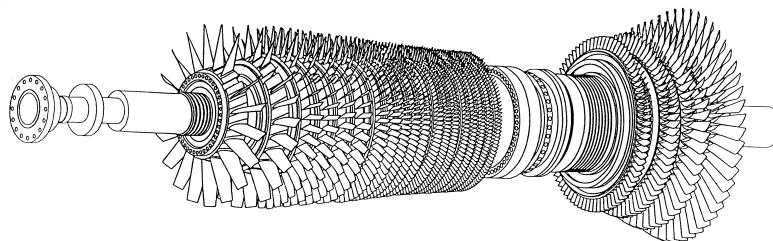


Figure 1. WH W501D5 Unit Rotor

2.0 Turbine Blades Withdrawal

- 2.1 Unit Rotor was settled on the stand and Locking Plates of the Turbine Blades were withdrawn.
- 2.2 Turbine Blades in each rows were withdrawn and placed in the separate wooden boxes.



3.0 Unit Rotor Blast Cleaning

3.1 Rotor was settled on the cart stand for Unit Rotor Blasting procedure.

3.2 Journal, Thrust Collar and Disc Gap sections were masked before Glass Bead Cleaning procedure.

3.3 Glass Bead Cleaning of the Unit Rotor was performed after moving it to Blasting Room.



Figure 2. Turbine Blades Withdrawal



Figure 3. Unit Rotor Blast Cleaning status

4.0 Nondestructive Testing(NDT)

4.1 Defect testing was performed using Nondestructive Testing(NDT) with Magnetic Particle Testing(MT) and Visual Testing(VT) after the Turbine Blades were withdrawn, and the mapping was done as well.

4.2 After performing MT for Turbine Disc in each rows, linear crack indication was not found but pitting damages were presented throughout the surface of the Dovetail as seen in the figure 4 and 5.

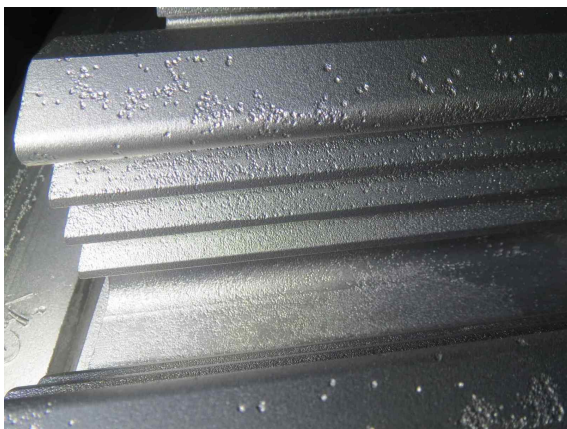


Figure 4. Row 1 Dovetail Pitting



Figure 5. Row 2 Dovetail Pitting



- 4.3 MT and VT were performed on Compressor Blades. Linear crack indication was not found but dent and bent damages were found in some of the blades as seen in the Figure 9.
- 4.4 VT was performed on the Turbine Wheel Belly Band and fracture was found on the Row 1-2 Belly Band overlap as seen in the Figure 7.
- 4.5 NDT Report : See the Attachment 1.



Figure 6. Row 2-3 Belly Band



Figure 7. Row 1-2 Belly Band Fracture

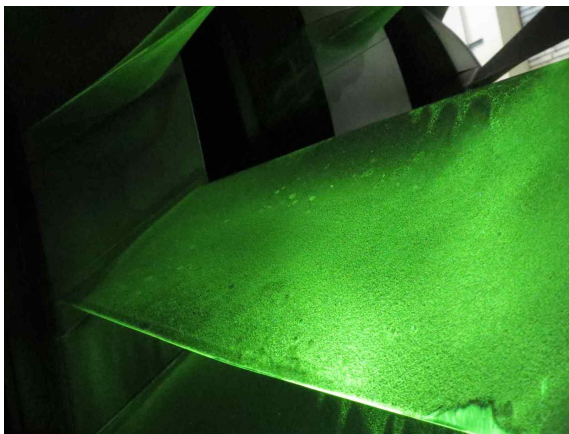


Figure 8. Compressor Blade MT performance



Figure 9. Compressor Blade Dent

5.0 Turbine Disc Gap Measurement

- 5.1 Set up the Unit Rotor on the Balancing Machine.
- 5.2 Turbine Disc Gap was measured to check Turbine Disc Curvic Clutch Teeth wearing out and Spindle Bolts looseness using Block Gage.
- 5.3 The results of Turbine Disc Gap measurement for each rows are tabulated in the Table 1, and no abnormality was found.

5.4 Turbine Disc Gap Measurement Results Table : See the Attachment 2.

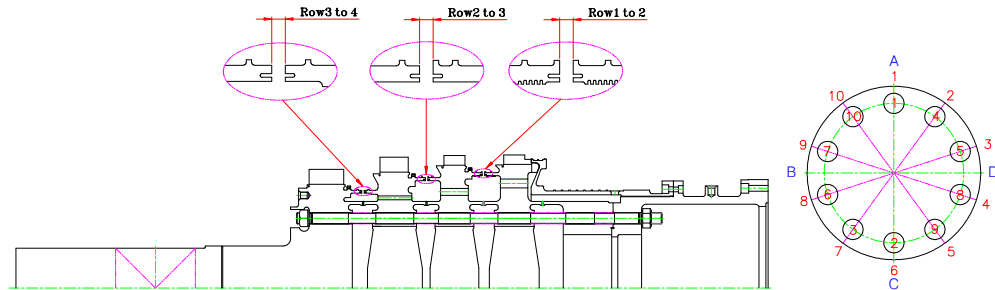


Figure 10. Turbine Disc Gap Measurement Position

Table 1. Turbine Disc Gap Measurement Results

Unit : mm

Position		Row 1-2	Row 2-3	Row 3-4
A	0°	12.12	12.26	11.92
B	90°	12.11	12.26	11.95
C	180°	12.10	12.22	11.96
D	270°	12.12	12.24	11.97

6.0 Compressor Disc Gap Measurement

6.1 To check the abnormalities of the Compressor Disc's assembling status in each rows, Compressor Disc Gap was measured as tabulated in the Table 2.

6.2 Compressor Disc Gap Measurement Results Table : See the Attachment 3.

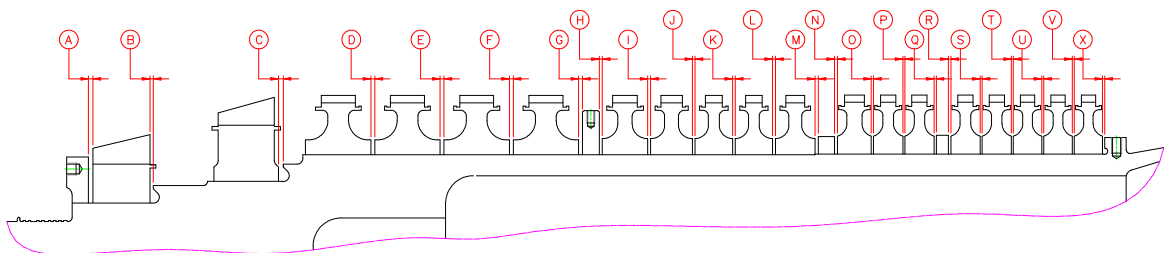


Figure 11. Compressor Disc Gap Measurement Position

Table 2. Compressor Disc Gap Measurement Results

Unit : inch

Pos	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X
0°	2.13	0.086	0.097	1.50	1.76	1.37	2.15	1.33	1.00	0.75	0.95	0.72	0.87	0.43	0.87	0.75	0.75	0.34	0.77	0.60	0.82	0.80	0.78
90°	2.12	0.088	0.096	1.48	1.75	1.35	2.22	1.33	1.08	0.75	0.92	0.73	0.83	0.41	0.92	0.77	0.73	0.36	0.78	0.54	0.92	0.78	0.78
180°	2.13	0.091	0.102	1.52	1.67	1.30	2.20	1.33	1.15	0.70	0.97	0.65	0.79	0.38	0.97	0.72	0.77	0.35	0.73	0.63	0.87	0.73	0.80
270°	2.08	0.088	0.102	1.55	1.67	1.27	2.20	1.32	1.12	0.73	0.95	0.64	0.87	0.38	0.91	0.77	0.72	0.36	0.78	0.72	0.77	0.77	0.80

