

INCOMING INSPECTION REPORT

Customer	Nghi Son Refinery & Petrochemical, LLC.	Report Date	27 April 2026
Customer P.O. No.	WO1003986864	Component	1st Stage Nozzle
Engine Type	MS6001FA (GE Frame 6FA)	Part Number (Ring)	143E5711G02
Part Number (Casting)	129E9734 P002	Qty. Received	24 Segments (1 Complete Set)
Material	FSX-414 Cobalt Superalloy	As-Received Coating	HVOF MCrAlY + Full TBC Top Coat
Repair Classification	HEAVY REPAIR Severity Level 9 of 10 (Very Heavy, upper boundary)	Total Emergency Trips	125
Total Initiated Starts	476	Breaker Trips at Load	127

Reviewed and approved
UNEW Engineering



Paul McGuire, Engineering Manager

1. EXECUTIVE SUMMARY

Twenty-four (24) MS6001FA 1st stage nozzle segments were received and inspected. The inspection confirmed extreme and widespread damage affecting both airfoil sections and structural components on all 24 segments. Multiple heavy damage mechanisms are acting at the same time. These include extensive cracking, heavy hot corrosion, critical wall thinning, permanent deformation, and widespread coating deterioration requiring full strip and recoat.

Extensive cracking is confirmed in critical regions, particularly along trailing edges and airfoil sections, accompanied by heavy corrosion and material loss. In several areas the trailing edge exhibits thinning and distortion, indicating loss of structural integrity and reduced load bearing capability. One segment exhibits through-wall material loss at the trailing edge. Widespread corrosion on concave airfoil surfaces and outer shroud walls further confirms material degradation under high temperature service conditions.

Ultrasonic wall thickness measurement at trailing edge positions T1 and T2 returned 89 of 94 measurable readings below the 2.03 mm minimum limit; the remaining 2 of the 96 defined positions could not be measured because of through-wall material loss (Item 8). All 48 airfoil trailing edges (2 airfoils per segment across 24 segments) were recorded as REJECT and require restoration. The lowest recorded reading is 1.12 mm, which is 0.91 mm (44.8%) below the minimum limit, and the mean of all readings is 1.57 mm, 22.6% below the limit. Additional geometric deviations, including bowing and misalignment, are confirmed and will affect flow path stability, sealing effectiveness, and overall turbine performance if not corrected.

The combined presence of structural cracking, through-wall material loss, geometric distortion, and universal dimensional non-conformance places this set beyond standard or medium repair. This condition cannot be corrected by routine blending, inspection, coating, or standard refurbishment alone; local or partial repair cannot recover the required geometry, thickness, or structural integrity. The nozzle set is classified as **HEAVY REPAIR, Severity Level 9 of 10 (Very Heavy, upper boundary)** under the UNEW Repair Severity Classification. The classification basis is summarized in Section 1.1 and derived in full in Section 4.

Full removal of degraded material, structural weld reconstruction, Transient Phase Restoration, trailing edge wall thickness restoration by PSP application on all 48 airfoil trailing-edge positions, dimensional requalification, and repeated controlled heat treatment are required to restore the components to a stable operating condition. No components are recommended for scrap; the set remains repairable through the Heavy Repair work scope defined in this report. This level of repair is necessary to recover airfoil geometry, ensure proper cooling effectiveness, maintain flow path stability, and extend component life under high temperature operation.

1.1 HEAVY REPAIR TECHNICAL BASIS

The Heavy Repair classification of this set rests on the measured findings summarized below. Each driver is independently documented in the referenced sections of this report; together they define a full-set restoration scope.

Heavy Repair Driver	Evidence (This Set)	Repair Impact
100% trailing edge rejection	48 of 48 airfoil trailing edges rejected across all 24 segments (Section 12.8).	PSP restoration on all 48 trailing-edge positions
Wall thickness below minimum	89 of 94 measurable T1/T2 readings below the 2.03 mm minimum; lowest reading 1.12 mm (44.8% below limit); mean 1.57 mm (22.6% below limit) (Sections 3.4 and 12.8).	Structural trailing edge restoration
Through-wall / missing material	Item 8: 8x100 mm through-wall loss at the trailing edge; O/D wall missing material patches on 9 of 24 segments (Section 3.6).	Weld build-up, EDM, and PSP restoration
Full-set structural cracking	TPR and weld repair required on Items 1 to 24; multi-site crack networks on airfoils, walls, and shrouds (Sections 3.2 and 5.1).	Full-set restoration; local repair not applicable
Metallurgical degradation	Grain boundary carbide coarsening and detrimental phase precipitation confirmed by material evaluation (Reports UNEW-ME-825091-01/-02/-03, Section 9).	Mandatory vacuum solution heat treatment
Coating / substrate degradation	Coating and substrate interface breakdown confirmed by material evaluation (Section 9).	Full chemical strip and full recoat (MCrAlY + TBC)
Dimensional distortion	Trailing edge bowing and permanent deformation; step deviations to -1.21 mm; gap and drop deviations recorded (Sections 3.5 and 12).	Cold straightening and dimensional requalification

BASIS OF CLASSIFICATION

This set is not classified as Heavy Repair because standard processes such as cleaning, FPI, coating, heat treatment, or dimensional inspection appear in the work scope; those processes are common to all repair levels. It is classified as Heavy Repair because the incoming condition shows full-set structural damage, universal trailing edge wall thickness rejection, through-wall material loss, metallurgical degradation, and a full trailing edge restoration requirement. These findings require structural restoration beyond routine refurbishment.

The scope of work (Section 8) identifies the repair processes applied to this component. The repair classification is determined by the actual incoming damage condition and the extent of restoration required, as documented in Sections 3, 4, 9, and 12 of this report.

APPLICABILITY OF LOWER REPAIR LEVELS

Lower Repair Level Argument	Why Not Applicable
-----------------------------	--------------------

INCOMING INSPECTION REPORT



Standard FPI, inspection, and coating processes appear in the SOW	The classification is based on the measured damage condition, not on the names of the processes applied (Section 8 note).
Local blending can restore the surfaces	Blending cannot restore 48 rejected trailing edge wall thickness positions; PSP structural restoration is required (Section 12.8).
Standard weld repair is sufficient	All 24 segments require full structural crack repair with TPR and subsequent vacuum solution heat treatment, in addition to PSP restoration (Sections 3.2 and 5).
Coating renewal is routine refurbishment	Coating is one element only; the classification is driven by structural wall loss, through-wall material loss, full-set cracking, distortion, and metallurgical degradation (Section 1.1 table).
Some dimensional results are within limits	Classification is governed by the more severe conditions: universal trailing edge rejection and through-wall material loss (Section 4).

2. INTRODUCTION

24 pcs. of MS6001FA 1st stage nozzle have been received and have undergone cleaning, coating removal where required, incoming inspection and metallurgical analysis. The initial findings and results of the incoming inspection are as follows:

Order Information	
Date of report	27 April 2026
Customer P.O. no.	1003986864
UNEW Job Order no.	825091
Component Details	
Engine type	MS6001FA
Component type	1st Stage Nozzle
Component part number	Retaining ring P/N: 143E5711G02 Casting segment P/N: 129E9734 P002
Qty. received	24
Material type	FSX414
As received coating type (s)	HVOF MCrAlY coating and full TBC top coat
Additional items received with main set (if any)	-
Customer supplied component history	
Total Initiated Starts	476
Manually Initiated Starts	468
Fired Starts	180
Total Emergency Trips	125
Breaker Tripped At Load Count	127
# of previous repairs	(No information supplied)
Hours of operation since last repair interval	(No information supplied)
Operational fuel type	(No information supplied)
Mode of operation (base load / peaking)	(No information supplied)
Maint. intervals combustion	(No information supplied)
Maint. intervals Hot gas path	(No information supplied)
Unloaded condition	
Incoming packing / container condition	Good
Signs of transit damage (if damaged upon receipt photos to be included within report)	-

3. INSPECTION SUMMARY

The following operational history increases the risk profile and supports the Heavy Repair classification:

- Total Initiated Starts: 476, Manually Initiated Starts: 468, Fired Starts: 180.
- Total Emergency Trips: 125. Together with 476 initiated starts and 180 fired starts, the unit counters record a severe cyclic thermal loading history with repeated thermal shock events that accelerate cracking and hot corrosion.
- Breaker Trips at Load: 127, consistent with heavy cyclic thermal loading causing fatigue crack propagation at trailing edges and platform junctions.
- As-received coating: HVOF MCrAlY with full TBC top coat. Widespread coating deterioration with confirmed coating/substrate interface degradation (Section 9); full strip and recoat required.

The following damage categories were identified across all 24 nozzle segments:

Damage Category	Finding (As Inspected)	Disposition
Trailing Edge Cracking	Extensive cracks 5 to 75 mm at O/D wall and 5 to 25 mm at I/D wall, on all 24 segments (Items 1 to 24).	TPR + Weld
Multi-Cracking at Airfoil Body	Multi-crack networks 15x40 mm ² to 30x120 mm ² on concave and convex surfaces, leading edge and trailing edge, on all 24 segments.	TPR Required
Non-Gas Path Cracking (I/D and O/D Wall)	Cracks 8 to 20 mm at I/D wall (non-gas path) on all segments. Cracks 8 to 15 mm at O/D wall on Items 1, 3, 22, 23.	TPR / Weld
Heavy Corrosion at Trailing Edge and Concave Airfoil	Heavy oxidation and hot corrosion on trailing edge and concave airfoil faces across all 24 segments. Heavy corrosion on outer shroud wall.	Blend + Braze
Trailing Edge Wall Thickness Below Minimum	48 of 48 airfoil trailing edges non-conforming: 89 of 94 measurable T1/T2 positions below the 2.03 mm minimum and 2 positions unmeasurable. One segment (Item 8) shows through-wall material loss at the trailing edge.	PSP Required (48 positions)
Trailing Edge Bowing / Distortion	Visible bowing and thin wall permanent deformation on trailing edges requiring cold straightening and planishing.	Straighten / PSP
Missing Material at O/D Wall and T/E	Missing material patches 5x30 mm to 8x50 mm at O/D wall on Items 1, 2, 4, 5, 6, 11, 14, 15, 17. Missing material 8x100 mm at trailing edge on Item 8.	Weld Build-up
Coating Deterioration (TBC + MCrAlY)	Widespread coating deterioration with confirmed coating/substrate interface degradation (Section 9). TBC requires full strip and recoat; HVOF MCrAlY bond coat depleted. Full gas path recoat required on the complete set.	Full Strip + Recoat

INCOMING INSPECTION REPORT



Base Metal Microstructure Degradation	As-received FSX-414 shows grain boundary carbide coarsening and detrimental phase precipitation. After pre-weld solution heat treatment, hardness measured 27.1 to 30.9 HRC; material recoverable for weld repair (Section 9).	Recovered via HT
--	--	-------------------------

3.1 DIMENSIONAL INSPECTION SUMMARY

Key dimensional findings from the incoming inspection are summarized below:

Inspection Parameter	Result	Status
Trailing Edge Wall Thickness (T1 and T2)	48 of 48 airfoil trailing edges non-conforming. 89 of 94 measurable positions below the 2.03 mm minimum; 2 positions unmeasurable (through-wall loss, Item 8). PSP restoration required on all 48 airfoil trailing-edge positions.	REJECT: 24/24
Nozzle Alignment (Step Between Segments)	Step deviations recorded on multiple segments against nominal datum. Largest recorded step deviations: -1.21 mm (Seg 11), -1.16 mm (Seg 16), -0.94 mm (Seg 4). Straightening and dimensional requalification required.	DEVIATIONS RECORDED
Nozzle Set Roundness	0.80 mm (A-A: 1732.70 / B-B: 1733.42 / C-C: 1733.50 / D-D: 1732.95 mm). Recorded as incoming baseline.	RECORDED
Total Nozzle Flow Area	132,124.07 mm ² (204.793 in ²). Area deviation 0.33%.	WITHIN LIMIT
Retaining Ring Roundness, Upstream	Max-Min: 1.21 mm (range 1715.11 to 1716.32 mm). Recorded as incoming baseline.	RECORDED
Retaining Ring Roundness, Downstream	Max-Min: 0.92 mm (range 1687.46 to 1688.38 mm). Recorded as incoming baseline.	RECORDED
Harmonic Analysis, Throat Areas	Individual segment area deviations within the acceptable range (max deviation under plus or minus 10% on individual throats).	ACCEPTABLE

Note: Wall thickness and throat area are assessed against the stated acceptance limits (2.03 mm minimum; plus or minus 10% area deviation). Alignment, gap, drop check, and roundness measurements are recorded against nominal datum as the incoming baseline; final acceptance of these dimensions is verified at post-repair dimensional requalification (Section 8).

