

## **Effects of case depth, side-face carburizing and helix angle on residual stress and bending fatigue strength of case-carburized helical gears**

### **Abstract**

This paper presents a study on effects of case depth, side-face carburizing and helix angle on the residual stress and the bending fatigue strength of case-carburized helical gears. The carbon content of each element of the FEM gear models due to carburizing was obtained. A heat conduction analysis and an elastic-plastic stress analysis in the case-carburizing process of helical gears were carried out by the three-dimensional finite-element method, and then residual stresses were obtained. Effects of the case depth, the side-face carburizing, the helix angle and the face width on the residual stress of case-carburized helical gears were determined. Bending fatigue tests were carried out for case-carburized helical gears and S-N curves and bending fatigue limit loads were obtained. Effects of the case-depth, the side-face carburizing and the helix angle on the bending fatigue strength of the case-carburized helical gear were determined.

**Keywords** — case depth, side-face carburizing, helix angle, carbon, heat conduction analysis, elastic-plastic stress, helical gears, bending fatigue.