7.0 Unit Rotor Runout Check

- 7.1 Rotor had been rotated for 4 hours on the Balancing Machine for Unit Rotor Bow Out procedure, and in a stationary state Runout was measured as tabulated in the Table 3.
- 7.2 Both sides of the Journal, Thrust Collar, Marriage Coupling, and Air Separator Coupling are measured with 0.0001" unit and the outer diameter of the uneven surfaces of the Compressor Disc and Turbine Disc are measured with 0.01mm unit by a Dial Indicator.
- 7.3 It was confirmed that the measured value of the Turbine Disc's Runout is in the range of manufacturers's specification(0.0030")
- 7.4 It was confirmed that the measured value of the Compressor Disc is in the range of manufacturers's specification(0.0060")
- 7.5 The measured Runout value of the Journal's Sliding Area is in 0.0003~0.0005" which is relatively in a good range.
- 7.6 Runout values for the Compressor Generator Coupling OD and the Face exceed the standard range and correction is needed.
- 7.7 Runout value of Turbine Rotor Journal is 0.0013" and correction is needed.
- 7.8 Unit Rotor Runout Measurement Results Table : See the Attachment 4.

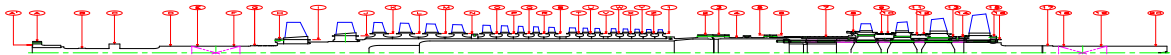


Figure 12. Unit Rotor Runout Measurement Position

☞3. Unit Rotor Runout Measurement Results

Position Values	Wheel(Disc) OD		Marriage Coupling OD	Journal OD	
	TBN side	COMP side		TBN side	COMP side
Design Limit	0.0030"	0.0060"	0.0020"	0.0003"	0.0003"
Actual Value	0.0028"	0.0024"	0.0018"	0.0003"	0.0005"

8.0 Unit Rotor Balancing Check

- 8.1 After having enough Bow Out procedure, the Unit Rotor without the Turbine Blades was rotated at 250 RPM and the measured Initial Total Unbalance value was 900 gram, which largely exceeds the permitted value.
- 8.2 Unit Rotor Shop Balancing procedure was performed to reduce the Unbalance value to the permitted value and the result is as found in the Attachment 4.



8.3 Balancing Check Sheet : See the Attachment 5 and 6.



Figure 13. Unit Rotor Shop Balancing

Talbe 4. Unit Rotor Shop Balancing Results

Planes Values	Plane #1 (Zone E)	Plane #2 (Zone A)
Initial	429g ∠ 344.9°	473g ∠ 307.3°
Final	13.5g ∠ 24.9°	14.4g ∠ 341.6°
Final Weight Mapping	-Zone A : 170g ∠ 286°(#10), -Zone B : 158g ∠ 325° -Zone C : 158g ∠ 324°(#9), -Zone D : 170g ∠ 322°(#6) -Zone E : 214g ∠ 7°(#1)	

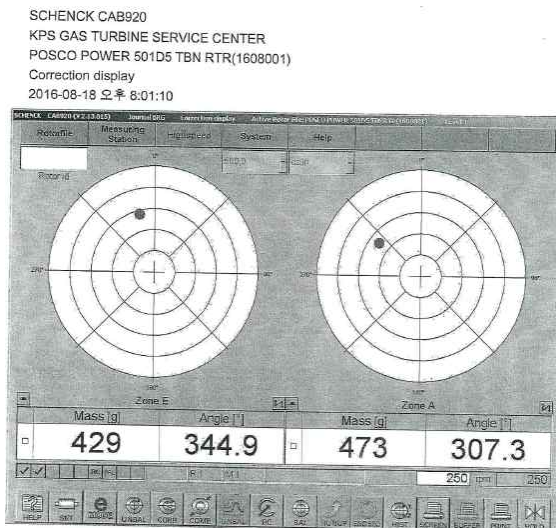


Figure 14. Initial Unbalance Values



Figure 15. Final Unbalance Values



V. Conclusion and Recommendations

W501D5 GT Unit Rotor used by Incheon POSCO Energy Inc. was inspected in the KPS GT Technology Service Center for the purpose of oversea transfer.





The major procedures done for the assessment of robustness of the Unit Rotor and its results are as the followings.

- Rusts and deposits on the Rotor were removed through Rotor Blast cleaning after withdrawing the turbine side blades in the 1~4 rows.
- NDT(MT & VT) was done for the Turbine side and the Compressor side. The results show that for Turbine Disc, there were damages in Belly Band at row 1-2 and the pitting damages on the surface of Dovetail. For the Compressor Blades, dents and bents were found that can be repaired.
- Disc Gap and Runout were measured to check the abnormalities such as deformation of the Unit Rotor or looseness of Marriage Coupling Bolts, Turbine Spindle Bolts and Air Separator Bolts. Overall, it was in a good condition but Runout values for Turbine Rotor Journal, and the Compressor Rotor Generator Coupling Face and the OD exceed the permitted values.
- Unbalance value of the rotor was measured under the Spool state where the Turbine Blades are withdrawn. There was a great difference between the measured values and the permitted values but the unbalance was corrected within the permitted range after performing the Shop Balancing.
- The Unit Rotor has been used by POSCO Energy in a stable condition after going through Class II B Inspection done by our Center from 14th March, 2007 to 15th August 2007, and it seems that there was no crucial defect or deformation found through this robustness assessment. As for the recommendation, whole replacement for the damaged Belly Band is required as well as for the corrections for the parts-Journal, Generator Coupling OD and the face- that the Runout values are not in the permitted range.



VI. Attachments

1. NDT Report MT / VT 1 copy.
2. Turbine Disc Gap Check Sheet 1 copy.
3. Compressor Disc Gap Check Sheet 1 copy.
4. Unit Rotor Runout Check Sheet(Incoming / Final) 1 copy.
5. Turbine Blade Gap Check Sheet. 1 copy.
6. Unit Rotor Initial & Final Balance Check Sheet 1 copy.

Report No. : QA-SHOP-2016-075-A2	Title : MAGNETIC PARTICLE EXAMINATION			
Inspection Records	Order No. : 1608001	Customer : POSCOENERGY-INCHEON		
	Unit / Site : WH W501D5 GT UNIT ROTOR	Part Name : GT UNIT ROTOR		
	Material : N/A	Quantity : 1 Set		
	<input checked="" type="checkbox"/> Incoming <input type="checkbox"/> In-process <input type="checkbox"/> Final <input type="checkbox"/> Special			
	<input checked="" type="checkbox"/> Shop <input type="checkbox"/> Site/Field			
	Surface Condition : <input type="checkbox"/> as is <input checked="" type="checkbox"/> after blasting <input type="checkbox"/> heat treat <input type="checkbox"/> welded <input type="checkbox"/> ground <input type="checkbox"/> machined			
Confirmation Data				
Process Spec.	<input checked="" type="checkbox"/> P3A-AG1 Magnetic Particle Inspection <input type="checkbox"/> _____			
Instruments	<input type="checkbox"/> CSQ-6R <input checked="" type="checkbox"/> CSV-15R <input type="checkbox"/> CMD-2030 <input type="checkbox"/> York Maker : <u>Magnaflux</u> S/N : <u>1596</u> Cal. Date : <u>2015.09.16</u>			
Mag. Particle	<input checked="" type="checkbox"/> Fluorescent / <input checked="" type="checkbox"/> wet , Maker <u>NAWOO</u> Model <u>NMP-F</u> Batch No. <u>14MPF15</u>			
Light Intensity	<input type="checkbox"/> White Light int. <u>6.35</u> ft.cd <input checked="" type="checkbox"/> UV Light Int. <u>2933</u> $\mu\text{m}/\text{cm}^2$			
Test Specimen	<input checked="" type="checkbox"/> Pie Gage Magnetic Field Strength Indicator <input type="checkbox"/> _____			
Method	<input type="checkbox"/> York	<input checked="" type="checkbox"/> Coil	<input type="checkbox"/> Headshot	<input type="checkbox"/> Prods
Magnetizing Current	<input type="checkbox"/> AC <input type="checkbox"/> DC	<input type="checkbox"/> AC <input type="checkbox"/> DC <input checked="" type="checkbox"/> HWDC	<input type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> HWDC	<input type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> HWDC
Distance of pole	_____ mm			_____ mm
Ampere		<u>800</u> A	<u> </u> A	<u> </u> A
Ampere-turns		<u>3 turns</u>		
Lifting Power	<input type="checkbox"/> 10 lb <input type="checkbox"/> 40 lb			
Field Strength				
De-magnetizing : magnetic field verified < <u>3</u> Gauss				
Quantity	Test Result	Notes :		
1 Set	No Recordable Linear Indication (VT-Rotor Row 1, 2, 3, 4 Wheel Dovetail Groove : Pitting) (VT-Rotor ROW 1 Bally bend : Fracture)			
Inspected by : Choi, D.S.  Date : Aug. 10, 2016		Reviewed by : Ha, T. G.  Date : Aug. 10, 2016		
Inspected by : Ryu, Y. J.  Date : Aug. 10, 2016				
 한진KPS	Document No.	GT-NDE-IS-02	Rev.: 0	Sheet No.: 1 No. of sh.: 9

