



COMPRESSOR GEARBOX (FERTILIZER INDIA)

1 TECHNICAL DATA:

Power	6.7 MW
Type	Speed Increaser
Input/Output Speed	7324 / 10,844 RPM
Application	Compressor
Make	German
Year of Commissioning	1990

2 PREAMBLE / PROBLEM REPORTED

The gearbox experienced frequent and repetitive failures of low-speed shaft (LSS) bearings, occurring approximately every two months.

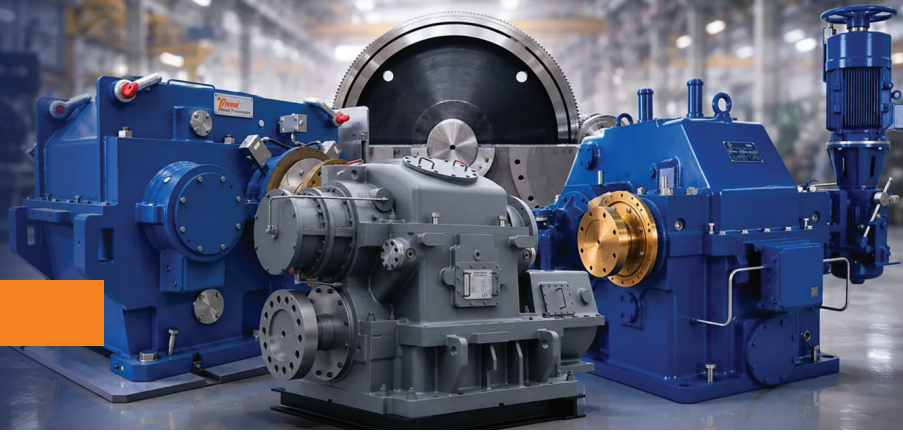
Additionally, repeated failures of the intermediate pinion drive end (DE) bearing, along with thrust clearance issues and gear pitting, significantly impacted equipment reliability and plant availability.

3 DIAGNOSTICS STEPS UNDERTAKEN / OBSERVATIONS MADE

A detailed inspection and technical evaluation revealed the following:

- Progressive increase in thrust clearance at the output shaft
- High casing vibration levels at the low-speed drive end bearing
- Misalignment between steam turbine, LP compressor, gearbox, and HP compressor shafts
- Increasing gap voltage readings from shaft vibration probes
- Uneven bearing clearance growth across the shaft length





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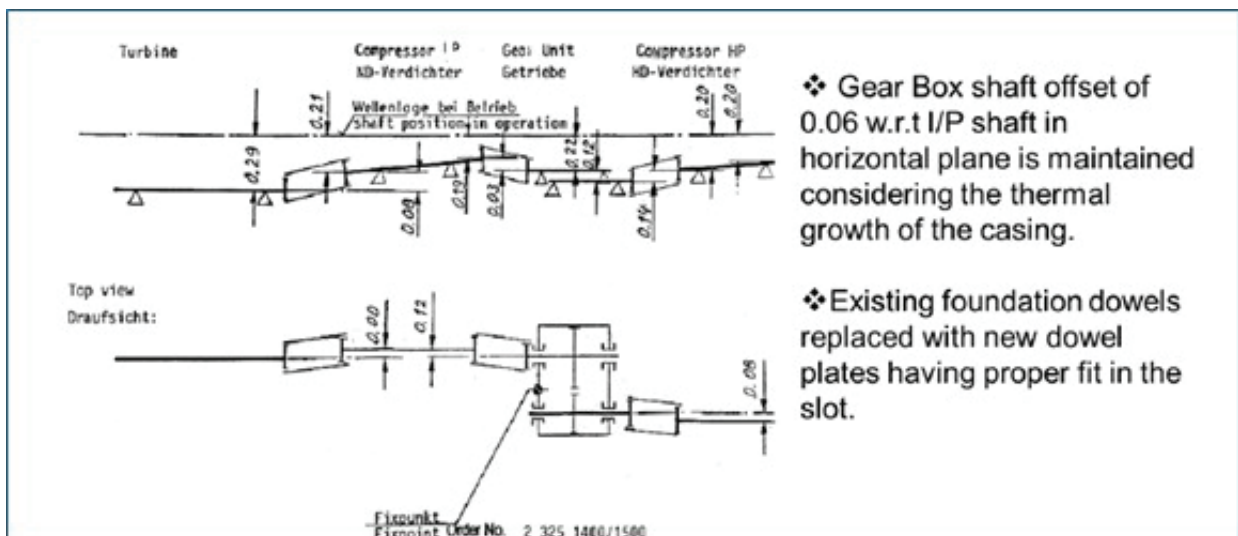
4 ANALYSIS:

- The primary root cause was identified as misalignment and level deviations, resulting in additional loads on the bearings
- Bearing loads exceeded permissible limits, leading to accelerated wear and frequent failures
- Correlation between casing vibration and probe data confirmed systematic bearing overload conditions
- Uneven bearing clearance altered dynamic gear tooth contact, causing localized overloading and subsequent gear pitting

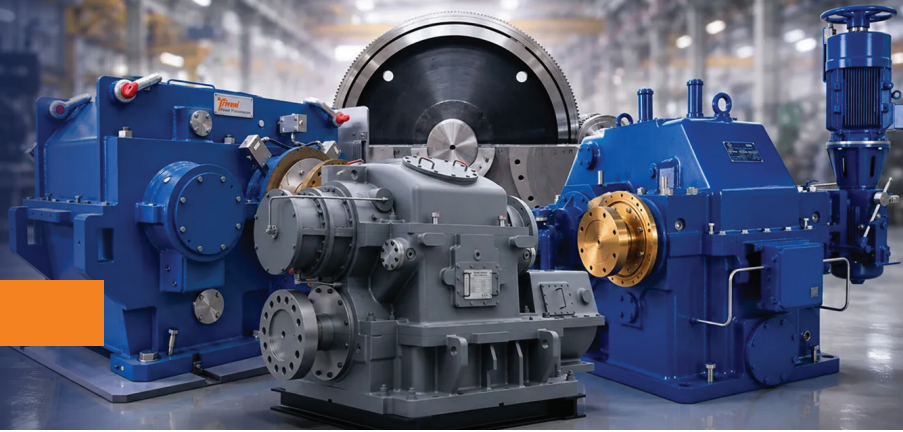
5 SOLUTION OFFERED / ACTION TAKEN:

Triveni implemented a comprehensive design and alignment optimization to address the root cause:

- Conducted detailed engineering analysis and load calculations
- Increased bearing bore diameter and width, reducing bearing specific load from 34 kg/cm² to 27 kg/cm²
- Introduced a controlled shaft offset (0.06 mm) relative to the input shaft to compensate for thermal growth
- Replaced foundation dowels with precision-fit dowel plates to ensure proper alignment retention
- Optimized alignment protocol:
- Maintained vertical offset
- Reduced horizontal offset by 50% to minimize growth-induced loads
- Maintained DBSE at axial mean position to ensure balanced load distribution during operation



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6 CONCLUSION:

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

The implemented solution ensured:

- Elimination of repetitive bearing failures
- Proper alignment and balanced load distribution across shafts
- Reduced bearing-specific load and improved component life
- Stable operation with all parameters within permissible limits

7 OUTCOME:

The gearbox has been operating reliably since recommissioning, with significantly improved performance and durability. The complete solution was delivered within 20 weeks, ensuring minimal operational disruption.