3.2 PERVASIVE MULTI-SITE CRACKING (100% OF SEGMENTS AFFECTED)

The defect records and FPI results confirm that all 24 nozzle segments exhibit cracking at multiple locations. This is a primary driver for the Heavy Repair classification:

- Trailing edge (T/E): Extensive cracks ranging 5 to 75 mm at the O/D wall and 5 to 25 mm at the I/D wall across all segments (Items 1 to 24). Photographs (Figs. 11 to 13) show severe crack networks with associated heavy corrosion at the trailing edge.

- Airfoil body multi-cracking: Crack networks 15x40 mm² to 30x120 mm² covering the concave, convex, leading edge, and trailing edge surfaces on all 24 segments. Transient Phase Restoration (TPR) is required.
- Non-gas-path I/D and O/D walls: Cracks 8 to 20 mm (non-gas path) on all segments. Cracks 8 to 15 mm on the O/D wall at Items 1, 3, 22, and 23.
- Individual segment anomalies: Item 19 exhibits a 50 mm crack at the concave face, a non-typical defect warranting specific weld repair attention.

The extent and distribution of cracking present on every single segment of the set require full structural weld repair (GTAW), Transient Phase Restoration (TPR), and subsequent vacuum solution heat treatment.

3.3 HEAVY HOT CORROSION AND OXIDATION

Photographs (Figs. 14 to 18) and defect records confirm:

- Heavy corrosion on the concave airfoil face and trailing edge, resulting in critical metal loss and surface pitting (Items 1 to 24).
- Heavy oxidation on the outer shroud (O/D) wall. This is structurally significant as it affects load bearing and sealing surfaces.
- Light to medium corrosion on the I/D wall and non-gas-path surfaces across all 24 segments requiring blending and restoration.

The severity of corrosive attack, combined with trailing edge thinning, is consistent in morphology with Type I or Type II high temperature hot corrosion under severe service exposure. Fuel chemistry and operating history should be reviewed separately if root cause confirmation is required. The resulting material loss is addressed through the Heavy Repair work scope.

3.4 TRAILING EDGE WALL THICKNESS, ALL 24 SEGMENTS REJECTED

Post-strip ultrasonic wall thickness inspection at positions T1 and T2 (trailing edge locations) confirmed universal non-conformance against the minimum allowable wall thickness of 2.03 mm. The measured data set (Section 12.8) is summarized below:

Trailing Edge Wall Thickness — Statistical Summary	Result (T1 / T2 positions)
Positions defined (24 segments × 2 airfoils × T1, T2)	96
Positions unmeasurable due to through-wall material loss (Item 8, S/N A1FC 04955)	2
Measured readings below the 2.03 mm minimum	89 of 94 (94.7%)
Lowest recorded reading (Item 21, Airfoil #2, T2)	1.12 mm — 0.91 mm (44.8%) below limit
Mean of all 94 measured readings	1.57 mm — 22.6% below limit
Readings at or below 1.50 mm / at or below 1.30 mm	38 / 18

INCOMING INSPECTION REPORT



Readings at or above the minimum (maximum 2.26 mm, within 0.23 mm of the limit; in every case the paired position on the same airfoil is below limit)	5
Airfoil trailing edges REJECT	48 of 48
Segments REJECT	24 of 24

- Trailing edge wall thinning is consistent with combined high temperature oxidation, hot corrosion, and service related deformation. The classification is based on the measured wall thickness rejection and the restoration scope required.
- Item 8 (S/N A1FC 04955) additionally shows missing material at the trailing edge (8x100 mm), confirming through-wall material loss. Through-wall loss is the condition that defines the approach to the repairability limit.
- Corrective action: Application of Pressure Side Plate (PSP) for trailing edge wall thickness restoration is required on all 48 airfoil trailing-edge positions (2 airfoils per segment x 24 segments = 48 positions). PSP restoration is applied per airfoil trailing edge; every one of the 48 positions carries at least one reading below the minimum limit, so the 48-position scope follows directly from the measured data in Section 12.8. This is classified as an Additional (non-standard) work item.

3.5 TRAILING EDGE BOWING AND AIRFOIL DISTORTION

Visible bowing and permanent deformation of the trailing edge walls were documented in Fig. 16, with accompanying annotation confirming the thin wall condition requiring PSP. Cold straightening and planishing will be performed on all affected trailing edge and airfoil sections prior to weld repair.

3.6 MISSING MATERIAL AT O/D WALL AND TRAILING EDGE

- O/D Wall: Missing material patches 5x30 mm to 8x50 mm identified on Items 1, 2, 4, 5, 6, 11, 14, 15, and 17 (9 of 24 segments).
- Trailing Edge, Item 8: Missing material 8x100 mm at the trailing edge, the largest single missing material defect in the set. Weld build-up and EDM or PSP restoration is required.

Missing material in gas-path locations adversely affects aerodynamic performance and thermodynamic efficiency and must be fully restored before return to service.

3.7 THERMAL BARRIER COATING (TBC) AND MCRALY DETERIORATION

The as-received coating system (HVOF MCrAlY + full TBC) has deteriorated to a level requiring complete chemical strip, abrasive blast, heat tint verification, and full recoat of the gas path surfaces. Metallurgical section UNEW-ME-825091-01 (Section 9, Fig. 1) confirmed severe breakdown at the coating and substrate interface. Full reapplication of HVOF MCrAlY and TBC top coat is required on the complete set.

3.8 BASE METAL CONDITION, FSX-414 (RECOVERABLE)

Metallurgical analysis (Reports UNEW-ME-825091-01, Item 13 Inner Shroud; UNEW-ME-825091-02, Item 11; UNEW-ME-825091-03, Item 8 Trailing Edge) confirmed:

- Base material: FSX-414 cobalt superalloy composition confirmed (Co 49.8%, Cr 28.1%, Ni 12.0%, W 7.1%, Fe 2.0%).
- As-received microstructure: Coarsened grain boundary carbide and detrimental phase precipitation typical of extended service without intermediate heat treatment.
- Post pre-weld solution heat treatment (HT): Grain boundary carbide and detrimental phases satisfactorily refined. Hardness results: 30.9 HRC (inner shroud) and 27.1 HRC (trailing edge), within UNEW's approved acceptance range for FSX-414 weld repair eligibility.
- Recommendation: Base material is suitable for repair. All components will undergo full vacuum solution heat treatment as part of the Heavy Repair process.

3.9 SPARE PART (REPAIR / REPLACE)

Item	Part Description	Received / Required	Condition	Remark
1	Segment Joint seals (Flat seals), positions 01 to 08	192/192 ea	Replace	In scope
2	Inner-Impingement Cover plate	24/24 ea	Replace	Additional
3	Outer-Impingement Cover plate	24/24 ea	Replace	Additional
4	Leading edge core plugs (inner side)	48/48 ea	Replace	In scope
5	Leading edge core plugs (outer side)	48/48 ea	Replace	In scope
6	Trailing edge core plugs	48/48 ea	Replace	In scope
7	Internal retaining ring 13/16"	24/24 ea	Replace	In scope
8	Heli coil 3/4"-10UNC	4/4 ea	Replace	In scope
9	Heli coil 5/8"-11 UNC	18/18 ea	Replace	In scope
10	PSP for trailing edge wall thickness restoration	0/48 ea	Replace	Additional

Note: Replacement of consumable and removable hardware listed above is not the basis of the Heavy Repair classification. The classification is based on structural cracking, through-wall and missing material, universal trailing edge wall thickness rejection, airfoil distortion, metallurgical degradation, and the full-set restoration requirement (Sections 1.1, 3, 4, and 12).

4. REPAIR SEVERITY CLASSIFICATION

UNEW applies a 10 level Repair Severity Classification to all gas turbine capital parts refurbishment. Levels 1 to 3 represent Light Repair. Levels 4 to 7 represent Standard or Medium Refurbishment. Levels 8 to 10 represent Heavy Repair. Repair severity is determined by the actual incoming condition of the component and the restoration effort required to return the part to serviceable condition.

Based on the incoming inspection findings, this set of 24 first stage nozzle segments is classified as **HEAVY REPAIR, Severity Level 9 of 10 (Very Heavy, upper boundary)**. This designation is derived from the recorded inspection data summarized in this section.

The repair level is determined by the combination of damage location, measured non-conformance, crack extent, wall thickness loss, missing material, metallurgical condition, and the total restoration scope required. The classification is set by the recorded inspection data in Sections 12 and 13, evaluated against fixed acceptance limits, and reflects the full restoration scope required across the complete set. The five core technical review categories of the UNEW classification basis are assessed below:

Review Category	Confirmed Condition (This Set)	Severity Contribution
Welding and Material Buildup	Trailing edge cracks up to 75 mm and airfoil multi-crack networks up to 30x120 mm ² on 24 of 24 segments. Missing material at nine O/D walls and through-wall loss of 8x100 mm at one trailing edge. Full crack excavation, GTAW weld reconstruction, weld build-up, and Transient Phase Restoration are required. This is major structural restoration across every unit.	Heavy (Level 9)
Dimensional Restoration	Trailing edge wall thickness: REJECT on 24 of 24 segments; 48 of 48 airfoil trailing edges non-conforming, with 89 of 94 measurable T1/T2 positions below the 2.03 mm minimum and 2 positions unmeasurable due to through-wall loss. Trailing edge bowing and permanent deformation across the full set requiring cold straightening. Step and alignment deviations recorded on multiple segments requiring straightening and requalification. Wall thickness results are objective pass or fail against the 2.03 mm limit. PSP restoration is required on all 48 airfoil trailing-edge positions.	Heavy (Level 9)
Coating and Base Metal Condition	Metallurgical examination confirmed severe breakdown at the coating and substrate interface with the MCrAlY bond coat depleted. The as-received base metal showed heavy grain boundary carbide coarsening and detrimental phase precipitation so severe that mandatory vacuum solution heat treatment was required before any repair work could begin. Full coating system removal and reapplication is required.	Heavy (Level 9)

INCOMING INSPECTION REPORT



Cooling Hole and Cooling Passage Recovery	Cooling hole flow recovery is in the repair route, with EDM restoration of cooling holes and seal slots and cooling hole flow checks before coating. All 144 leading and trailing edge core plugs (96 leading edge, 48 trailing edge) and all 48 impingement cover plates require replacement, as listed in Section 3.9, to restore the cooling system.	Heavy (Level 9)
Inspection, Heat Treatment, and Engineering Risk	The repair route requires two full vacuum solution heat treatments as a minimum, HF and vacuum cleaning for TPR, repeated FPI cycles, ultrasonic wall thickness verification, and full harmonic and roundness requalification at final assembly. The operating history of 125 emergency trips and 127 breaker trips at load adds engineering risk to every acceptance decision.	Heavy (Level 9)

Level 9 (Very Heavy, the upper boundary of the Heavy Repair band) in the UNEW classification is defined as extensive full-set or critical-zone restoration: widespread damage across many parts, major geometry restoration, multiple heat cycles, repeated FPI and NDT, and high repair labor and acceptance risk. Every element of that definition is present in this set, and it is present on all 24 segments at the same time. Several categories sit at the top of Level 9, most notably the universal trailing edge rejection and the through-wall material loss at Item 8. Where multiple criteria apply, the more severe technical condition governs the classification.