Report No. : QA-SHOP-2016-075-A2	Title :	MAGNETIC PARTICLE EXAMINATION
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Order No. : 1608001	Plant / Unit : WH W501D5 GT UNIT ROTOR
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Part Name : GT UNIT ROTOR	Attached <input checked="" type="checkbox"/> Photos <input type="checkbox"/> Sketch
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	Items	Result		Description	Remark
		Accept	Reject		
TBN Side	Row 1 Wheel	√		No Recordable Linear Indication	
	Row 2 Wheel	√		No Recordable Linear Indication	
	Row 3 Wheel	√		No Recordable Linear Indication	
	Row 4 Wheel	√		No Recordable Linear Indication	
GEN Side	Row 19 Blade	√		No Recordable Linear Indication	
	Row 18 Blade	√		No Recordable Linear Indication	
	Row 17 Blade	√		No Recordable Linear Indication	
	Row 16 Blade	√		No Recordable Linear Indication	
	Row 15 Blade	√		No Recordable Linear Indication	
	Row 14 Blade	√		No Recordable Linear Indication	
	Row 13 Blade	√		No Recordable Linear Indication	
	Row 12 Blade	√		No Recordable Linear Indication	
	Row 11 Blade	√		No Recordable Linear Indication	
	Row 10 Blade	√		No Recordable Linear Indication	
	Row 9 Blade	√		No Recordable Linear Indication	
	Row 8 Blade	√		No Recordable Linear Indication	
	Row 7 Blade	√		No Recordable Linear Indication	
	Row 6 Blade	√		No Recordable Linear Indication	
	Row 5 Blade	√		No Recordable Linear Indication	
	Row 4 Blade	√		No Recordable Linear Indication	
	Row 3 Blade	√		No Recordable Linear Indication	
Row 2 Blade	√		No Recordable Linear Indication		
Row 1 Blade	√		No Recordable Linear Indication		



- WH W501D5 GT UNIT ROTOR -

Report No. : QA-SHOP-2016-075-A2

Title :

MAGNETIC PARTICLE EXAMINATION

Order No. : 1608001

Plant / Unit : WH W501D5 GT UNIT ROTOR

Part Name : GT UNIT ROTOR

Attached Photos Sketch



Fig. 1. Check the Light Intensity

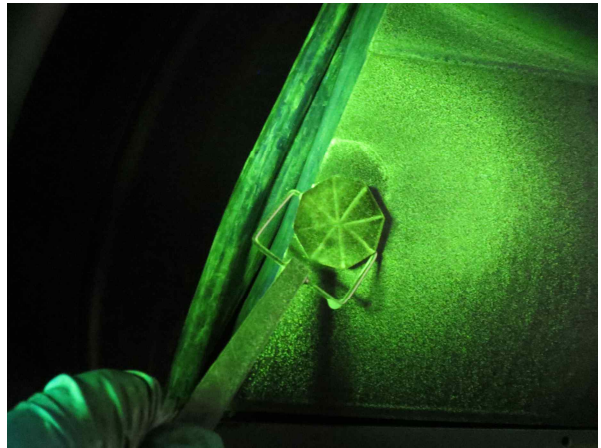


Fig. 2. Confirmed the magnetic field

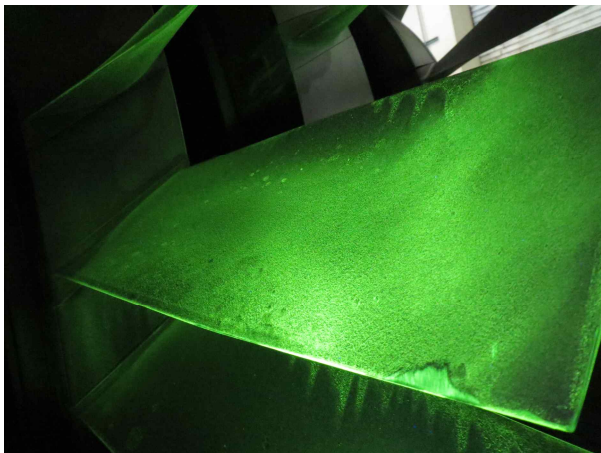


Fig. 3. Comp. blades MPI



Fig. 4. Check the demagnetization

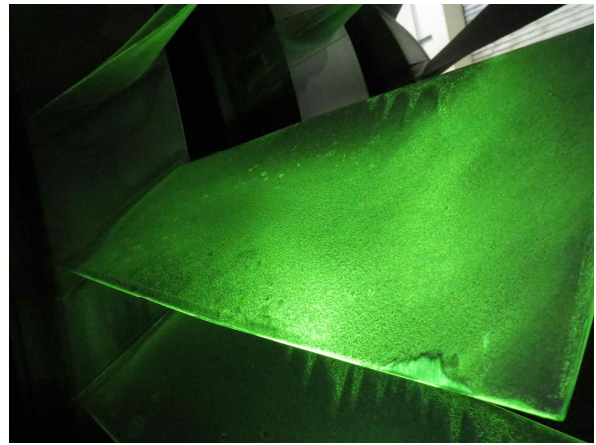
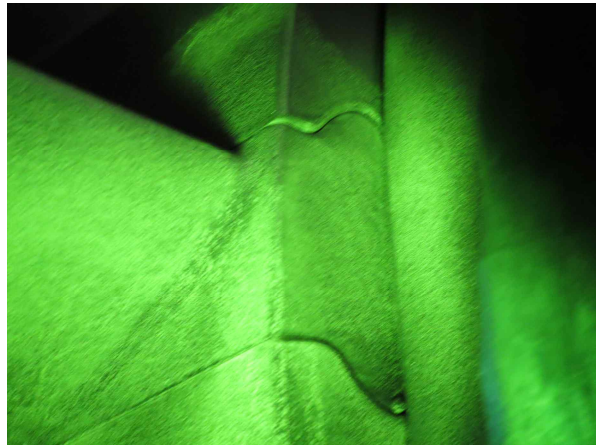


