Triveni
POWER TRANSMISSION LTD.

GAS TURBINE – GENERATOR GEARBOX (IPP INDIA – GUJARAT)

1 TECHNICAL DATA:

Power	54,000 kW
Type	Speed Reducer
Input/Output Speed	5133 / 3000 RPM
Ratio	1.711
Driving Equipment	Gas Turbine (Frame-6)
Driven Equipment	Alternator
Make	European
Year of Commissioning	1992–93

2 PREAMBLE / PROBLEM REPORTED

Repeated failures of the pinion shaft teeth were reported in Unit 3 of the gas turbine generator gearbox. The failures were consistently observed near the apex region of the pinion teeth, accompanied by an abnormal rise in pinion bearing temperature, indicating a systemic issue affecting gearbox reliability.

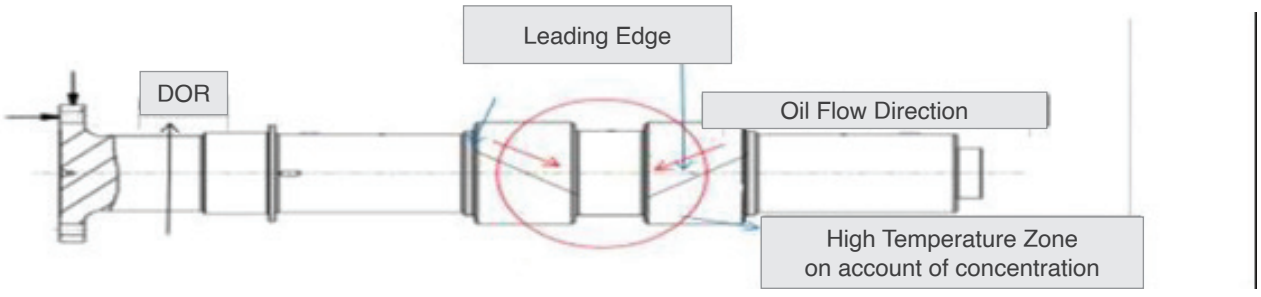
3 DIAGNOSTICS STEPS UNDERTAKEN / OBSERVATIONS MADE

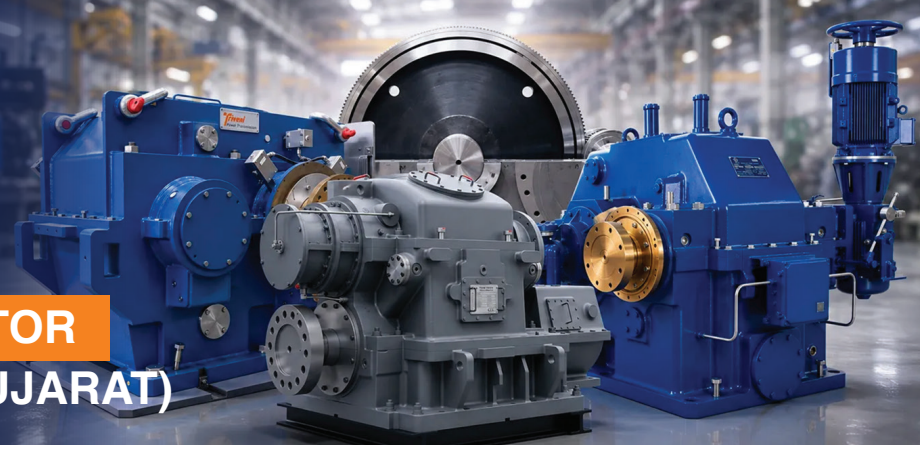
Structured technical evaluation was performed to assess failure patterns and operating behaviour:

- Multiple instances of identical tooth failures near the apex region of the pinion.
- No deficiencies observed in gear strength or service factor.
- All operating parameters, including vibration and load conditions, were within acceptable limits.
- Detailed study of lubrication behaviour indicated localized overheating across gear teeth.
- Significant temperature variation across the face width resulted in uneven thermal expansion, leading to localized loading.