Level 10 is reserved for components at or near the technical repair limit, where non-repairable disposition is possible. All 24 segments remain repairable, but the margin between their as-received condition and that retirement limit is small. The set is therefore designated Severity Level 9 of 10 (Very Heavy, upper boundary), the most severe classification available for a repairable set. The documented condition requires Heavy Repair classification under the criteria assessed above.

5. ENGINEERING RECOMMENDATION

Following receipt, cleaning, coating removal, incoming solution heat treatment, visual inspection, fluorescent penetrant inspection (FPI), wall thickness measurement, dimensional checks, harmonic analysis, and metallurgical sectioning, UNEW Engineering has evaluated all 24 segments of the MS6001FA 1st Stage Nozzle set (UNEW Job Order 825091) received from Nghi Son Refinery & Petrochemical, LLC. (NSRP).

The severity, extent, and combination of damage found across the complete set, including through-wall material loss, extensive hot corrosion, universal trailing edge wall thinning below minimum limits, and missing material, confirms that this set requires HEAVY REPAIR at the most severe repairable level. No segment in the set is eligible for a lower repair classification: every segment carries rejected trailing edge wall thickness and requires TPR, weld, and blend restoration, with PSP restoration additionally required on all 48 airfoil trailing-edge positions.

The following operational factors were noted as contributors to the damage severity:

- 476 Total Initiated Starts, 180 Fired Starts, and 125 Emergency Trips recorded on the unit counters: a severe cyclic thermal loading history driving fatigue cracking at trailing edges and airfoil bodies.
- 127 Breaker Trips at Load: consistent with repeated thermal shock events accelerating hot corrosion and crack propagation.
- Complete service history was not available beyond the operating counter data listed in this report; fired hours, fuel type, prior repair count, and maintenance interval records were not supplied. A conservative repair approach has therefore been applied.

5.1 DEFECT FINDINGS AND RECOMMENDED REPAIR ACTIONS

The table below defines the required repair action for each defect category identified during incoming inspection. All repair methods shall be performed in accordance with UNEW approved repair procedures.

No.	Defect / Condition	Location / Affected Items	Repair Method	Action
1	Extensive cracking at Trailing Edge (T/E)	O/D Wall: cracks 5 to 75 mm, Items 1 to 24. I/D Wall: cracks 5 to 25 mm, Items 1 to 24.	GTAW Weld + Blend	REQUIRED
2	Multi-cracking at Airfoil Body (concave, convex, L/E, T/E)	Crack networks 15x40 mm ² to 30x120 mm ² , all 24 segments.	Transient Phase Restoration (TPR)	REQUIRED
3	Non-gas path cracking at I/D and O/D Wall	I/D Wall: 8 to 20 mm, Items 1 to 24. O/D Wall: 8 to 15 mm, Items 1, 3, 22, 23.	TPR / GTAW Weld	REQUIRED
4	Single large crack at concave airfoil	50 mm crack, Item 19 only (non-typical).	GTAW Weld + Blend	REQUIRED

INCOMING INSPECTION REPORT



5	Heavy hot corrosion at T/E and concave airfoil face	Gas path surfaces, all 24 segments (Figs. 11 to 15).	Blend to Remove	REQUIRED
6	Heavy corrosion at Outer Shroud (O/D) Wall	O/D Wall surface, all 24 segments (Figs. 17 and 18).	Blend to Remove	REQUIRED
7	Light to medium corrosion at I/D Wall and non-gas path surfaces	I/D Wall and non-gas path, all 24 segments.	Blend to Remove	REQUIRED
8	Trailing Edge wall thickness below minimum limit (T1 and T2)	ALL 24 segments; 48 of 48 airfoil trailing edges. Item 8: through-wall missing material at T/E, 8x100 mm.	Apply PSP (48 positions)	ADDITIONAL ITEM
9	Trailing Edge bowing and permanent deformation	All T/E faces, confirmed across the full set (Fig. 16).	Cold Straighten / Plannish	REQUIRED
10	Missing material at O/D Wall	Patches 5x30 mm to 8x50 mm, Items 1, 2, 4, 5, 6, 11, 14, 15, 17 (9 of 24 segments).	GTAW Weld Build-up	REQUIRED
11	Full TBC and MCrAlY coating degradation	All gas path surfaces, complete set.	Full Strip + Recoat	REQUIRED
12	Base metal microstructure degradation (grain boundary carbide)	FSX-414 substrate, confirmed via metallurgical analysis (UNEW-ME-825091-01).	Solution Heat Treatment	REQUIRED

NOTE: All weld repairs (GTAW) will be performed using approved filler materials compatible with FSX-414 base alloy. Pre-weld and post-weld fluorescent penetrant inspection (FPI) is mandatory for all weld and TPR areas.

5.2 RECOMMENDED REPAIR SEQUENCE

All components shall be repaired in the following sequence to ensure structural integrity and coating adhesion:

Step	Process	Applies To
1	Receipt inspection, serial number recording, dimensional and harmonic baseline measurement	All 24 Segments
2	Chemical strip of external gas path coatings + heat tint verification for full removal	All 24 Segments
3	Incoming solution heat treatment in full vacuum environment (pre-weld condition)	All 24 Segments

INCOMING INSPECTION REPORT



4	Post-HT FPI + visual inspection; record all defects per defect chart	All 24 Segments
5	Cold straightening / planishing of trailing edge and airfoil sections	All 24 Segments
6	Blend to remove oxidation, corrosion, and minor surface defects	All 24 Segments
7	Prep and GTAW weld repair, all areas of major structural cracking and missing material	All 24 Segments
8	Local FPI, post-weld verification before heat treatment	All 24 Segments
9	Transient Phase Restoration (TPR), all areas of multi-cracking	All 24 Segments
10	Solution heat treatment in full vacuum environment (post-repair)	All 24 Segments
11	Post-repair FPI + visual inspection	All 24 Segments
12	Apply PSP for trailing edge wall thickness restoration	All 48 T/E positions
13	EDM to restore cooling holes and seal slots	As required
14	Ultrasonic wall thickness inspection, confirm T/E meets the 2.03 mm minimum or greater	All 24 Segments
15	Pre-coating dimensional inspection and cooling hole flow check	All 24 Segments
16	Apply HVOF MCrAlY bond coat + full TBC to all gas path surfaces	All 24 Segments
17	Re-install core plugs and cover plates; visual inspect fabrication welds	All 24 Segments
18	Final assembly, dimensional inspection, harmonic and roundness check	Complete Set
19	Weld in place nozzle retaining pins; final visual inspection	Complete Set
20	Compile Final Report, pack and ship with all required documentation per Purchase Order	Complete Set

5.3 COATING RECOMMENDATION

The following HVOF MCrAlY bond with full Thermal Barrier Coating top coat scope applies to the complete set:

Coating Process	Surface / Area	Applies To
Chemical strip of existing TBC and MCrAlY	All external gas path surfaces	All 24 Segments
Heat tint verification, confirm full removal	All gas path surfaces	All 24 Segments
Abrasive blast, surface preparation	All gas path surfaces	All 24 Segments

INCOMING INSPECTION REPORT



Apply HVOF MCrAlY bond coat	Full gas path surface	All 24 Segments
Apply full Thermal Barrier Coating (TBC) top coat	Full gas path surface	All 24 Segments
Post-coating visual inspection	All coated surfaces	All 24 Segments

5.4 ENGINEERING RECOMMENDATION CONCLUSION

CLASSIFICATION: HEAVY REPAIR, SEVERITY LEVEL 9 OF 10 (VERY HEAVY, UPPER BOUNDARY), All 24 Segments

UNEW Engineering confirms that the complete set of 24 MS6001FA 1st Stage Nozzle segments (UNEW Job Order 825091) is classified as HEAVY REPAIR, Severity Level 9 of 10 (Very Heavy, upper boundary), based on the findings of the incoming inspection process. The damage categories identified, pervasive multi-site cracking, heavy hot corrosion, universal trailing edge wall thinning below the 2.03 mm minimum limit, through-wall missing material, and widespread coating deterioration with confirmed coating/substrate interface degradation, are consistent with extended service operation under severe cyclic thermal loading conditions.

All components are within the repairable limits established by UNEW Engineering and will be restored to a serviceable condition in accordance with the Heavy Repair work scope defined in this report. An additional work item, PSP application for trailing edge wall thickness restoration (48 airfoil trailing-edge positions), is required and forms part of the Heavy Repair work scope of this work order; the 48-position quantity follows directly from the measured wall thickness data recorded in Section 12.8.

All repair methods, heat treatment programs, weld procedures, and coating processes will be performed in accordance with UNEW approved process specifications and quality procedures.

Based on the objective inspection results summarized in this report, a classification below Severity Level 9 would not reflect the measured incoming condition or the restoration scope required.

6. PACKING LIST FROM CUSTOMER

PACKING LIST FROM CUSTOMER

NOZZLE KIT, TURB-STG1	2060157737	143E5711G02	SNEG642589	SET	6/8	H64 X L220 X W128	700	575
		129E9734 P002						

7. COMPONENT SERIAL NUMBER CORRELATION

CORRELATION SHEET

Retaining ring part number	P/N: 143E5711G02 S/N: SNEG642589
----------------------------	-------------------------------------

Item	Part Number	Serial Number	Material
1	129E9734 P002	A1FC 04959	FSX414
2	129E9734 P002	A1FC 04965	FSX414
3	129E9734 P002	A1FC 04999	FSX414
4	129E9734 P002	A1FC 04981	FSX414
5	129E9734 P002	A1FC 04978	FSX414
6	129E9734 P002	A1FC 04958	FSX414
7	129E9734 P002	A1FC 04964	FSX414
8	129E9734 P002	A1FC 04955	FSX414
9	129E9734 P002	A1FC 04963	FSX414
10	129E9734 P002	A1FC 05000	FSX414
11	129E9734 P002	A1FC 04957	FSX414
12	129E9734 P002	A1FC 05002	FSX414
13	129E9734 P002	A1FC 04962	FSX414
14	129E9734 P002	A1FC 05007	FSX414
15	129E9734 P002	A1FC 05004	FSX414
16	129E9734 P002	A1FC 04960	FSX414
17	129E9734 P002	A1FC 04956	FSX414
18	129E9734 P002	A1FC 05003	FSX414
19	129E9734 P002	A1FC 04945	FSX414
20	129E9734 P002	A1FC 04998	FSX414
21	129E9734 P002	A1FC 05006	FSX414
22	129E9734 P002	A1FC 05001	FSX414

INCOMING INSPECTION REPORT



23	129E9734 P002	A1FC 04996	FSX414
24	129E9734 P002	A1FC 04961	FSX414

8. SCOPE OF WORK

MS6001FA STAGE 1 NOZZLE

Work Scope	Inspect	Heavy Repair Scope
Inspect		
Perform receipt inspection and record serial numbers	X	
Mate halves, perform dimension checks and harmonic analysis	X	
Perform metallurgical evaluation of base material and report on condition	X	
Disassemble nozzle segments from carrier ring, bag and tag hardware	X	
Remove cover plates and core plugs, bag and tag hardware with segment serial number	X	
Abrasive blast	X	
Perform chemical strip of external gas path coatings	X	
Perform heat tint operation to ensure full coating removal	X	
Perform incoming solution heat treatment in full vacuum environment	X	
Cooling Hole check	X	
Perform visual inspection on all components and record all defects	X	
Perform fluorescent penetrant inspection on all components and record all defects	X	
Perform post-strip wall thickness inspect, report all non-conformities	X	
Compile and forward Incoming Inspection Report to customer.	X	
Repair		
Blend to remove oxidation and corrosion to nozzle segments		X
Cold straighten / Plannish trailing edge and airfoil sections as required.		X
Prep for weld all areas of major structural cracking		X
Perform local fluorescent penetrant inspection		X
Perform weld repairs using GTAW		X
Blending to restore component profile		X
Perform fluorescent penetrant inspection		X
Perform solution heat treatment in full vacuum environment		X
Perform fluorescent penetrant inspection		X
Perform HF and vacuum cleaning in preparation for TPR		X
Perform transient phase restoration of all areas of multi-cracking		X

INCOMING INSPECTION REPORT



Electro Discharge Machine (EDM) to restore cooling holes, seal slots		X
Perform ultrasonic wall thickness inspection		X
Perform solution heat treatment in full vacuum environment		X
Perform fluorescent penetrant inspection		X
Perform visual inspection		X
Cooling Hole check		X
Perform dimension inspection		X
Coating		
Apply HVOF MCrAlY & Full TBC to gas path surface		X
Perform visual inspection		X
Re install core plugs and cover plates. Visual inspect fabrication welds		X
Perform final assembly and inspection checks		X
Mate halves, perform final dimension and harmonic inspections, record results		X
Weld in place nozzle retaining pins		X
Perform final visual inspection		X
Compile Final Report, pack and ship components with all required documentation as listed in Purchase Order		X

Required:

- Apply PSP for trailing edge wall thickness restoration, Qty 48 (airfoil trailing-edge positions; 2 airfoils per segment x 24 segments).