Fig. 5. Comp. blades MPI

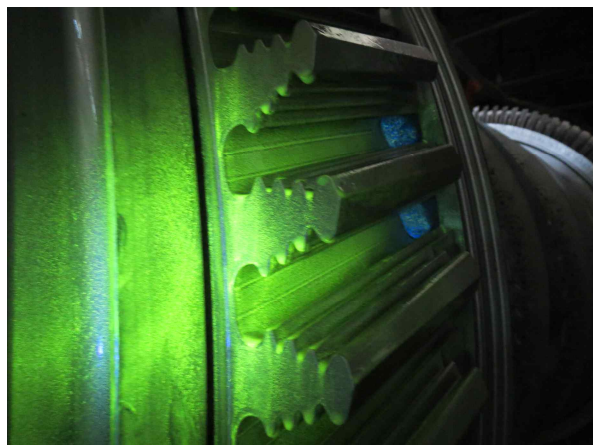


Fig. 6. Row 1 Wheel dovetail MPI

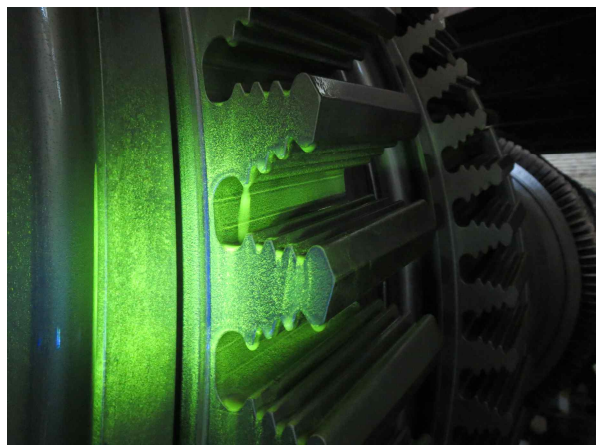


Fig. 7. Row 2 Wheel dovetail MPI

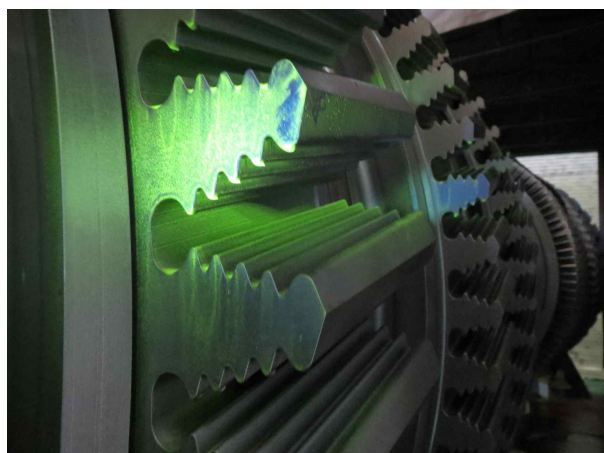


Fig. 8. Row 3 Wheel dovetail MPI



Fig. 9. Row 4 Wheel dovetail MPI



Fig. 10. Row 1 Wheel dovetail - Pitting

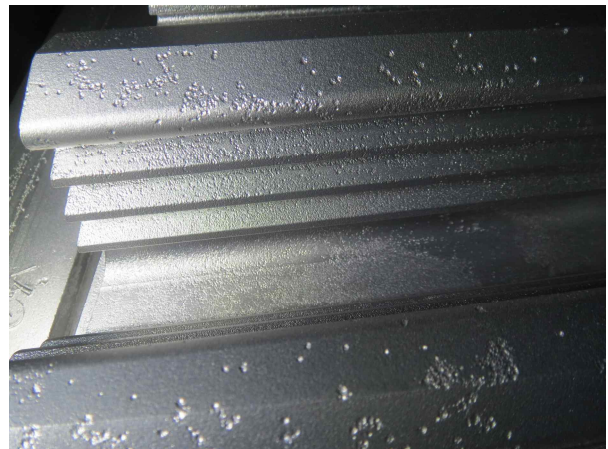
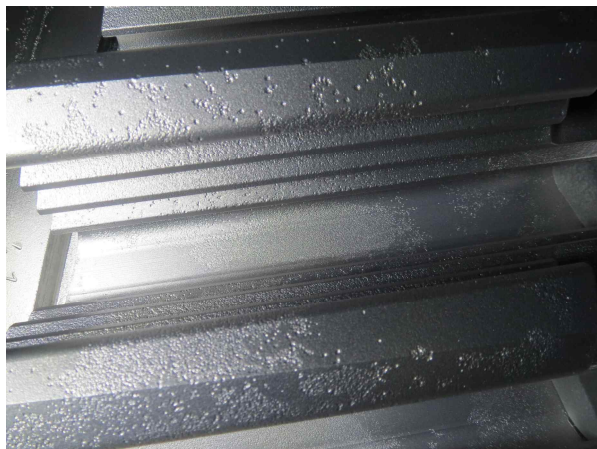