4 ANALYSIS:

- The root cause was identified as improper heat dissipation across the gear teeth, driven by an unsuitable helix configuration
- The existing helix orientation caused heat concentration at the leading edge, resulting in thermal stress buildup.
- This led to localized overloading and recurring tooth failures in the pinion





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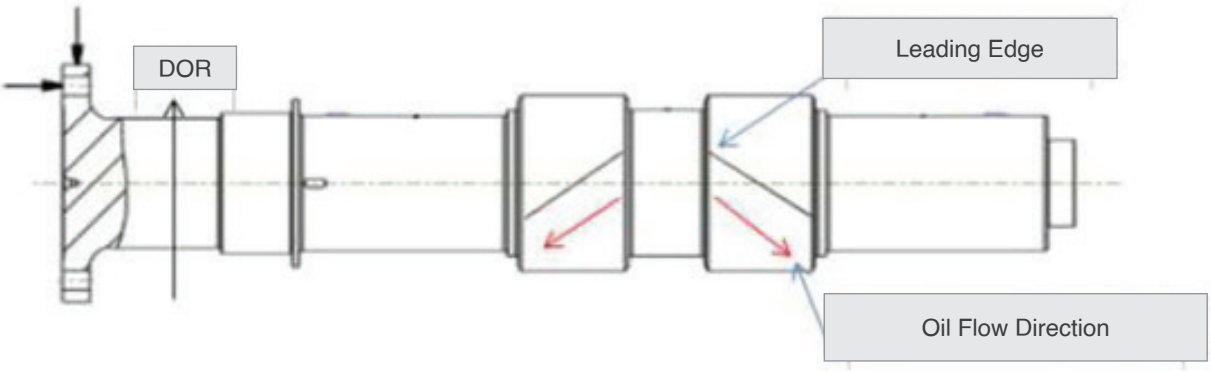
5 SOLUTION OFFERED / ACTION TAKEN:

Triveni implemented a comprehensive design intervention to address the root cause:

- Helix direction modified from diamond configuration to optimized “X-shape”, enabling uniform heat distribution across the tooth face
- Advanced gear parameter optimization, including tooth corrections and load distribution refinement using proprietary engineering tools
- Replacement of tilt pad bearings with pressure dam bearings to improve efficiency and operational stability
- Manufacturing and installation of new gear internals and bearing systems within the existing gearbox casing
- Successful validation through rated speed and 110% overspeed testing



6 CONCLUSION:

The gearbox was successfully re-engineered and recommissioned, delivering a reliable long-term solution.

The implemented solution ensured:

- Elimination of repetitive pinion tooth failures
- Uniform heat dissipation across gear teeth
- Stable gearbox operation with all parameters within permissible limits

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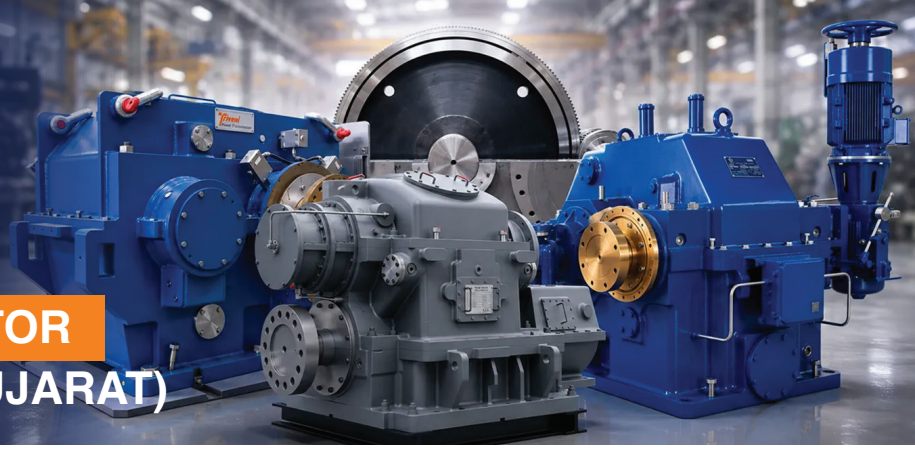

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7 OUTCOME:

The gearbox has been operating reliably since modification, with no recurrence of failures and improved overall performance.