Note: The processes listed above define the work scope applied to this component. The repair classification is determined by the incoming damage condition documented in this report, not by the process list (see Section 1.1).

9. MATERIAL EVALUATION

Report No.	UNEW-ME-825091-01	Job Order No.	825091
Serial No. (or ID)	Item 13	Cutting Location	Inner Shroud
Received Status	As-Received	Hardness Test	Not required at as-received stage; post-HT hardness reported in UNEW-ME-825091-02 and -03
Grain Size	Refer to micrographs, Figs. 1 and 2	Coating Type	TBC coating
Nearest Alloy	FSX-414		

Element	Co	Cr	Ni	Ti	W	Ta	Mo	Fe
Nominal (%)	52.5	29.0	10.0	-	7.5	-	-	1.0
Result (%)	49.8	28.1	12.0	-	7.1	-	-	2.0



Fig. 1: Heavy coating degradation exposing base metal

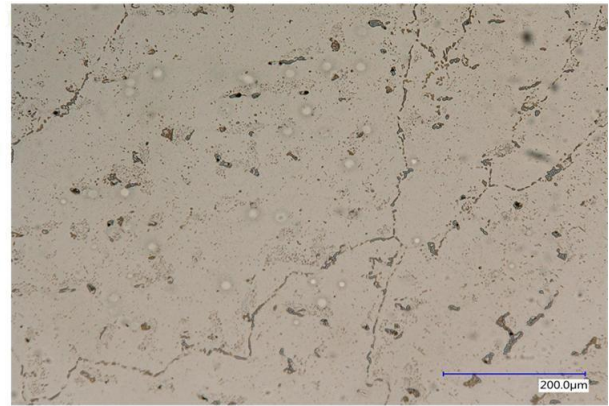


Fig. 2: Heavy grain boundary damage at high magnification (Etched)

Specimen UNEW-ME-825091-01 was prepared and examined to assess material condition for repair eligibility. Hot gas path coating (TBC) showed severe degradation with heavy breakdown at the coating and substrate interface, refer to Fig. 1. Base material was confirmed as FSX-414 alloy, exhibiting heavy grain boundary carbide coarsening, detrimental phase precipitation, and a gamma matrix with advanced primary and secondary carbide deterioration, refer to Fig. 2.

Recommendation

Based on the examination above, the base material exhibits severe microstructural degradation consistent with extended high temperature service under heavy cyclic loading. Heavy grain

boundary carbide coarsening and detrimental phase precipitation are confirmed throughout the substrate. The material condition requires mandatory full vacuum solution heat treatment prior to any weld repair to restore microstructural integrity. Subject to successful heat treatment recovery, the base material is considered eligible for Heavy Repair. All repair activities shall be performed strictly in accordance with UNEW approved procedures for FSX-414 alloy.

Report No.	UNEW-ME-825091-02	Job Order No.	825091
Serial No. (or ID)	Item 11	Cutting Location	Inner Shroud
Received Status	Pre-Weld HT	Hardness Test	30.9 HRC
Grain Size	Refer to micrographs, Figs. 1 and 2	Coating Type	(Refer to as-received analysis)
Nearest Alloy	FSX-414		



Fig. 1: Heavy microstructural damage requiring mandatory heat treatment intervention (Etched)

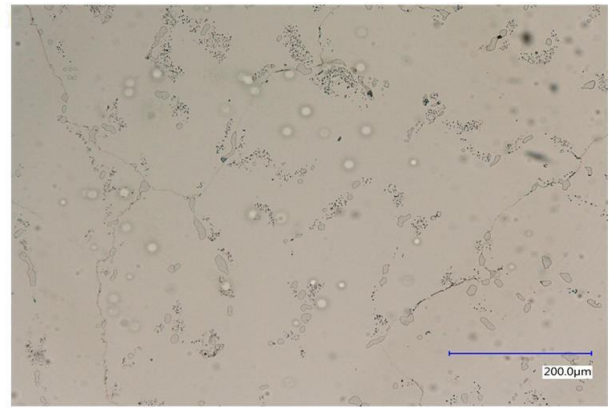


Fig. 2: Severe grain boundary attack and carbide deterioration at high magnification (Etched)

Specimen UNEW-ME-825091-02 was prepared and examined to evaluate base material microstructure in the pre-weld solution heat treated condition. Examination confirmed that the severely degraded microstructure has been recovered through mandatory heat treatment intervention. The heavily coarsened grain boundary carbides and detrimental phases previously identified as critical damage indicators in report UNEW-ME-825091-01 have been successfully refined to an acceptable condition for Heavy Repair welding operations (Figs. 1 and 2).

Recommendation

Based on the examination above, the badly damaged base material has been successfully restored by the pre-weld heat treatment process. The heavy grain boundary damage and harmful phases, which were confirmed as serious damage in the as-received condition, have been reduced to an acceptable level for Heavy Repair welding. The hardness test result is 30.9 HRC, which is acceptable for GTAW weld repair on FSX-414 alloy. The material is now approved to proceed with Heavy Repair welding and all work must follow UNEW approved weld repair procedures for FSX-414 alloy. A full heat treatment process is still required after all welding and TPR work is completed.

Report No.	UNEW-ME-825091-03	Job Order No.	825091
Serial No. (or ID)	Item 8	Cutting Location	Trailing Edge
Received Status	Pre-Weld HT	Hardness Test	27.1 HRC
Grain Size	Refer to micrographs, Figs. 1 and 2	Coating Type	(Refer to as-received analysis)
Nearest Alloy	FSX-414		

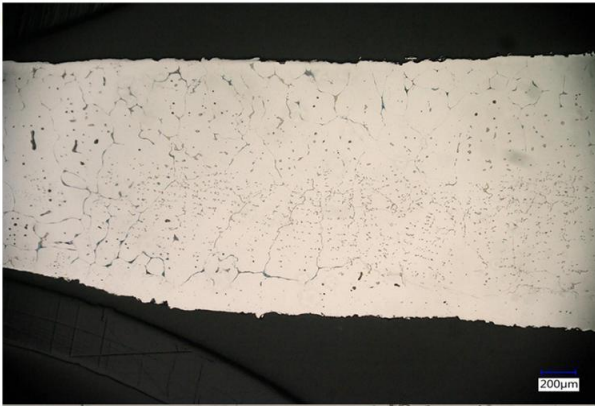


Fig. 1: Critical base metal damage condition prior to heat treatment (Etched)

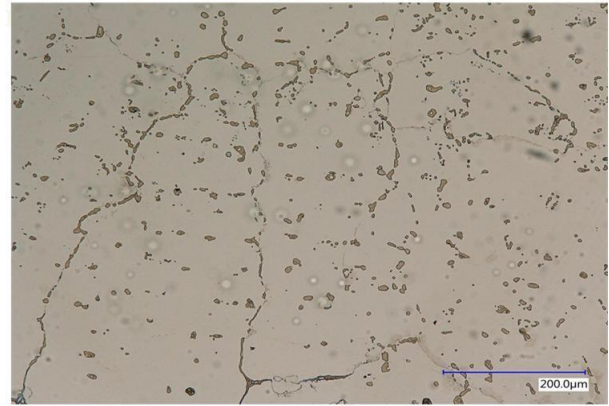


Fig. 2: Critical base metal damage confirmed at high magnification (Etched)

Specimen UNEW-ME-825091-03 was prepared and examined to evaluate the base metal condition at the Trailing Edge, one of the most severely damaged areas in this set. The heavy grain boundary damage and harmful phases confirmed as critical damage in the as-received condition (report UNEW-ME-825091-01) were so severe that mandatory pre-weld heat treatment was required before any repair work could proceed. Following heat treatment, the badly damaged microstructure has been sufficiently restored to allow Heavy Repair welding operations to begin. This confirms that the damage level in this set requires Heavy Repair intervention with mandatory pre-weld heat treatment (Figs. 1 and 2).

Recommendation

Based on the examination above, the badly damaged base metal at the Trailing Edge has been successfully restored by the pre-weld heat treatment process. The heavy grain boundary damage and harmful phases which were confirmed as critical damage in the as-received condition have been reduced to an acceptable level for Heavy Repair welding. This area required special attention due to the combination of heavy cracking, severe wall thinning below the minimum limit of 2.03 mm, and bowing, all confirmed across all 24 segments. The hardness test result is 27.1 HRC, which is acceptable for GTAW weld repair on FSX-414 alloy. The material is now approved to proceed with Heavy Repair welding. All work must follow UNEW approved weld repair procedures for FSX-414 alloy. A full heat treatment process is still required after all welding and

TPR work is completed. In addition, all 48 Trailing Edge positions require PSP application to restore wall thickness to the minimum acceptable level before coating can proceed.

10. PHOTOGRAPHS



Fig.1 Received as heavy damage condition



Fig.2 Received as heavy damage condition

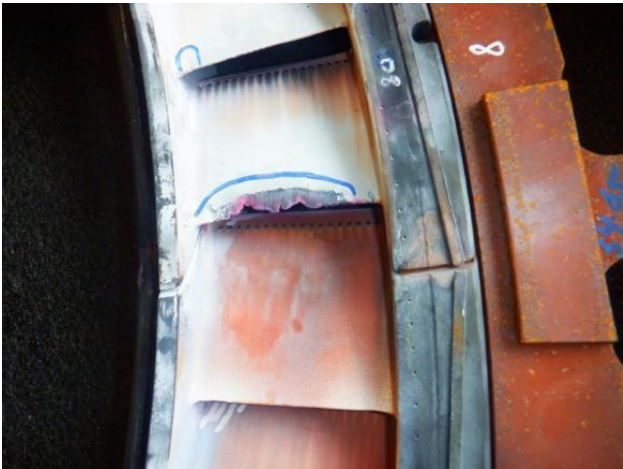


Fig.3 Received as heavy damage condition

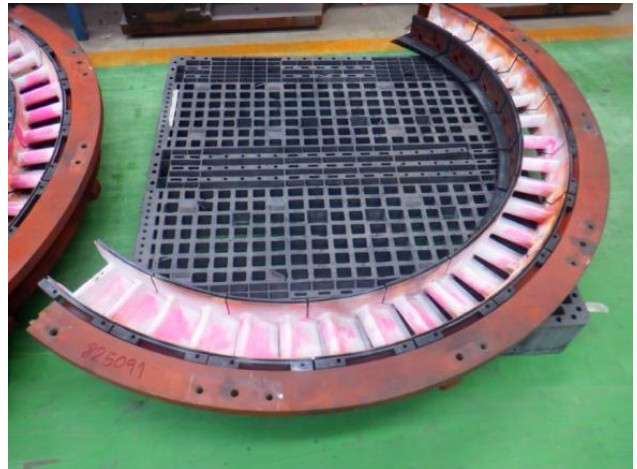
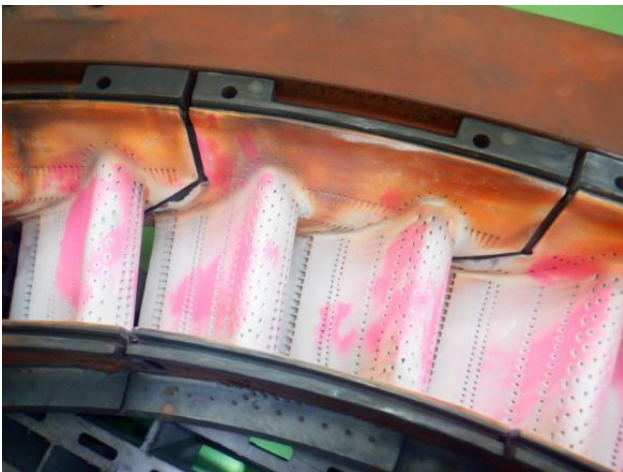