Fig. 11. Row 1 Wheel dovetail - Pitting



Fig. 12. Row 1 Wheel dovetail - Pitting

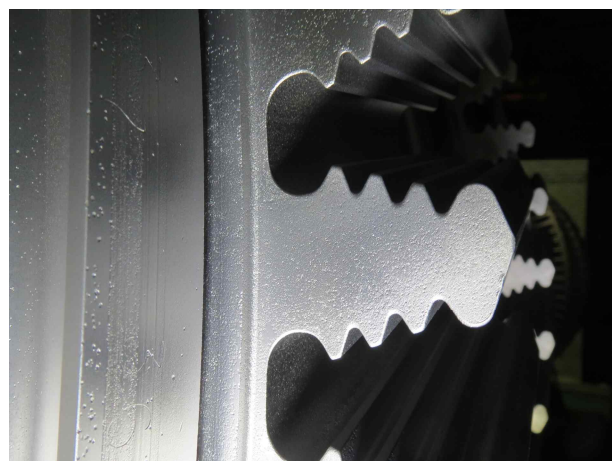


Fig. 13. Row 2 Wheel dovetail - Pitting



Fig. 14. Row 2 Wheel dovetail - Pitting

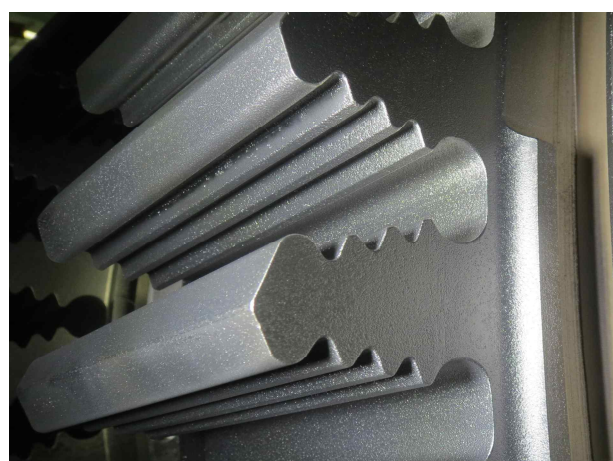


Fig. 15. Row 2 Wheel dovetail - Pitting

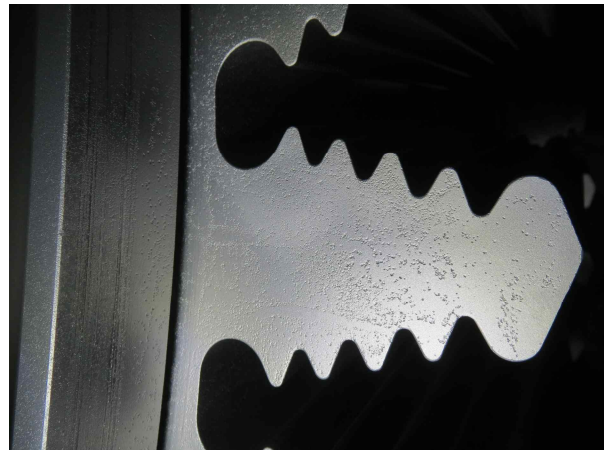


Fig. 16. Row 3 Wheel dovetail - Pitting

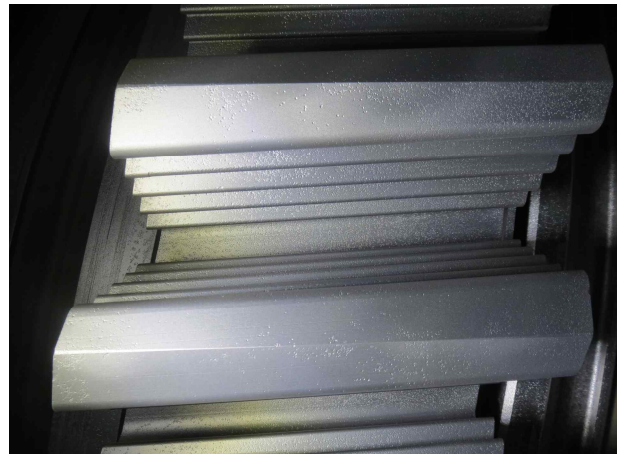


Fig. 17. Row 3 Wheel dovetail - Pitting

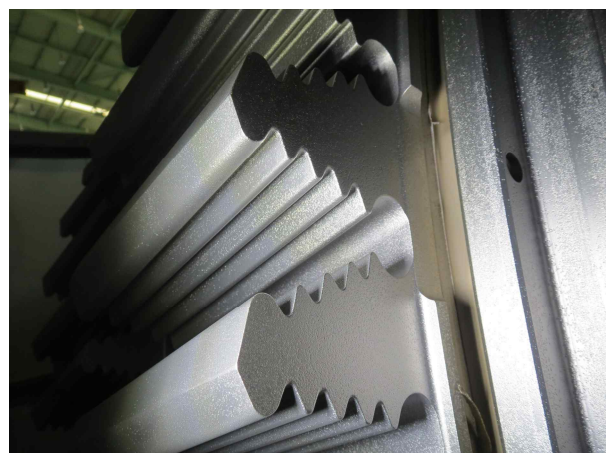


Fig. 18. Row 3 Wheel dovetail - Pitting

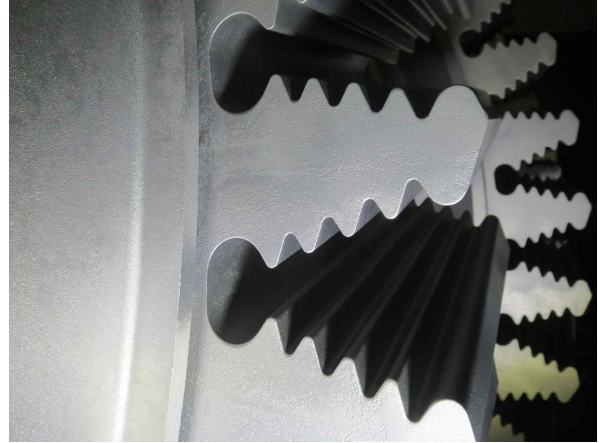


Fig. 19. Row 4 Wheel dovetail - Pitting



Fig. 20. Row 4 Wheel dovetail - Pitting

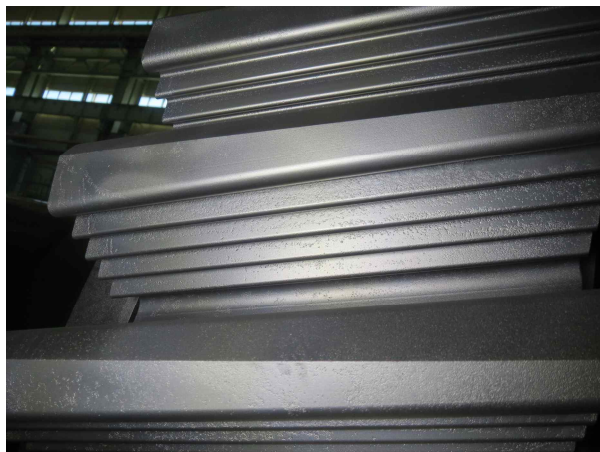


Fig. 21. Row 4 Wheel dovetail - Pitting

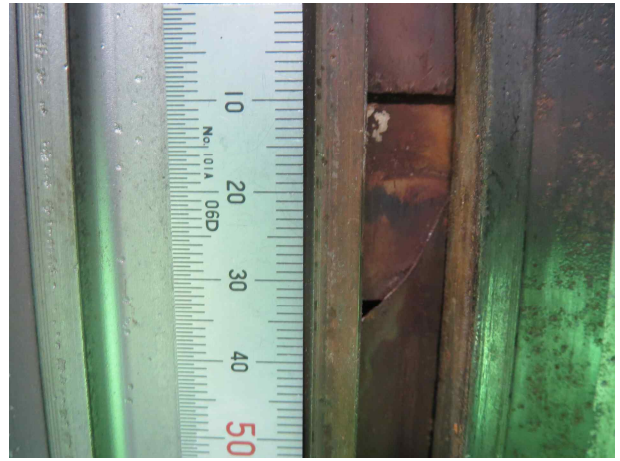


Fig. 22. Row 1 Bally bend - Fracture

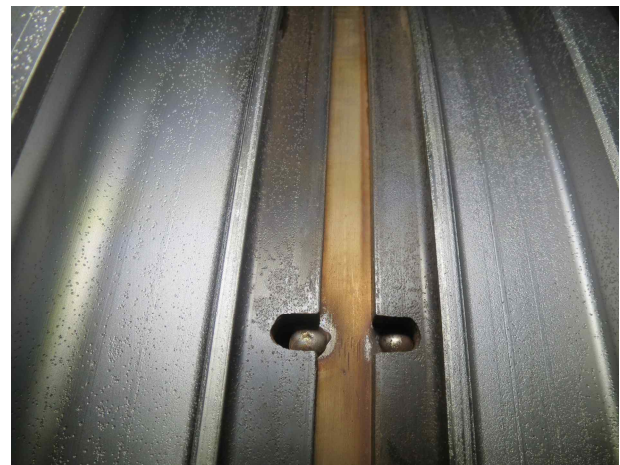
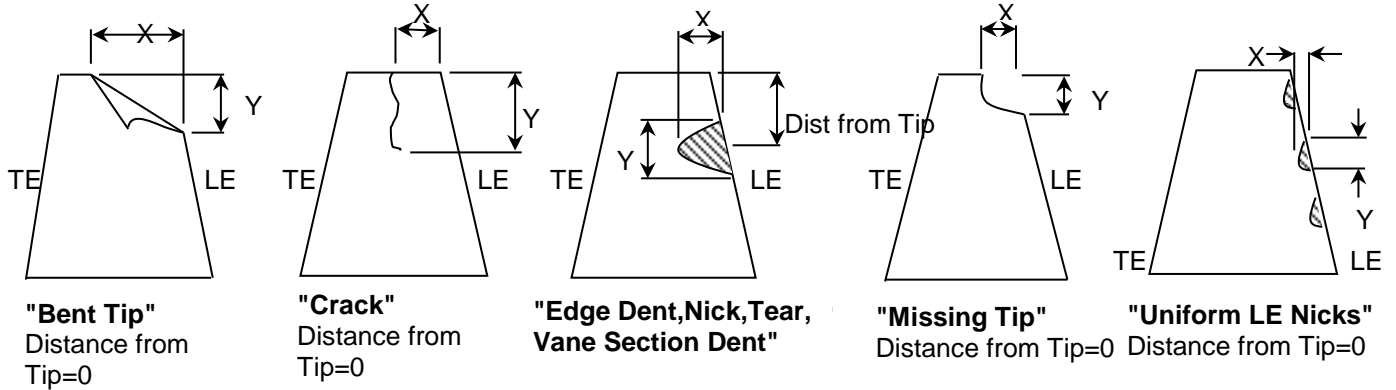


Fig. 23. Row 2 Bally bend - No linear indication



Fig. 24. Row 3 Bally bend - No linear indication

Damage Definitions



No.	Stage	S/N	Damage Type	Location	Distance from Tip	X	Y	D	Blending Type	Remark
1	2	5	D	TE	35	3	6	-	-	
2	2	19	D	TE	10	2	6	-	-	
3	3	4	D	TE	0	5	5	-	-	
4	3	12	B	TE	0	9	9	-	-	
5	3	18	D	TE	36	3	10	-	-	
6	3	24	D	TE	44	3	10	-	-	
7	3	36	D	TE	212	2	6	-	-	
8	4	7	D	TE	0	12	12	-	-	
9	4	8	D	TE	10	3	5	-	-	
10	4	9	D	TE	0	8	8	-	-	
11	4	12	B	TE	0	12	12	-	-	
12	4	22	D	TE	10	4	22	-	-	
13	4	22	D	TE	46	4	10	-	-	
14	5	6	D	TE	9	2	5	-	-	
15	5	7	D	TE	0	7	7	-	-	
16	5	8	B	TE	0	10	10	-	-	
17	5	12	D	TE	53	3	10	-	-	
18	5	15	D	TE	131	2	10	-	-	
19	5	20	B	TE	0	5	5	-	-	
20	5	22	B	TE	0	9	9	-	-	
21	5	23	D	TE	0	10	10	-	-	
22	5	32	D	TE	0	10	10	-	-	
23	5	33	D	TE	24	2	6	-	-	
24	6	23	D	TE	50	3	10	-	-	
25	6	36	D	TE	0	10	10	-	-	
26	7	16	B	TE	0	10	10	-	-	
27	7	31	D	LE	22	3	10	-	-	
28	7	32	B	TE	0	8	8	-	-	
29	7	32	D	TE	21	3	10	-	-	






