



STEAM TURBINE GEARBOX (BIOMASS PLANT – SRI LANKA)

1 TECHNICAL DATA:

Power	2,500 KW
Type	Speed Reducer
Input / Output Speed	8120 / 1500 rpm
Ratio	1 : 5.41
Driving Equipment	Japanese Steam Turbine
Driven Equipment	Alternator
Make	Japanese
Year of Commissioning	2018

2 PREAMBLE / PROBLEM REPORTED

During commissioning, the gearbox exhibited high noise and vibration while synchronization, impacting operational stability and reliability.

The customer approached Triveni to diagnose the issue and implement a sustainable solution for stable and reliable operation.

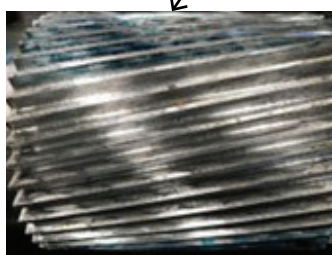
3 DIAGNOSTICS STEPS UNDERTAKEN / OBSERVATIONS MADE

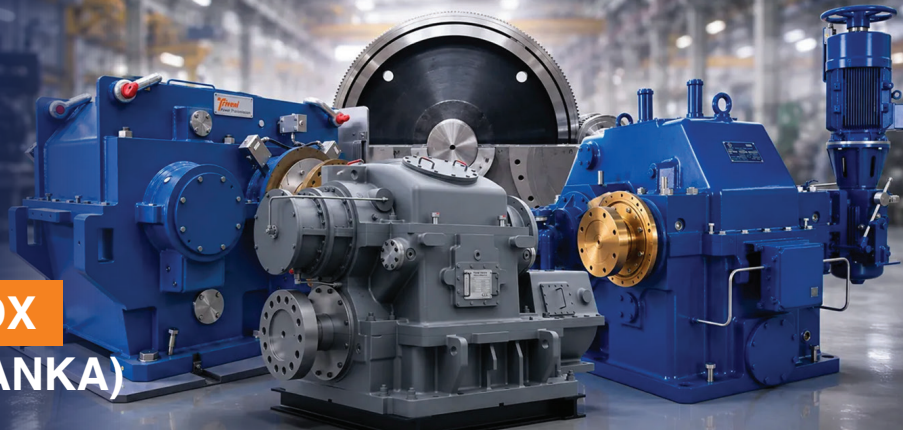
The assessment and vibration analysis revealed the following:

- Gear tooth wear observed on both pinion and gear wheel
- The turbine rotor overhang at the coupling end caused the pinion shaft to behave like an extension of the turbine shaft
- Under load, vibration levels increased significantly, reaching up to 24.6 mm/sec
- High gear mesh frequencies with sidebands indicated improper tooth contact under load conditions
- Dominant vibration observed at 1X turbine speed
- Uneven clearance in coupling bolts, contributing to imbalance and vibration



Tooth wear noticed both in pinion and gear tooth





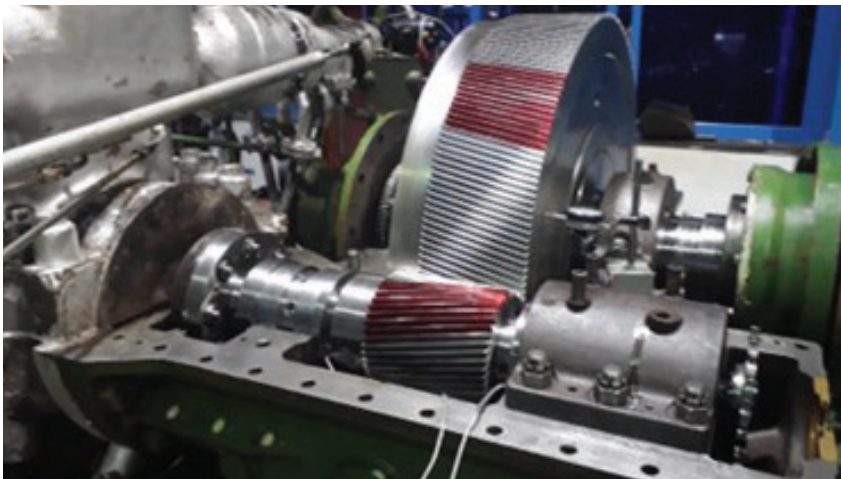
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4 ANALYSIS