Fig.4 Received as heavy damage condition



INCOMING INSPECTION REPORT

Fig.5 Received as heavy damage condition

Fig.6 Received as heavy damage condition



Fig.7 Received as heavy damage condition



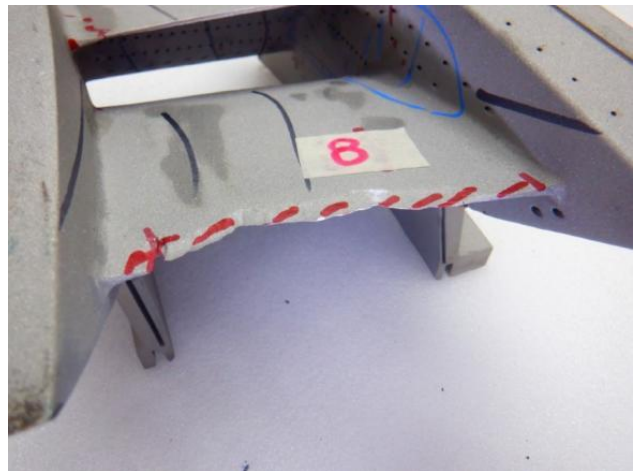
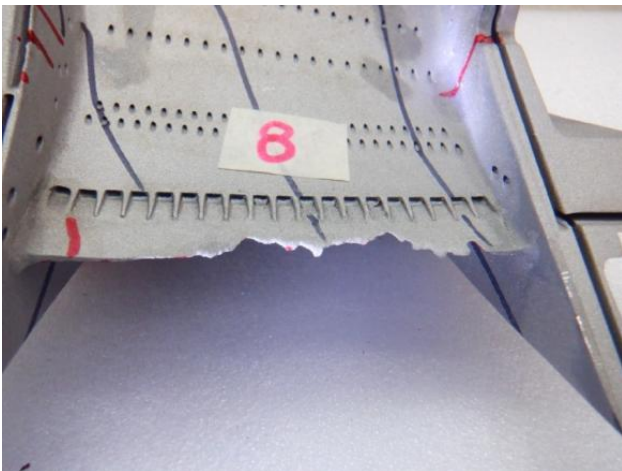
Fig.8 Received as heavy damage condition



Fig.9 Received as heavy damage condition



Fig.10 Received as heavy damage condition



INCOMING INSPECTION REPORT

Fig.11 Extensive crack and heavy corrosion on trailing edge

Fig.12 Extensive crack and heavy corrosion on trailing edge

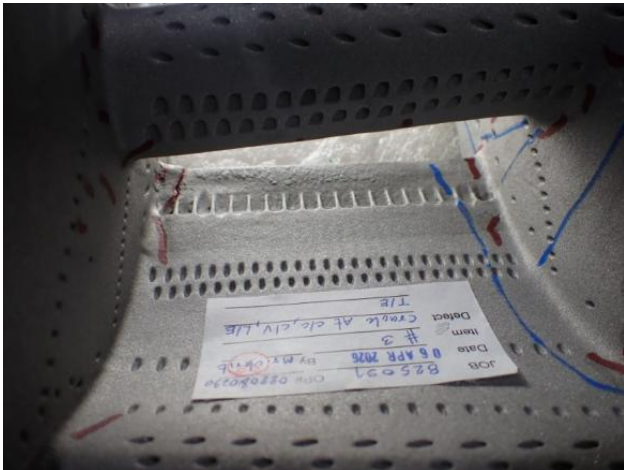


Fig.13 Extensive crack and heavy corrosion on trailing edge

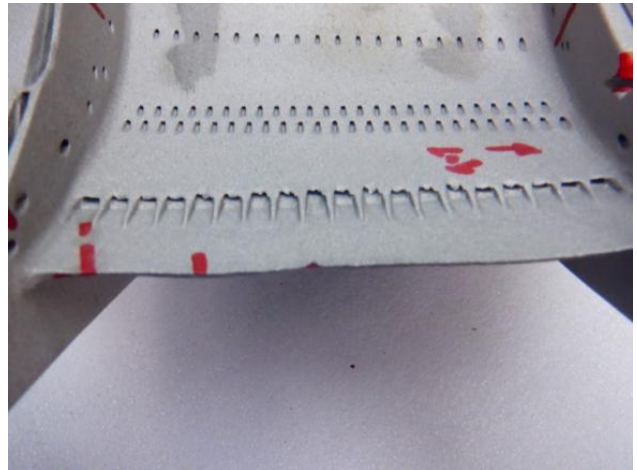


Fig.14 Heavy corrosion on concave airfoil and trailing edge

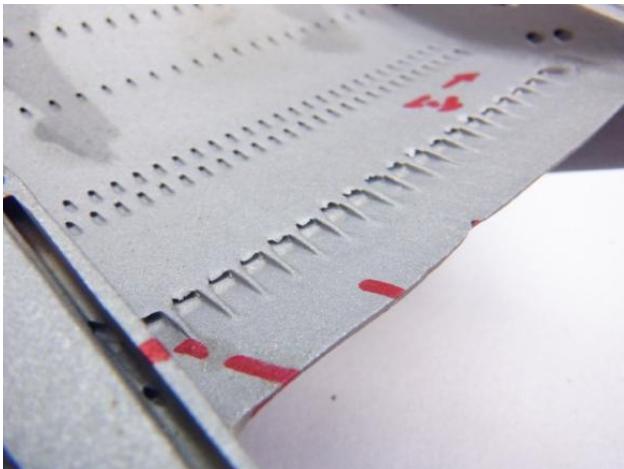


Fig.15 Heavy corrosion on concave airfoil and trailing edge

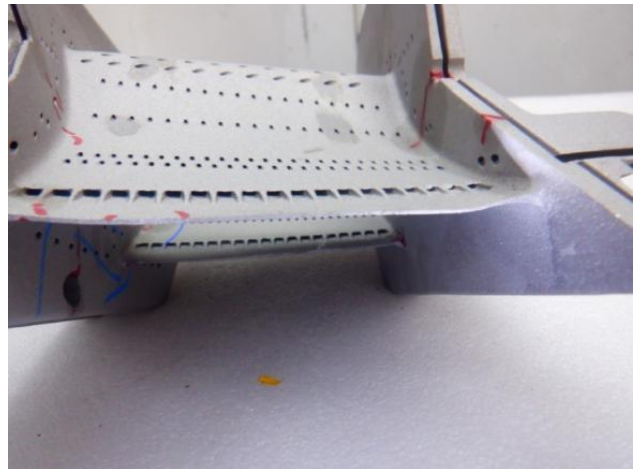


Fig.16 Critical bowing and thin wall on trailing edge



Fig.17 Heavy corrosion on outer shroud wall

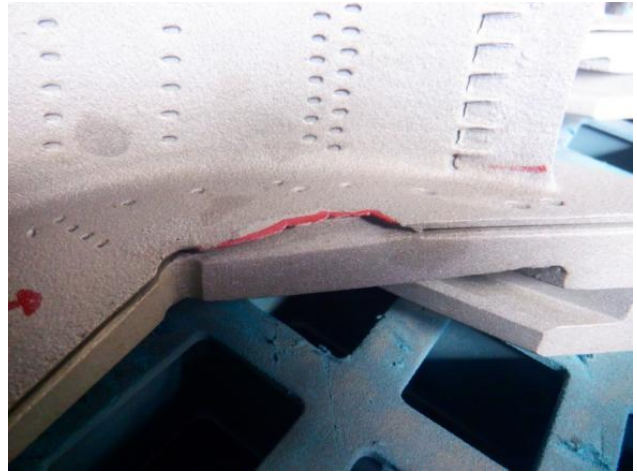


Fig.18 Heavy corrosion on outer shroud wall



Fig.19 As received condition of Impingement Cover plates



Fig.20 As received condition of Impingement Cover plates



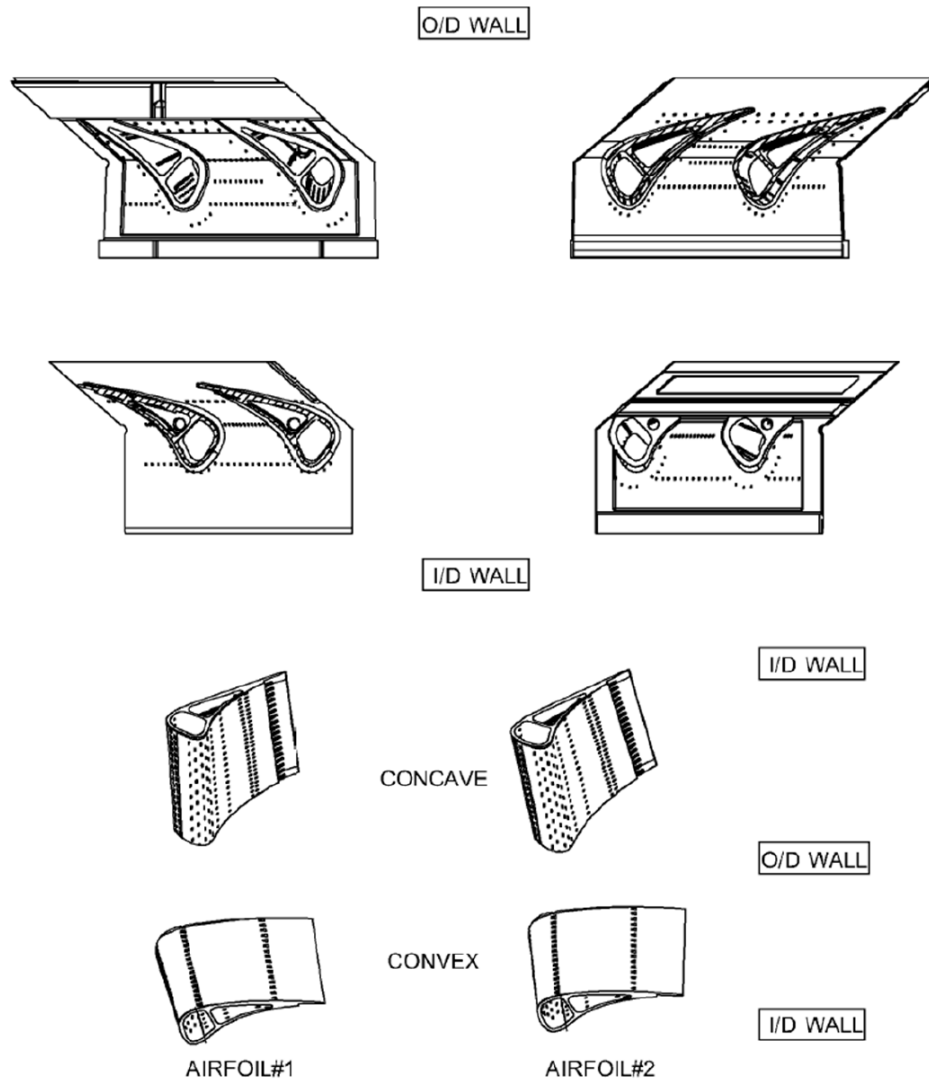
Fig.21 As received condition of core plugs



Fig.22 As received condition of core plugs

11. COMPONENT INSPECTION ZONES

The following reference drawing shows the nozzle segment inspection zones (O/D wall, I/D wall, concave and convex airfoil surfaces) used for defect recording during incoming inspection.