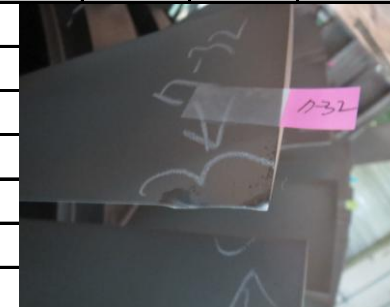
Compressor Blades Mapping

UNIT:mm

No.	Stage	S/N	Damage Type	Location	Distance from Tip	X	Y	D	Blending Type	Remark
30	7	33	D	TE	68	3	15	-	-	
31	8	23	D	TE	0	3	10	-	-	
32	8	23	D	TE	40	4	10	-	-	
33	8	28	D	TE	0	6	6	-	-	
34	8	37	B	TE	0	5	10	-	-	
35	9	45	B	TE	0	3	11	-	-	
36	10	11	D	TE	69	1	2	-	-	
37	10	11	D	TE	97	8	5	-	-	
38	10	45	D	TE	40	3	12	-	-	
39	10	48	D	TE	108	3	15	-	-	
40	10	48	D	TE	130	3	16	-	-	
41	11	15	D	TE	45	1	1	-	-	
42	11	18	D	TE	78	1	3	-	-	
43	11	39	D	TE	21	3	10	-	-	
44	11	43	D	LE	42	2	6	-	-	
45	11	54	D	TE	42	2	6	-	-	
46	12	27	B	TE	0	2	3	-	-	
47	12	56	D	TE	92	2	9	-	-	
48	12	57	D	TE	106	3	10	-	-	
49	12	77	RUBBING	TIP	-	-	-	-	-	
50	13	ALL	RUBBING	TIP	-	-	-	-	-	
51	13	65	D	TE	82	3	11	-	-	
52	13	66	D	TE	77	1	7	-	-	
53	13	66	D	TE	102	3	11	-	-	
54	13	82	D	LE	14	1	1	-	-	
55	14	ALL	RUBBING	TIP	-	-	-	-	-	
56	14	62	D	TE	61	1	1	-	-	
57	14	65	D	TE	78	2	7	-	-	
58	14	66	D	TE	69	2	7	-	-	
59	14	66	D	TE	92	3	10	-	-	
60	14	77	BLENDING	LE	31	1	8	-)	
61	14	92	BLENDING	LE	12	2	12	-)	
62	15	28	BLENDING	TE	30	1	14	-	(
63	15	57	D	TE	51	1	3	-	-	
64	15	58	D	TE	64	1	7	-	-	
65	15	59	D	TE	56	1	7	-	-	
66	15	59	D	TE	78	3	12	-	-	
67	15	62	D	TE	59	2	3	-	-	
68	16	58	D	TE	56	1	5	-	-	
69	16	59	D	TE	46	2	9	-	-	
70	16	59	D	TE	70	3	10	-	-	

Compressor Blades Mapping

UNIT:mm

No.	Stage	S/N	Damage Type	Location	Distance from Tip	X	Y	D	Blending Type	Remark	
71	16	60	D	TE	60	2	7	-	-		
72	16	101	D	LE	40	2	12	-	-		
73	17	63	D	TE	27	1	1	-	-		
74	17	65	D	TE	55	3	13	-	-		
75	17	66	D	TE	45	2	8	-	-		
76	17	66	D	TE	68	3	12	-	-		
77	18	65	D	TE	47	2	12	-	-		
78	18	66	D	TE	39	2	9	-	-		
79	18	66	D	TE	62	2	10	-	-		
80	19	50	D	TE	20	2	2	-	-		
											
			2-5 TE DENT				4-9 TE DENT				
											
			4-22 TE DENT				5-22 TE BENT				
											
			7-16 TE BENT				7-32 TE BENT & DENT				



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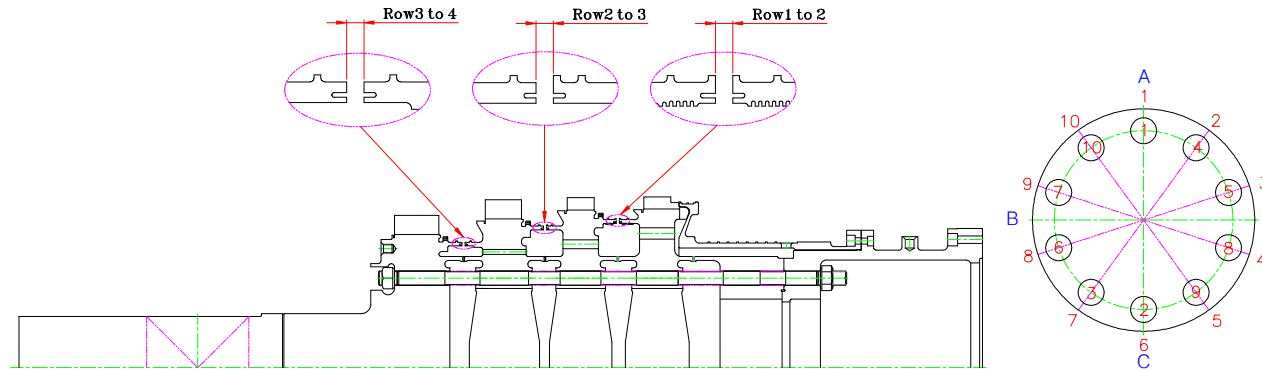
TBN Disc Gap Check Sheet

Incoming
 Final

Customer :

Service Order No. : 1608001

Model : W501D5



Unit : mm

Before Loose Spindle Bolt				After Loose Spindle Bolt					
Position		Row 1 to 2	Row 2 to 3	Row 3 to 4	Position		Row 1 to 2	Row 2 to 3	Row 3 to 4
A	0°	12.12	12.26	11.92	A	0°			
B	90°	12.11	12.26	11.95	B	90°			
C	180°	12.10	12.22	11.96	C	180°			
D	270°	12.12	12.24	11.97	D	270°			

◦Measuring Instrument : Block Gage
◦Serial No. : 957378(~18.8.2)

Inspection Date	Inspector / Signature	Confirmer / Signature	Quality Checker/ Signature
2016.08.12	신상철, 지원준		



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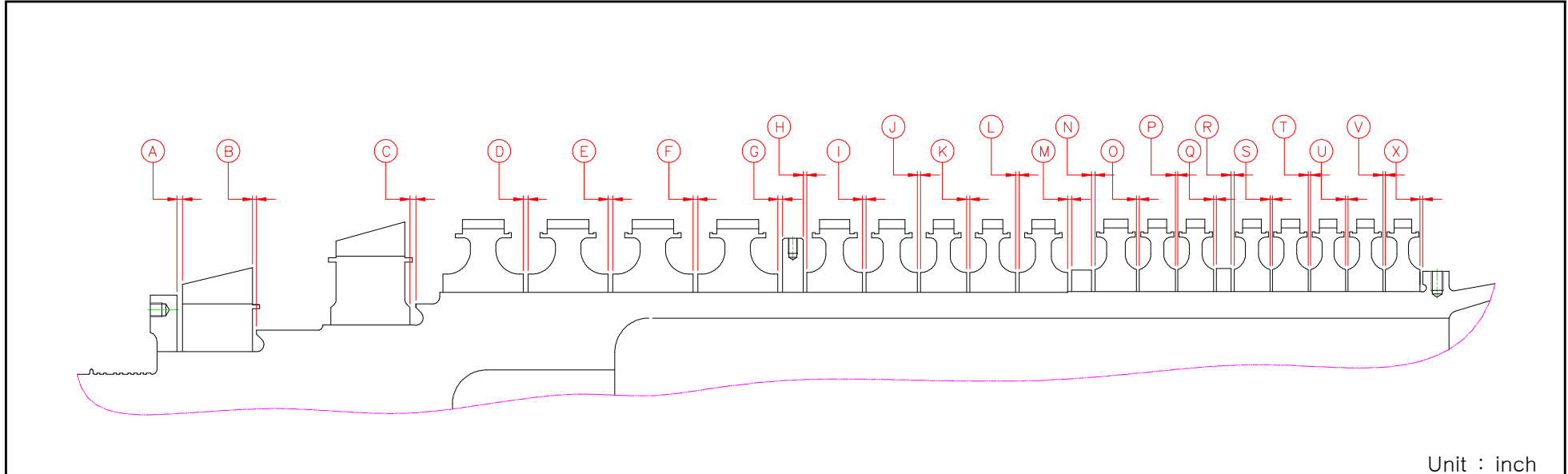
Compressor Disc Gap Check Sheet

