



CASE STUDY /

Engineering Simulation Enables Fast Development of a Reliable Gearbox — Elecon Engineering Company Limited

“Our association with Ansys has accelerated our knowledge and capabilities in gearbox design and enabled us to deliver an exceptional product for our clients.”

V.B.Senjaliya

Senior Manager – Design B / Elecon Engineering Company, Gear Division

Gear mechanisms transmit rotation and torque between axes in a machine. The gear wheel is a part of the machine that has intrigued many engineers because numerous technological problems arise in a complete cycle as the gear rotates and meshes with its counterpart. To achieve high load-carrying capacity, reduce the weight of gear drives and increase strength of the gearbox, engineers carry out gear-tooth stress analysis and perform tooth modifications to optimize gear drive design.

/ Company Description

Established in 1951, Elecon Engineering Co. Ltd, India, pioneered breakthrough innovations in the manufacturing of material handling equipment, industrial geared motors and reducers, mining equipment, casting processes, alternate energy, and more. Elecon is proud to be Asia's largest industrial gearbox manufacturer. The company has expertise in providing customized gearboxes for steel mills, high-speed turbines, sugar mills, windmills, marine vessels for the Coast Guard and the Indian Navy, plastic extrusion, satellites, and antenna drives for the Indian Space program.

/ Challenges

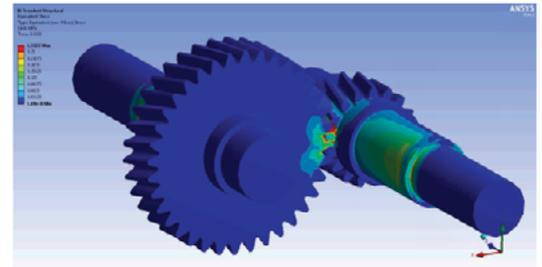
To develop a reliable product that meets market demand, gear tooth performance needs to be evaluated quickly, regardless of construction material and manufacturing processes. Performance parameters, such as tooth bending, surface distress and tooth deflection contribute to tooth gear failure.

/ Technology Used

Ansys® Mechanical™

/ Engineering Solutions

Gear geometry, and especially the involute profile of the tooth, is the most important element in gear design. Elecon engineers constructed a 3D model of the gear and pinion while maintaining the optimized profile of teeth. They applied local high mesh refinement at the contact region. The team calculated loads on the mating gears that act along the pressure line and applied the loads in Ansys Mechanical. Engineers then performed transient analysis to simulate the frictional motion of the gears.



Equivalent stresses at contact of pinion and gear in helical gear pair.



3D gear model.

/ Benefits

- Obtained accurate results along with extensive, customized reports of loads, stresses, deformation and transmission (gearbox) errors.
- Identified potential failure modes early in the product development cycle.
- Predicted gear misalignment and its source and minimized misalignment across the load range.
- Investigated the full scope of conditions to understand the effects of design parameters on product durability and performance. This avoided excessive prototype testing.
- Employed a virtual testing environment throughout design lifecycle.
- Quickly designed reliable gears to meet customer demands.

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