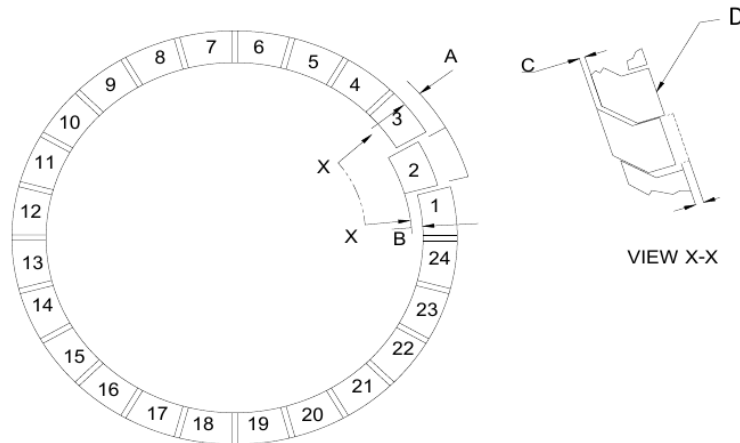


12. DIMENSION INSPECTION

12.1 ALIGNMENT CHECK

Segment numbering and measurement positions A, B (horizontal) and C, D (vertical) are shown below. All values in mm.

ALIGNMENT CHECK



SEGMENT No.	A (Horiz.)	B (Horiz.)	C (Vert.)	D (Vert.)
1-2	0.27	0.55	1.04	0.84
2-3	0.17	0.46	0.54	0.98
3-4	0.48	0.17	0.85	0.97
4-5	0.29	0.47	0.8	1.06
5-6	0.48	0.42	1.01	0.75
6-7	0.19	0.33	0.64	1.01
7-8	0.39	0.28	0.92	0.97
8-9	0.29	0.56	0.7	0.79
9-10	0.49	0.33	1.01	1.03
10-11	0.01	0.4	0.7	0.75
11-12	0.22	0.29	0.77	0.67
12-13	0.69	0.78	1.1	1.15
13-14	0.27	0.24	0.91	0.72
14-15	0.34	0.18	0.67	0.7
15-16	0.4	0.11	1.14	0.76
16-17	0.44	0.36	0.93	1.13
17-18	0.45	0.12	0.98	0.93
18-19	0.4	0.36	0.73	1.08
19-20	0.31	0.46	0.85	0.71

INCOMING INSPECTION REPORT

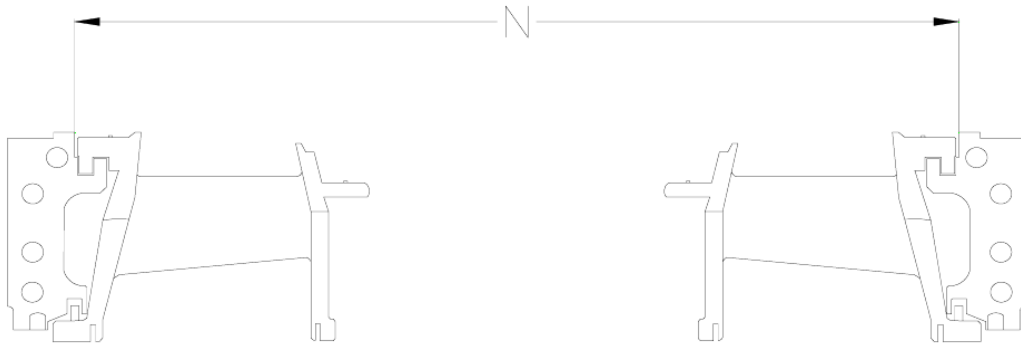


20-21	0.2	0.41	1.04	0.93
21-22	0.49	0.28	0.66	0.98
22-23	0.35	0.35	0.93	0.82
23-24	0.39	0.11	0.48	0.64
24-1	0.88	0.71	0.93	0.78

*Note: Alignment step deviations are recorded against nominal (zero) datum as the incoming baseline.
Straightening and dimensional requalification to final fits and clearances form part of the Heavy Repair scope;
final acceptance is verified at post-repair dimensional inspection.*

12.2 ROUNDNESS CHECK

ROUNDNESS CHECK



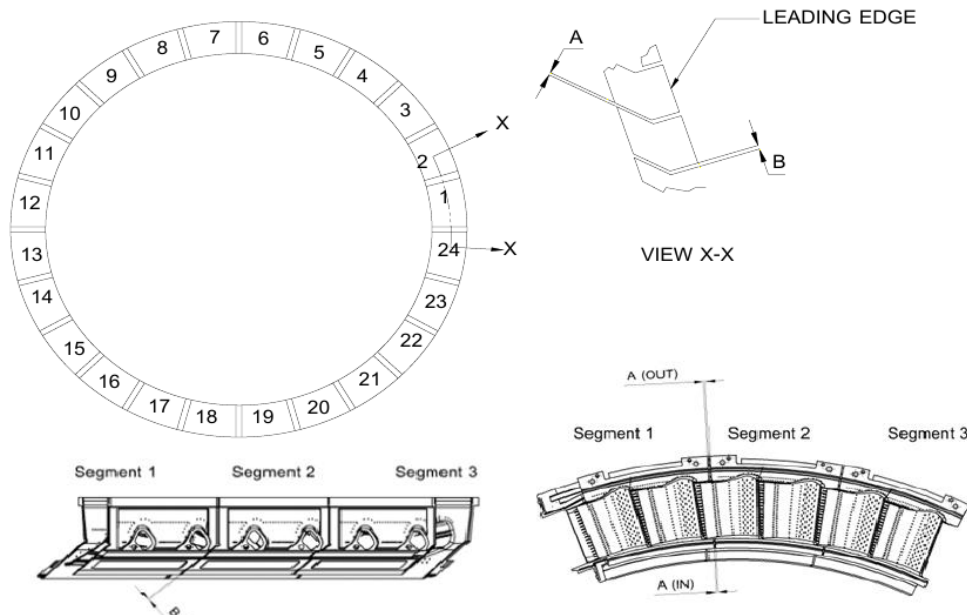
No.	A-A	B-B	C-C	D-D	Roundness	Result
1	1732.7	1733.42	1733.5	1732.95	0.8	ACCEPT

Unit: mm

12.3 GAP MEASUREMENT CHECK

Gap measurements at I/D and O/D walls, positions A and B. All values in mm.

GAP MEASUREMENT CHECK



SEGMENT NO.	I/D Wall A	I/D Wall B	O/D Wall A	O/D Wall B
1-2	2.98	4.28	2.83	3.26
2-3	3.53	3.78	3	3.73
3-4	3.22	4.08	3.07	5.49
4-5	3.66	4.47	3.48	4.8
5-6	3.38	3.66	2.59	4.43
6-7	3.55	3.76	3.73	5.12
7-8	3.45	3.95	2.63	4.24
8-9	3.14	3.65	2.82	5.91
9-10	3.61	3.55	3.14	3.83
10-11	3.97	4.07	2.47	3.41
11-12	4.08	4.14	2.83	5.95
12-13	4.16	5.22	2.77	6.43
13-14	3	3.6	2.47	4.41
14-15	3.87	4.15	3.18	4.45
15-16	2.58	4.1	2.33	5.53
16-17	3.59	4.3	3.24	4.57
17-18	3.01	3.71	2.54	4.1

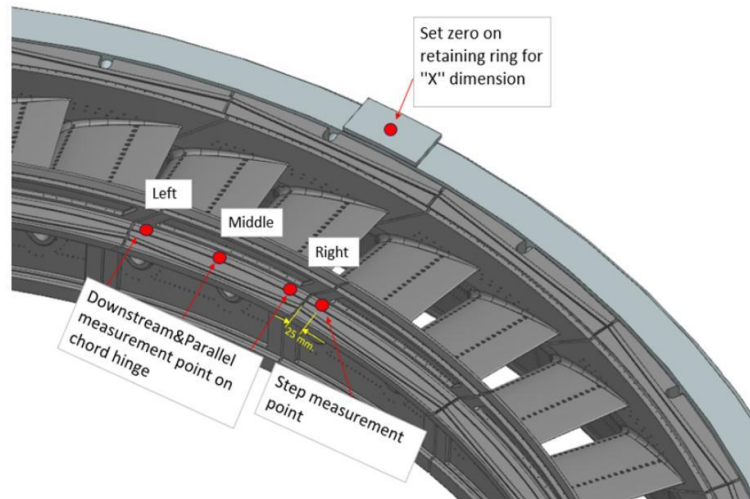
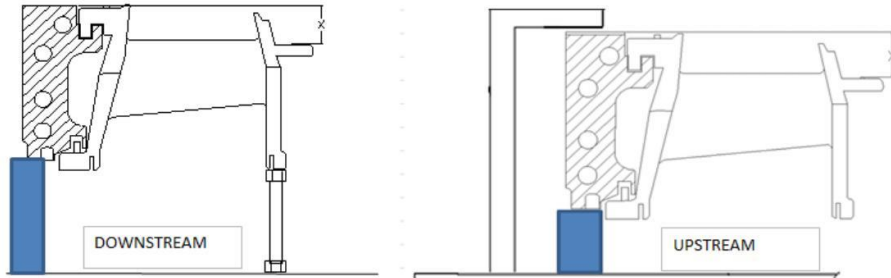
INCOMING INSPECTION REPORT

18-19	3.58	4.58	3.2	4.72
19-20	3.45	4.24	2.61	3.92
20-21	3.63	4.34	3.04	3.07
21-22	3.39	4.04	3.65	3.6
22-23	3.66	3.65	3.52	3.7
23-24	3.28	3.88	2.32	4.64
24-1	3.87	4.13	3.82	5.19

12.4 DROP CHECK (DOWNSTREAM DEFLECTION)

Measurement positions on the chord hinge (Left, Middle, Right) with zero set on the retaining ring for the X dimension. All values in mm.

