

MemoReference No: X1384726-190;
Rev 0Name Phathutshedzo Nemakhavhani
Title / Designation Works Welding Engineer
Turbo Generation ServicesTo: Boikutso Hantise
Project manager

Copy to:

Date: 15/02/2022

Subject: Tutuka LPI & LP2 Rotor – Stage 4 Understrap Replacement.

*References: Memo RTD/MAT/18/245
NLC: WPS 0026 Rev 0
PWHT specification: NLC-Tenons-HT-0003
NLC: WPS 0045 Rev 0
PWHT specification: NLC-Tenons-HT-0004*

During inspection, linear indications are often observed on the stage 4 understraps of GEC LP1 & LP2 Rotors. The proposed repair process is to grind-off the top of the tenons, then cut the shroud, and remove the piece of shroud to access and replace the understrap.

After replacing the understrap, the tenons will be laser beam welded and Post Weld Heat Treated (PWHT), and then followed by fitting back the original shroud in its original position. Thus, the shroud will also be laser beam welded and PWHT treated back to the original position. The tenons will be pinned to mushroom the top surface to secure the shroud in position.

Therefore, the following is recommended to replace the understrap on stage 4 of GEC LP1 & LP2 Rotors.

1. Construct Laser welding tent (engineering to advice).
2. Acquire grinding consumables (see table 1).

	<u>Item required</u>	<u>Specification</u>	<u>Quantity</u>
<u>2.1</u>	Abrasive Stone Burrs	Flat Head Cylindrical: 6.5 mm diameter x 13 mm length	50

Tel: 011 629 4480
Fax: 086 604 0276
Cell: 072 822 6010E-mail: NemakhP@eskom.co.za

Page 1 of 4

		Total length: 44 mm Shank diameter: 3 mm	
<u>2.2</u>	Tungsten Rotary Burrs	Flat Head Cylindrical: 3 mm diameter Total length: 40 mm Shank diameter: 3 mm	50
<u>2.3</u>	Round Backing Pad for Sanding Disc	Shank: 6 mm diameter Total Length: 35 mm Disc: For 50 mm diameter sanding disc	2
<u>2.4</u>	Sanding Disc	Cotton Fabric that is Coated with Aluminium Oxide. Plastic thread on the back to fasten the disk to Mandrel. Used for sanding Steel. 50 mm Diameter. 60 Grit.	100
<u>2.5</u>	Abrasive Cutting Disc	115 x 22.2 mm x 1 mm.	10
<u>2.6</u>	Angle Head Pencil Grinder	90° Angle Head. Aluminium Body and Trigger Safety Catch. For grinding, polishing, burnishing, and deburring.	1
<u>2.7</u>	Electric Baby Grinder	Angle Grinder. Rated output power: 710W No-load Speed: 1200 rpm 115 mm Disc Diameter	1

3. Manufacture shroud templates, 10.5 mm and 12.0 mm thick gauges to measure the height of tenons and to aid with grinding of the tenons (2 off on each). Use Durehete material.
4. Manufacture shroud templates, 2 mm thick gauges to measure the shape of the tenons and aid with grinding of the tenons. (2 off). Use Durehete material.
5. Hold point for Engineering to mark-off the defective understraps and the cut line on the respective shrouds.
6. Grind-off the peened top section on the tenons (on five blades on each side of the defective understrap) on stage 4 blades.
***NB:** Only the joining packet blades adjacent to the affected understrap to be worked on in accordance to Engineering Instruction.*
7. Cut the shroud using 1 mm thick cutting disc, and remove the shroud and the defective understrap from the joining packet blades.
8. Perform NDT (MT) on the removed shrouds.
9. Perform NDT (PT) on the remaining stem of the tenons before laser beam welding (Flow spec: RTD/MAT/18/245).
10. Take hardness readings on the remaining stem of the tenons before welding.

Tel: 011 629 4480
 Fax: 086 604 0276
 Cell: 072 822 6010

Email: NemakhP@eskom.co.za

11. Prep and peen the tenons to form landing tabs around the remaining stem of the tenons for laser build-up purpose.
12. CSIR to Laser Beam Weld the tenons as per welding procedure NLC: WPS 0026 Rev 0.
13. Grind-flush the top of the tenons for NDT inspections (PT & UT).
 - a) **The height of the tenons securing both the shroud and the understrap must be ground to the height of 12.0 mm or just above 12.0 mm from the tip of the blade.**
 - b) **The height of the tenons securing only the shroud must be ground to the height of 10.5 mm or just above 10.5 mm from the tip of the blade.**
14. Perform NDT (PT & UT) after laser beam welding the tenons (Flow spec: RTD/MAT/18/245).
15. If defects are found, Laser weld repair any defects as per welding procedure NLC: WPS 0026 Rev 0
16. Perform Post Weld Heat Treatment on tenons in accordance with the PWHT specification: NLC-Tenons-HT-0003.
17. Take hardness readings on the remaining stem of the tenons after PWHT.
18. Dress the tenons back to the original profile working from the remaining part of the stem. Profile the tenons to fit the shroud. Use the *shroud template* and existing shroud to ensure the correct pitching, and also to secure the shroud onto the tenons.
19. Perform NDT (PT & UT) after PWHT of the tenons (Flow spec: RTD/MAT/18/245).
20. Mill the template understrap to fit onto the tenons.
21. Fit the template understrap onto the tenons.
22. If the template understrap fit onto the tenons, continue to mill the new understrap to fit. Care must be taken not to bend/ crack the understrap when fitting it onto the tenons.
23. Perform NDT (PT) on the understand.
24. Re-use the shroud. Laser beam weld the shroud cut-end to compensate for the material loss during cutting (*NLC: WPS 0045 Rev 0*).
25. Grind the ends of both shrouds and prep the cut-end for welding (to join the shroud together).
26. Perform NDT (PT) after weld prep on the tenons (Flow spec: RTD/MAT/18/245).
27. Fit and secure the shroud in position.
28. Fit the jig with copper backing, run-on and run-off tabs. Align shroud pieces and tack weld (*NLC: WPS 0045 Rev 0*).
29. Laser beam weld, joining the shroud pieces together. Welding procedure *NLC: WPS 0045 Rev 0*.
30. Clean and hand dress the welding on the shroud to the original profile.
31. Perform NDT (PT) after laser beam welding the shroud (Flow spec: RTD/MAT/18/245).

Tel: 011 629 4480
Fax: 086 604 0276
Cell: 072 822 6010

Email: NemakhP@eskom.co.za

32. If defects are found, Laser weld repair any defects as per welding procedure NLC: WPS 0026 Rev 0
33. Perform Post Weld Heat Treatment on the shroud in accordance with the PWHT specification:
NLC-Shroud-HT-0004.
34. Perform NDT (PT) after PWHT of the shroud. (*Flow Spec: RTD/MAT/18/245*).
35. Grind the top of the tenons to the final sizes before peening.
 - c) **The height of the tenons securing both the shroud and the understrap must be ground to the height of 12.0 mm from the tip of the blade.**
 - d) **The height of the tenons securing only the shroud must be ground to the height of 10.5 mm from the tip of the blade.**
36. Peen the tenons to form a mushroom and secure the shroud in position.
37. Perform NDT (PT) after peening the tenons (*Flow spec: RTD/MAT/18/245*).

Kind Regards,

Phathutshedzo Nemakhavhani

Tel: 011 629 4480
Fax: 086 604 0276
Cell: 072 822 6010

Email: NemakhP@eskom.co.za