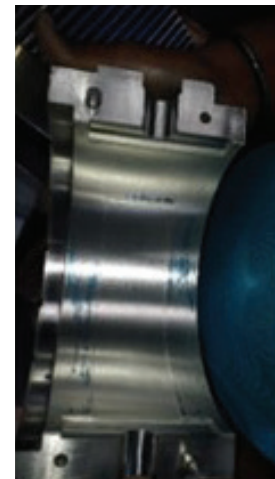
- The root cause was identified as misalignment and improper centering of the pinion shaft
- The extended shaft behaviour introduced torsional deflection under load, affecting gear meshing
- Improper coupling clearances further aggravated dynamic imbalance and vibration
- Combined effects led to poor contact pattern, increased noise, and excessive vibration levels

5 SOLUTION OFFERED / ACTION TAKEN

- Manufactured a new gear set with optimized helix and profile corrections to accommodate load-induced deflections
- Replaced conventional bearings with pressure dam bearings to improve performance under misalignment conditions
- Performed site reaming of coupling bolt holes to maintain controlled minimum clearance (0.05 mm), eliminating bolt-induced imbalance
- Executed pinion shaft face truing at the NDE side to ensure precise co-axial alignment with the turbine and gearbox axes
- Optimized gear mesh contact (~60% towards alternator side) to accommodate torsional effects during load operations and prevent localized loading
- Post-commissioning hard blue checks confirmed greater than 90% uniform gear contact

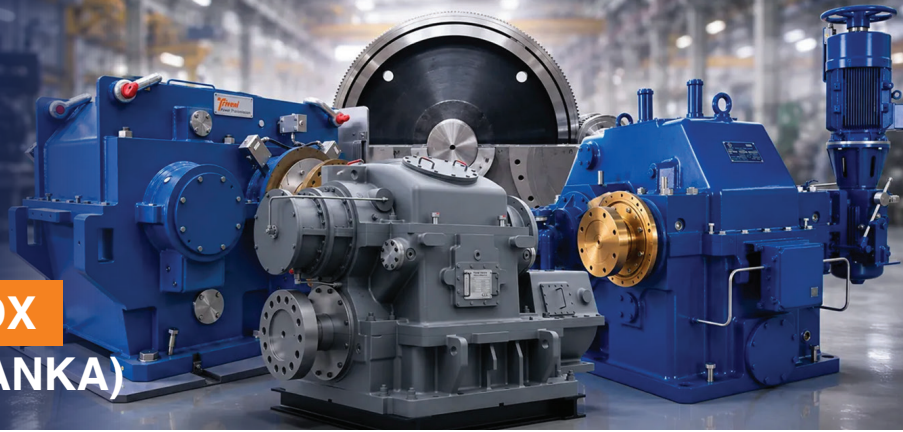


New Gear Internals



No Pressure Dam Bearings

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6 CONCLUSION

The gearbox was successfully refurbished and recommissioned, restoring stable and reliable operation.

The implemented solution ensured:

- Elimination of high noise and vibration during operation
- Accurate pinion alignment and improved gear mesh contact
- Enhanced system reliability through optimized bearing and coupling design
- Stable performance with all operating parameters within permissible limits

7 OUTCOME

The gearbox has been operating reliably since recommissioning, delivering consistent performance under load conditions. The complete solution was implemented within 16 weeks, ensuring minimal downtime.