Incoming
 Final

Customer :

Service Order No. : 1608001

Model : W501D5



Unit : inch

Pos	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X
0°	2.13	0.086	0.097	1.50	1.76	1.37	2.15	1.33	1.00	0.75	0.95	0.72	0.87	0.43	0.87	0.75	0.75	0.34	0.77	0.60	0.82	0.80	0.78
90°	2.12	0.088	0.096	1.48	1.75	1.35	2.22	1.33	1.08	0.75	0.92	0.73	0.83	0.41	0.92	0.77	0.73	0.36	0.78	0.54	0.92	0.78	0.78
180°	2.13	0.091	0.102	1.52	1.67	1.30	2.20	1.33	1.15	0.70	0.97	0.65	0.79	0.38	0.97	0.72	0.77	0.35	0.73	0.63	0.87	0.73	0.80
270°	2.08	0.088	0.102	1.55	1.67	1.27	2.20	1.32	1.12	0.73	0.95	0.64	0.87	0.38	0.91	0.77	0.72	0.36	0.78	0.72	0.77	0.77	0.80

◦Measuring Instrument : Block Gage
◦Serial No. : 957378(~18.8.2)

Inspection Date	Inspector / Signature	Confirmer / Signature	Quality Checker / Signature
2016.08.12	지원준, 신상철, 이대용		



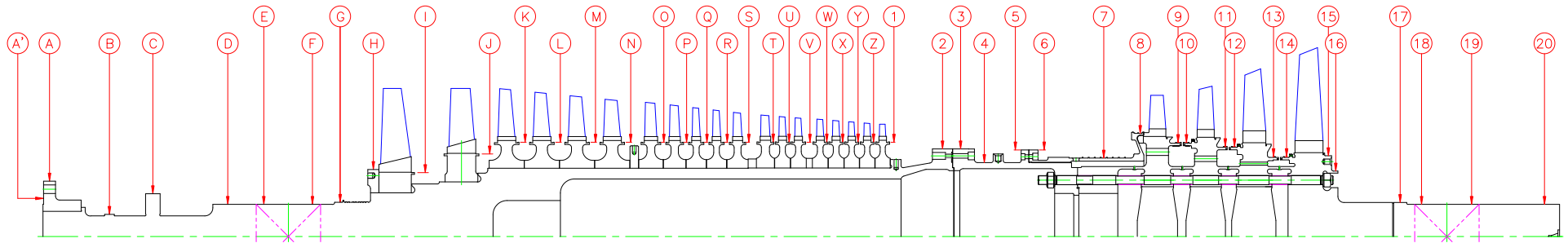
UNIT ROTOR RUNOUT CHECK

Customer :

Service Order No. : 1608001

Model : W501D5

Incoming Final



Unit : 1/100mm(White), 1/10,000inch(Yellow)

No	A'	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	7	2	0	2	0	1	0	-1	0	-1	1	0	-1	-2	-3	0	-2	-1	-1	-1	0	0	0	0	0	1	1	-2	-7	-13	0	-2	7	-1	-1	2	0	0	-2	-1	2	1	2	1	2	-1	-6			
3	7	9	5	2	1	-1	3	0	-1	1	0	1	3	0	-1	-2	2	0	0	-1	-2	-1	0	1	0	0	2	-2	-8	-11	1	4	5	-1	-2	5	3	3	-1	0	4	2	3	4	3	-2	-7				
4	2	6	6	3	0	-1	5	-1	-1	3	2	4	4	2	0	-1	4	3	3	0	-2	0	0	1	1	0	2	-2	-5	-3	2	15	12	0	-2	7	6	5	0	1	3	1	2	4	3	-3	-5				
5	-2	0	5	1	0	-1	3	0	-2	4	4	4	4	3	1	0	5	3	5	1	-1	1	1	1	1	1	2	-1	0	5	3	27	15	2	2	7	7	7	1	3	1	0	1	3	2	-1	0				
6	-6	-2	6	4	0	-1	2	2	-1	4	4	4	3	3	1	1	4	3	5	3	2	3	3	3	2	2	4	1	4	5	3	27	32	3	4	6	6	7	3	4	-1	-1	0	-1	1	0	3				
7	-8	0	4	4	-1	0	2	3	0	2	3	2	2	4	1	1	3	2	4	3	3	3	3	2	2	2	3	2	6	0	2	23	17	4	4	4	5	5	3	3	-2	-2	0	-3	0	0	6				
8	-8	-2	0	2	0	0	2	2	1	1	2	2	1	4	2	2	2	1	2	3	2	2	1	0	1	0	3	0	5	-6	0	11	17	3	3	2	1	2	1	2	-2	-1	-1	-2	0	0	5				
Tot	15	11	6	4	3	1	5	4	3	4	5	4	4	5	4	5	5	5	6	4	5	4	3	3	2	2	4	4	14	18	3	29	32	5	6	7	7	7	5	5	6	4	4	7	3	3	13				

Limit	60																											20	20	30																										
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Measuring Instrument : Dial Indicator	Inspection Date 2016.08.11	Inspector / Signature 설영수, 지원준 신상철, 이대용	Confirmer / Signature /	Quality Checker/ Signature /
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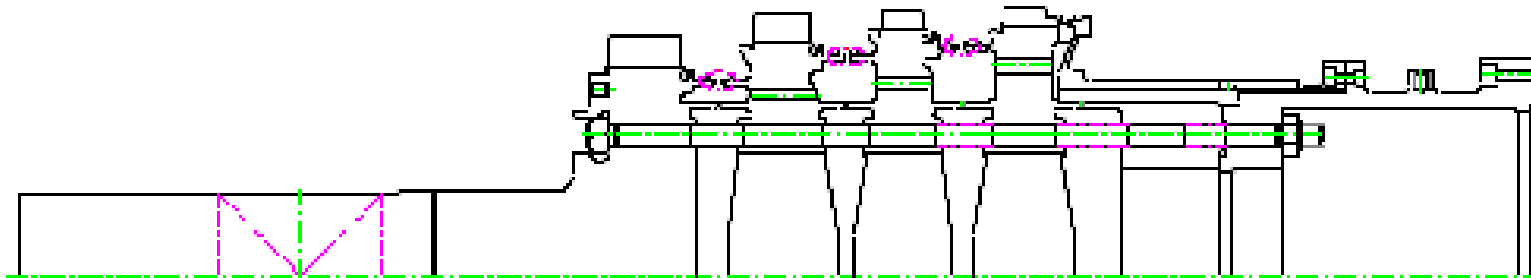
TBN Blade Gap Check Sheet

Incoming
 Final

Customer :