DROP CHECK



INCOMING INSPECTION REPORT

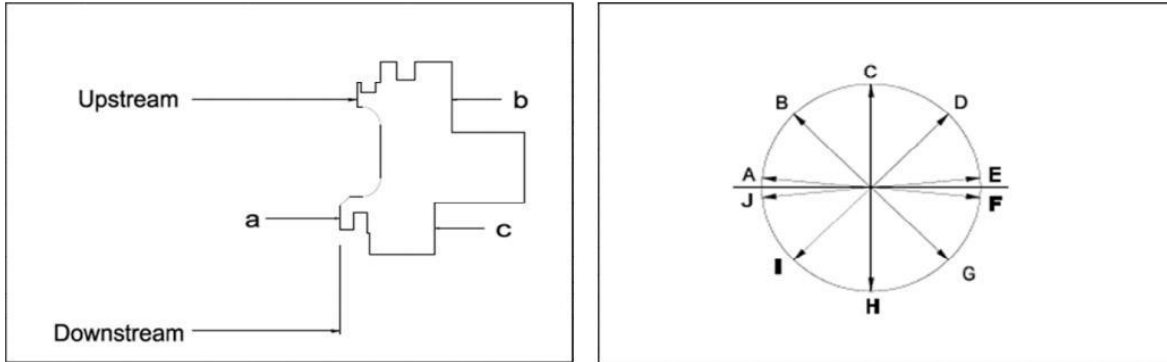


Seg	X'Dn L	X'Dn M	X'Dn R	Paral.	Step	X'Up L	X'Up M	X'Up R	Paral.	Step	Flex L	Flex M	Flex R
1	29.58	29.54	29.47	-0.11	0.19	30.73	30.13	30.46	-0.27	-0.28	1.15	0.59	0.99
2	29.28	29.47	29.23	-0.05	-0.21	30.74	30.67	30.57	-0.17	-0.06	1.46	1.2	1.34
3	29.44	29.42	29.14	-0.3	-0.4	30.63	30.46	30.32	-0.31	-0.58	1.19	1.04	1.18
4	29.54	29.57	28.91	-0.63	-0.94	30.9	30.38	30.8	-0.1	0.02	1.36	0.81	1.89
5	29.85	29.44	29.13	-0.72	-0.13	30.78	31.02	30.88	0.1	0.48	0.93	1.58	1.75
6	29.26	29.23	28.98	-0.28	-0.12	30.4	30.6	30.79	0.39	0.22	1.14	1.37	1.81
7	29.1	29.22	29.22	0.12	-0.21	30.57	30.75	30.72	0.15	-0.01	1.47	1.53	1.5
8	29.43	29.72	29.63	0.2	0.09	30.73	30.85	30.46	-0.27	-0.27	1.3	1.13	0.83
9	29.54	29.26	28.9	-0.64	-0.37	30.73	30.91	30.92	0.19	0.38	1.19	1.65	2.02
10	29.27	29.43	29.41	0.14	0.58	30.54	30.68	30.6	0.06	0.15	1.27	1.25	1.19
11	28.83	28.87	28.42	-0.41	-1.21	30.45	30.53	30.47	0.02	-0.07	1.62	1.66	2.05
12	29.63	29.47	29.12	-0.51	-0.63	30.54	30.62	30.72	0.18	0.16	0.91	1.15	1.6
13	29.75	29.65	29.42	-0.33	0.08	30.56	30.44	30.66	0.1	0.05	0.81	0.79	1.24
14	29.34	29.34	29.19	-0.15	-0.72	30.61	31.24	30.97	0.36	0.13	1.27	1.9	1.78
15	29.91	29.86	29.44	-0.47	0.76	30.84	30.5	31	0.16	0.7	0.93	0.64	1.56
16	28.68	28.43	28.44	-0.24	-1.16	30.3	30.24	30.37	0.07	-0.01	1.62	1.81	1.93
17	29.6	29.64	29.52	-0.08	0.45	30.38	30.53	30.38	0	-0.4	0.78	0.89	0.86
18	29.07	29.34	29.29	0.22	-0.48	30.78	30.88	30.28	-0.5	-0.28	1.71	1.54	0.99
19	29.77	29.49	29.15	-0.62	-0.45	30.56	30.53	30.45	-0.11	-0.23	0.79	1.04	1.3
20	29.6	29.55	29.35	-0.25	0.04	30.68	30.46	30.37	-0.31	-0.51	1.08	0.91	1.02
21	29.31	29.29	29.08	-0.23	-0.87	30.88	30.7	30.26	-0.62	-0.68	1.57	1.41	1.18
22	29.95	29.76	29.25	-0.7	-0.41	30.94	30.64	30.55	-0.39	0.04	0.99	0.88	1.3
23	29.66	29.88	29.65	-0.01	-0.18	30.51	30.37	30.49	-0.02	-0.09	0.85	0.49	0.84
24	29.83	29.5	29.41	-0.42	-0.17	30.58	30.53	30.43	-0.15	-0.3	0.75	1.03	1.02

Note: Drop check deflection and parallelism values are recorded against nominal (zero) datum as the incoming baseline; final acceptance is verified at post-repair dimensional requalification.

12.5 RETAINING RING ROUNDNESS

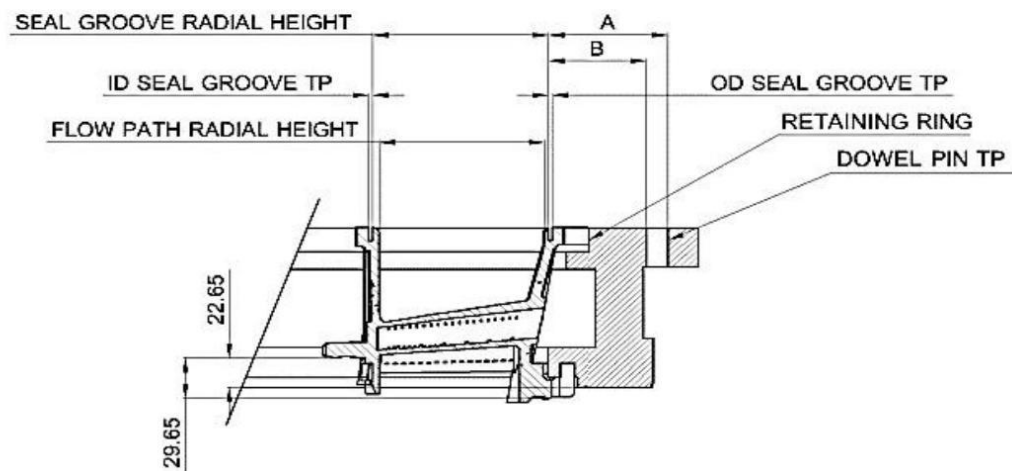
RETAINING RING ROUNDNESS



(Unit: mm)	A-F	B-G	C-H	D-I	E-J	Max-min
A-Upstream	1715.19	1716.01	1716.32	1715.36	1715.11	1.21
A-Downstream	1687.5	1688.24	1688.38	1687.79	1687.46	0.92

12.6 RADIAL HEIGHTS

RADIAL HEIGHTS



Item	Dowel OD to Outer seal groove (A)	Dowel ID to Outer wall flow path (B)
1	86.48	70.58
2	87.78	71.74
3	86.57	70.72
4	87.06	71.56
5	86.6	70.69
6	87.14	71.05

INCOMING INSPECTION REPORT



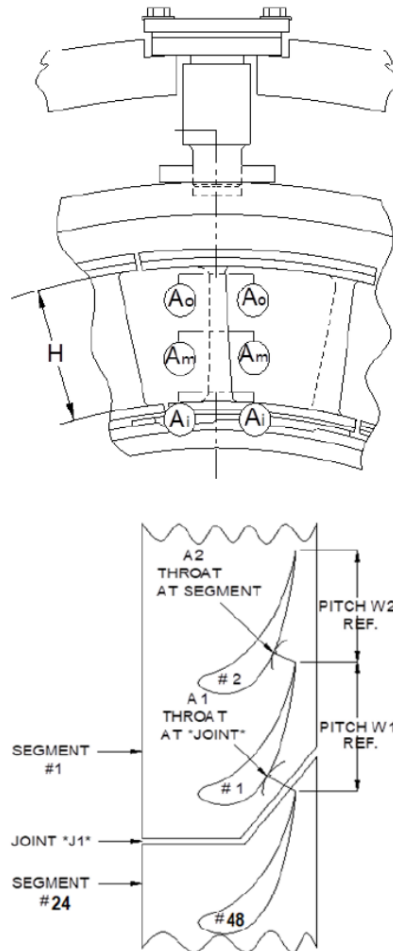
7	86.91	71.17
8	87.04	71.3
9	86.39	70.66
10	87.24	71.59
11	86.76	70.82
12	87.13	71.85

Unit: mm

12.7 HARMONIC ANALYSIS

Throat dimensions, pitch, and gas path areas were measured at all 48 throat positions (24 joints and 24 segments). Summary results:

HARMONIC



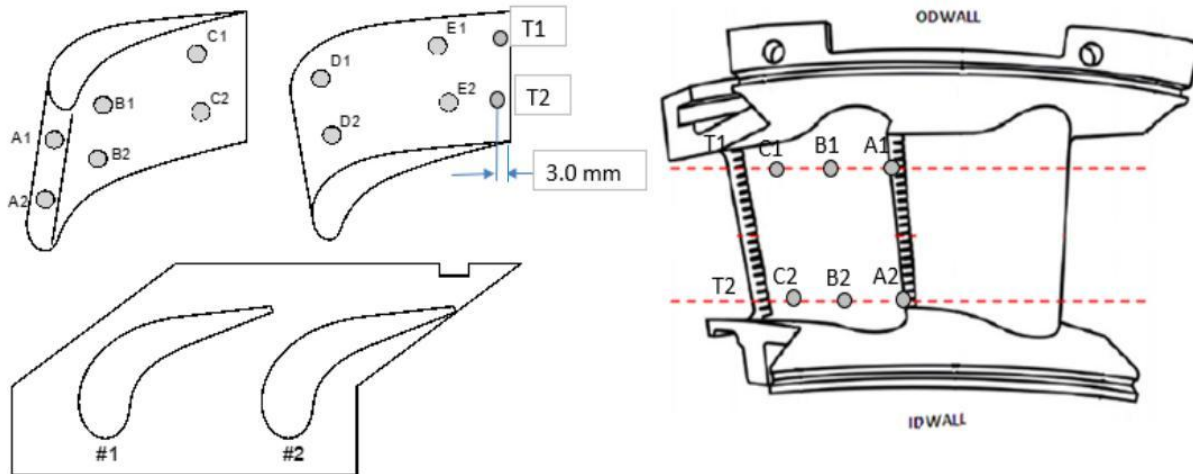
Parameter	Result
Total Joint Area	67,483.04 mm ² (104.599 in ²)
Total Segment Area	64,641.03 mm ² (100.194 in ²)
Total Nozzle Area	132,124.07 mm ² (204.793 in ²)
% Area Deviation	0.33%
Individual throat deviation	All within plus or minus 10% acceptance range

The complete 48 position harmonic data set (throat dimensions AO, AM, AI, H at centre, pitch WM and WO, gas path area, and harmonic values with percentage deviations) is retained in the UNEW inspection record for Job Order 825091 and is available on request.

12.8 WALL THICKNESS CHECK

Ultrasonic wall thickness measurement positions A1 to E2 and trailing edge positions T1 and T2 (minimum limit 2.03 mm at T1 and T2). All values in mm.

WALL THICKNESS CHECK



Airfoil # 1:

Seg	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	T1	T2	Result
1	2.78	2.83	2.49	2.64	2.31	2.27	3.73	3.18	2.95	2.87	1.18	1.21	Rej
2	2.68	2.97	2.52	2.81	2.27	2.22	3.82	3.68	3.6	2.96	1.99	2.05	Rej
3	2.87	2.82	2.69	2.78	2.41	2.3	3.16	2.68	2.79	2.36	1.36	1.68	Rej
4	3.05	3.07	2.55	2.68	2.45	2.92	3.18	3.11	3.44	3.17	1.9	2.26	Rej
5	2.88	3.11	2.71	3.15	2.3	2.48	3.36	3.51	3.51	3.44	1.25	1.26	Rej
6	3.03	3.39	3.16	3.23	3.18	3.45	3.2	3.46	3.69	3.52	1.75	1.9	Rej
7	3.05	3.24	2.46	2.94	2.36	2.7	3.58	2.75	2.95	2.85	1.29	1.53	Rej
8	3.02	3.76	2.62	2.98	2.24	2.46	3.55	3.02	3.39	3.13	1.8	1.96	Rej
9	3.03	3.48	2.6	2.89	2.65	2.94	3.53	3.18	3.54	3.21	1.37	1.38	Rej
10	2.96	3.39	2.48	2.73	2.42	2.47	3.29	3.52	3.45	3.43	1.52	1.6	Rej
11	3.06	3.6	2.78	2.96	2.27	2.46	3.95	3.55	3.03	3.12	1.73	2.1	Rej
12	2.95	3.46	2.38	2.69	2.61	2.42	3.07	3.11	3.47	3.25	1.53	1.64	Rej
13	3.03	3.55	2.28	2.48	2.68	2.54	3.29	2.86	3.7	3.23	1.65	1.61	Rej
14	3.02	3.45	2.57	2.68	2.56	2.3	3.21	3.16	3.35	3.29	1.27	1.5	Rej
15	2.96	2.93	2.53	2.79	2.4	2.48	3.55	3.26	2.8	3.11	1.56	1.73	Rej
16	2.97	3.22	2.42	2.56	2.31	2.48	3.33	2.94	3.45	2.78	1.38	1.56	Rej
17	3.04	3.13	2.56	2.42	2.24	2.35	3.46	3.32	3.44	3.23	1.25	1.26	Rej
18	2.95	3.24	2.32	2.61	2.4	2.82	3.18	2.96	2.95	2.8	1.5	1.6	Rej
19	2.82	3.23	2.45	2.88	2.62	2.89	3.29	3.16	2.95	2.97	1.28	1.45	Rej
20	2.75	3.22	2.53	2.82	2.54	2.78	3.55	3.22	3.44	3.42	1.44	1.53	Rej
21	3.03	3.34	2.62	2.8	2.61	2.77	3.33	2.86	3.55	2.93	1.29	1.62	Rej

INCOMING INSPECTION REPORT



22	2.8	3.04	2.66	3.07	2.44	2.55	3.55	3.33	2.98	2.9	1.39	1.45	Rej
23	2.9	2.92	2.46	2.77	2.43	2.66	3.64	3.42	3.32	3.11	1.52	1.58	Rej
24	2.97	3.06	2.41	2.64	2.55	2.88	3.61	3.11	3.32	3.37	1.28	1.25	Rej

Airfoil # 2:

Seg	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	T1	T2	Result
1	2.84	2.86	2.44	2.63	2.38	2.49	3.74	3.22	2.85	2.92	1.5	1.22	Rej
2	3.02	3.11	2.98	2.95	2.56	2.64	3.51	3.33	3.4	3.35	1.71	2.06	Rej
3	2.86	3.05	2.58	2.66	2.29	2.28	3.04	3.31	2.77	3.06	2.05	1.81	Rej
4	2.96	2.98	3.08	3.24	2.45	2.88	3.41	3.57	3.43	3.42	1.87	1.93	Rej
5	2.91	3.04	2.6	2.48	2.48	2.76	3.37	3.3	3.11	3.09	1.63	1.6	Rej
6	3.02	3.45	2.91	3.2	3.01	3.11	3.57	3.42	4.15	3.93	1.94	1.93	Rej
7	2.64	3.23	2.5	2.94	2.59	2.97	3.5	2.83	3.14	3.23	1.74	1.68	Rej
8	3.01	3.62	2.36	2.78	2.47	3.12	3.48	3.12	3.76	3.8	Missin g	Missin g	Rej
9	2.93	3.43	2.57	2.97	2.55	3.14	3.75	3.16	3.32	3.12	1.3	1.43	Rej
10	2.98	3.41	2.81	3.17	2.35	2.6	3.43	3.03	3.44	3.08	1.86	1.88	Rej
11	2.94	3.15	2.63	2.68	2.27	2.51	3.32	3.42	3.55	3.4	1.93	1.79	Rej
12	2.89	3.04	2.64	2.68	2.26	2.56	3.02	3.05	3.57	3.49	1.61	1.59	Rej
13	3.02	3.06	2.44	2.53	2.57	2.63	3.57	2.85	3.52	3.44	1.6	1.36	Rej
14	3.01	3.47	2.68	2.48	2.3	2.5	3.21	3.04	3.42	3.38	1.4	1.18	Rej
15	2.86	2.94	2.51	2.78	2.27	2.39	3.01	2.86	3.07	3.36	1.23	1.35	Rej
16	2.98	3.04	2.47	2.61	2.55	2.64	3.38	3.45	3.05	2.82	1.68	1.7	Rej
17	3.05	3.11	2.24	2.48	2.3	2.55	3.29	2.97	3.54	3.3	1.56	1.68	Rej
18	2.75	3.05	2.65	2.98	2.53	3.18	3.43	3.15	3.34	3.35	1.52	1.41	Rej
19	3.03	3.12	2.6	2.87	2.56	3	3.35	3.34	3.31	3.45	1.5	1.56	Rej
20	2.76	3.12	2.75	3.06	2.52	3.04	3.07	2.86	3.31	3.42	1.41	1.52	Rej
21	3.06	3.4	2.72	3.03	2.28	2.43	3.27	2.95	3.22	3.38	1.21	1.12	Rej
22	2.78	3.01	2.73	3.02	2.68	2.92	3.39	3.12	3.32	3.19	1.78	1.75	Rej
23	2.95	3.13	2.63	3.03	2.87	3.02	3.64	3.42	3.41	3.59	1.52	1.41	Rej
24	2.91	3.14	2.74	3.14	2.57	2.7	3.44	3.06	3.1	3.08	1.53	1.38	Rej

Note: Based on incoming wall thickness dimensional inspection, positions T1 and T2 are non-conforming against the 2.03 mm minimum limit on all 24 segments: 89 of 94 measurable readings are below the limit and 2 positions are unmeasurable due to through-wall material loss (Item 8). This requires PSP application for trailing edge wall thickness restoration on all 48 airfoil trailing edge positions.

13. PER-SEGMENT DISPOSITION SUMMARY

Per-segment inspection dispositions are summarized below. B = Blend repair. TPR = Transient Phase Restoration. REJ = Dimension unacceptable, repair required.

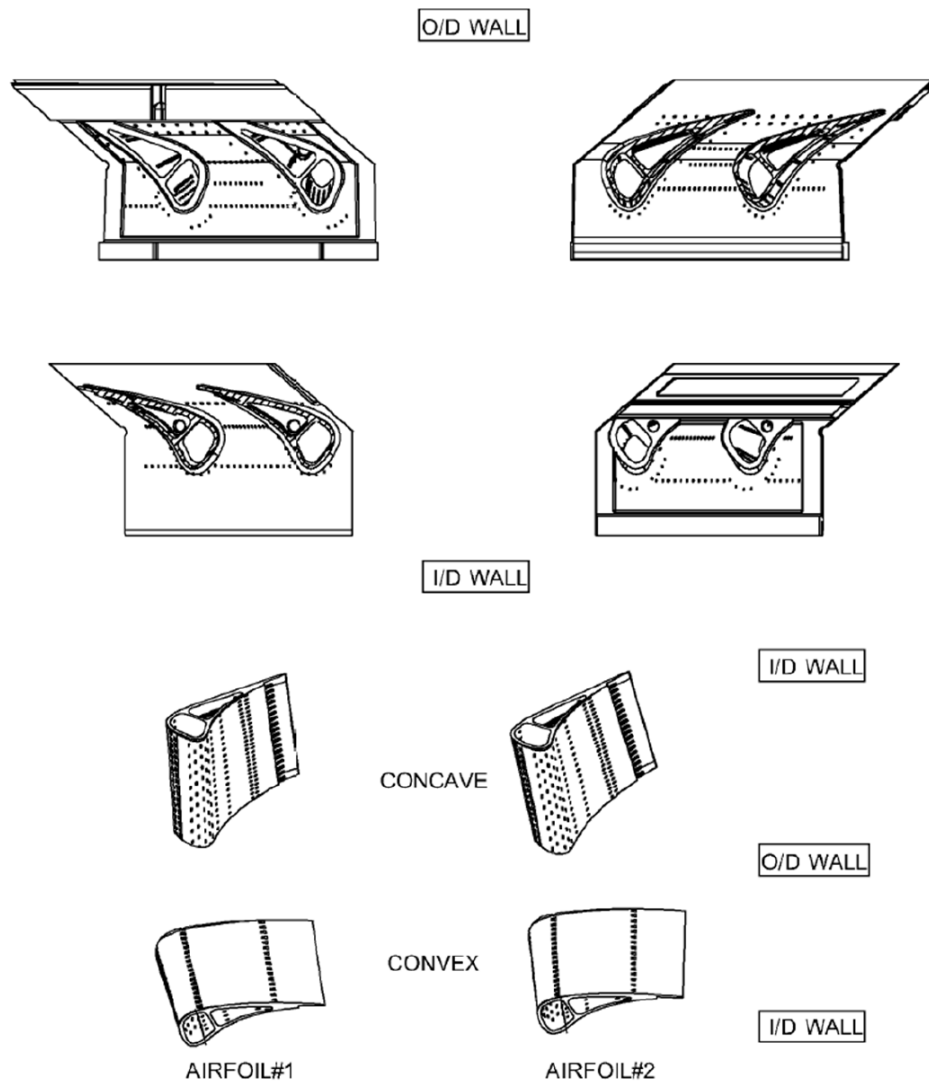
Item	Serial Number	Airfoil Cracking	Shroud Cracking	Corrosion	T/E Wall Thickness
1	A1FC 04959	TPR	TPR	B	REJ
2	A1FC 04965	TPR	TPR	B	REJ
3	A1FC 04999	TPR	TPR	B	REJ
4	A1FC 04981	TPR	TPR	B	REJ
5	A1FC 04978	TPR	TPR	B	REJ
6	A1FC 04958	TPR	TPR	B	REJ
7	A1FC 04964	TPR	TPR	B	REJ
8	A1FC 04955	TPR	TPR	B	REJ
9	A1FC 04963	TPR	TPR	B	REJ
10	A1FC 05000	TPR	TPR	B	REJ
11	A1FC 04957	TPR	TPR	B	REJ
12	A1FC 05002	TPR	TPR	B	REJ
13	A1FC 04962	TPR	TPR	B	REJ
14	A1FC 05007	TPR	TPR	B	REJ
15	A1FC 05004	TPR	TPR	B	REJ
16	A1FC 04960	TPR	TPR	B	REJ
17	A1FC 04956	TPR	TPR	B	REJ
18	A1FC 05003	TPR	TPR	B	REJ
19	A1FC 04945	TPR	TPR	B	REJ
20	A1FC 04998	TPR	TPR	B	REJ
21	A1FC 05006	TPR	TPR	B	REJ
22	A1FC 05001	TPR	TPR	B	REJ
23	A1FC 04996	TPR	TPR	B	REJ
24	A1FC 04961	TPR	TPR	B	REJ

Exceptions and non-typical findings: Item 8 (A1FC 04955), through-wall missing material 8x100 mm at the trailing edge. Item 19 (A1FC 04945), 50 mm crack at the concave airfoil face. Items 1, 2, 4, 5, 6, 11, 14, 15, 17, missing material patches at the O/D wall requiring GTAW weld build-up.

14. DEFECT MAP RECORD

Defect locations recorded during incoming inspection are summarized below against the component inspection zone reference of Section 11. This record consolidates the incoming defect mapping for the complete set of 24 segments.

Component	MS6001FA 1st Stage Nozzle, 24 Segments (1 Complete Set)
Part Number (Casting)	129E9734 P002
Customer	Nghi Son Refinery & Petrochemical, LLC.
Customer P.O. No.	1003986864
UNEW Job Order No.	825091
Record Date	27 April 2026
Recorded By	UNEW Incoming Inspection; reviewed and approved by Paul McGuire, Engineering Manager



DEFECT LOCATION SUMMARY

Zone / Location	Defect / Condition	Size Range	Items Affected
Trailing edge, O/D wall side	Cracking	5 to 75 mm	Items 1 to 24
Trailing edge, I/D wall side	Cracking	5 to 25 mm	Items 1 to 24
Airfoil body (concave, convex, LE, T/E)	Multi-crack networks	15x40 to 30x120 mm ²	Items 1 to 24
I/D wall, non-gas path	Cracking	8 to 20 mm	Items 1 to 24
O/D wall, non-gas path	Cracking	8 to 15 mm	Items 1, 3, 22, 23
O/D wall	Missing material	5x30 to 8x50 mm	Items 1, 2, 4, 5, 6, 11, 14, 15, 17
Trailing edge	Through-wall missing material	8x100 mm	Item 8
Concave airfoil face	Crack	50 mm	Item 19
Concave airfoil, trailing edge, and outer shroud wall	Heavy oxidation and hot corrosion	Widespread	Items 1 to 24
I/D wall, non-gas path	Light to medium corrosion	Surface	Items 1 to 24
All gas path surfaces	Coating deterioration (TBC + MCrAlY)	Full gas path	Items 1 to 24
Trailing edge, airfoil	Bowing and permanent deformation	Per Section 12	Items 1 to 24

Metallurgical sectioning locations: coupons were removed at Item 13 (inner shroud, report UNEW-ME-825091-01), Item 11 (inner shroud, report UNEW-ME-825091-02), and Item 8 (trailing edge, report UNEW-ME-825091-03). Results are given in Section 9.

Defect sizes and item allocations above correspond to the disposition actions of Sections 5.1 and 13 and the dimensional records of Section 12.