Service Order No. : 1608001

Model : W501D5

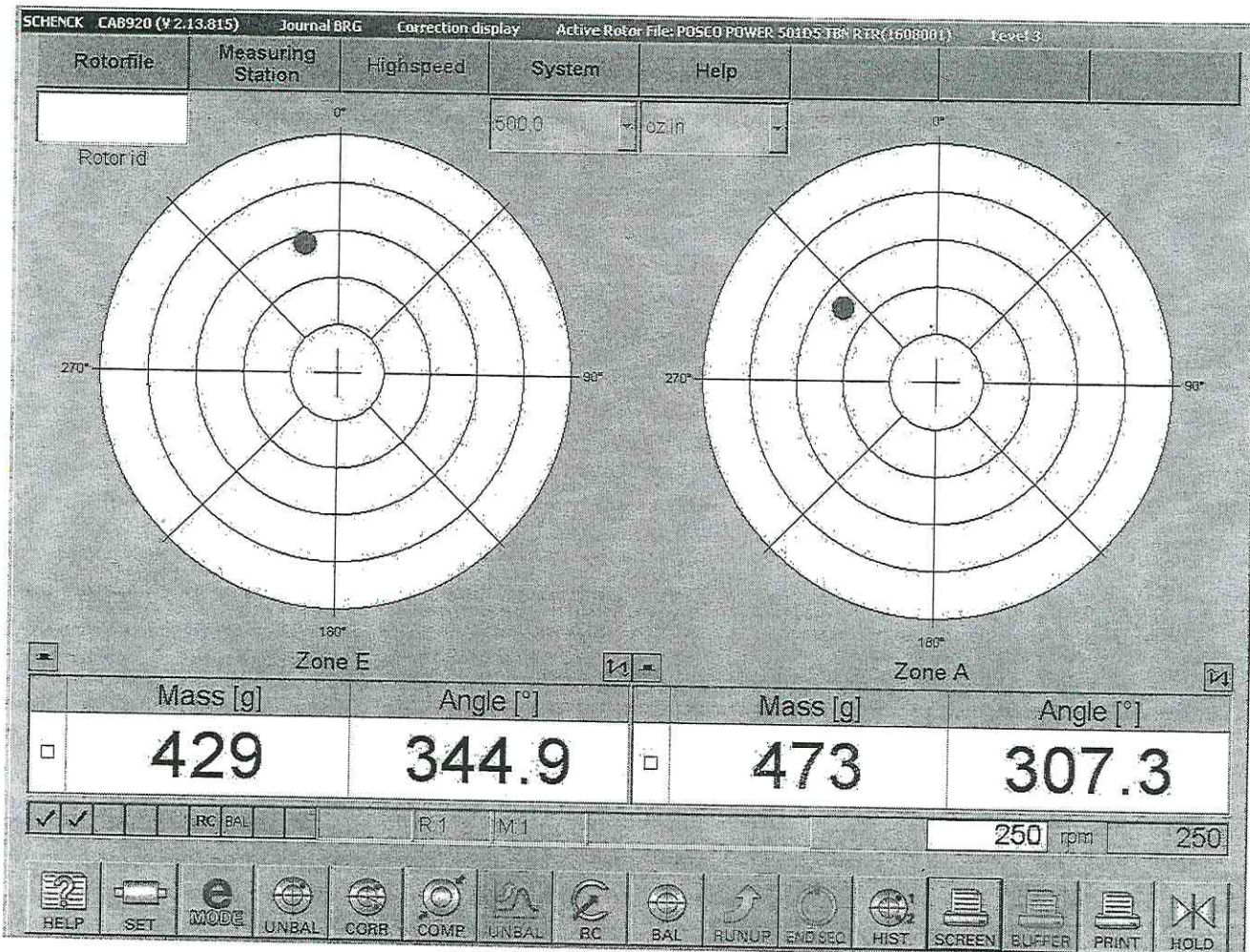


Unit : mm

TBN Blade Gap		
Stage	FWD	AFT
1	4.11	3.79
2	4.00	3.78
3	4.30	4.07
4	4.39	3.67

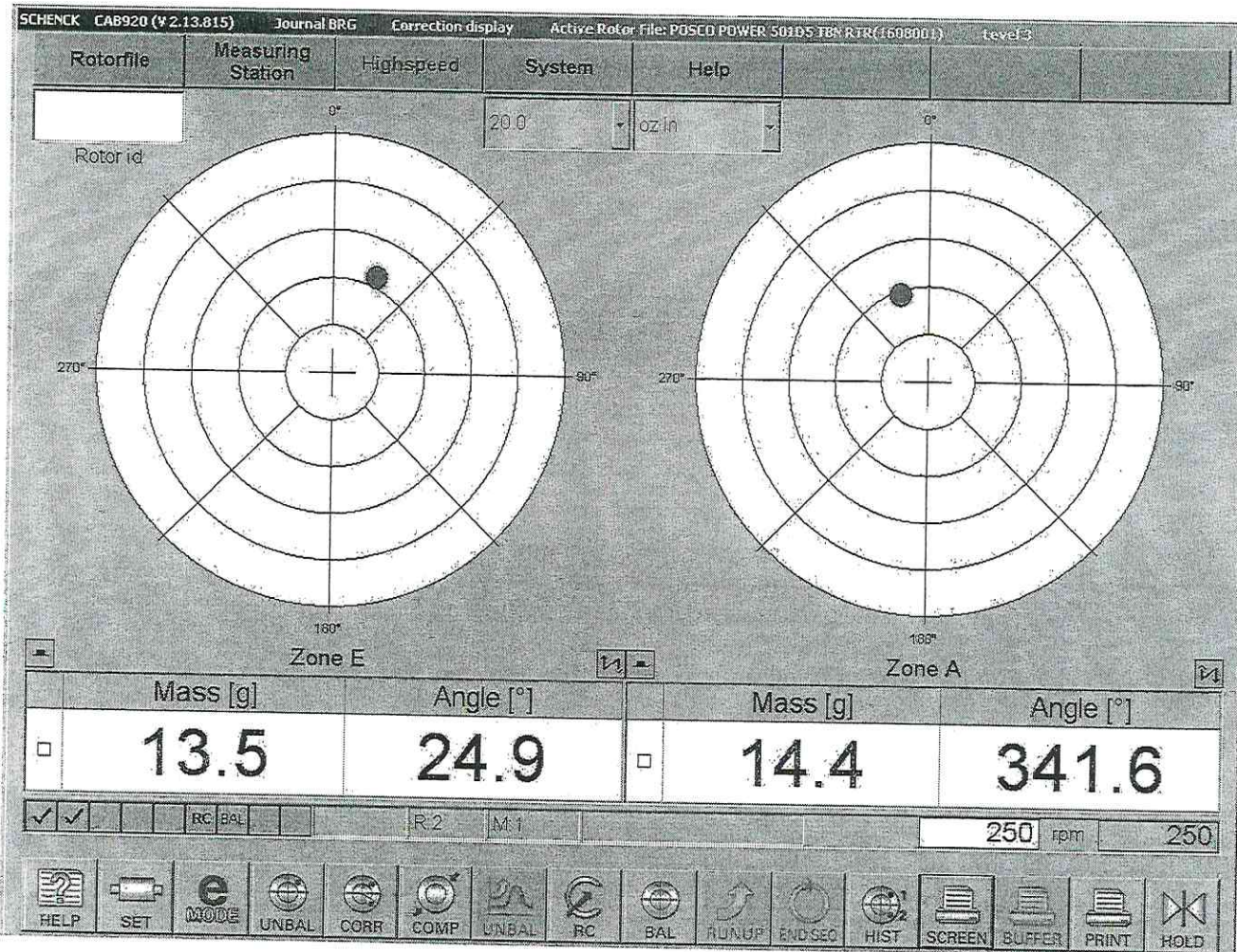
Inspection Date	Inspector / Signature	Confirmer / Signature	Quality Checker/ Signature
2016.08.11	설영수, 신상철		

SCHENCK CAB920
KPS GAS TURBINE SERVICE CENTER
POSCO POWER 501D5 TBN RTR(1608001)
Correction display
2016-08-18 오후 8:01:10



* Initial Data.

SCHENCK CAB920
 KPS GAS TURBINE SERVICE CENTER
 POSCO POWER 501D5 TBN RTR(1608001)
 Correction display
 2016-08-18 오후 10:02:39



* Final Data

- Zone A : 170g Δ 286° (#10)
- Zone B : 158g Δ 325°
- Zone C : 158g Δ 324° (#9)
- Zone D : 170g Δ 322° (#6)
- Zone E : 214g Δ 7° (#1)