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Optimization of Tooth Root Profile and Drive Side Pressure Angle to Minimize Bending Stress at Root of Asymmetric Spur Gear Tooth

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Abstract : Bending stress at the root of the gear tooth is the very important criteria in gear design and it should be kept the minimum. Minimization of bending stress at the root of the gear tooth is a recent demand from industry. This paper presents an innovative approach to obtain minimum bending stress at the root of a tooth by optimizing tooth root profile and drive side pressure angle. Circular-filleted at the root of the tooth is widely used in the design. Circular fillet creates discontinuity at the root of the tooth. So, at root stress concentration occurs. In order to minimize stress concentration, an important criterion is a G2 continuity at the blending of the gear tooth. A Bezier curve is used with G2 continuity at the root of asymmetric spur gear tooth. The comparison has been done between normal and modified tooth using ANSYS simulation. Tooth root profile and drive side pressure angle are optimized to minimize bending stress at the root of the tooth of the asymmetric involute spur gear. Von Mises stress of optimized profile is analyzed and compared with normal profile symmetric gear. Von Mises stress is reducing by 31.27% by optimization of drive side pressure angle and root profile. Stress concentration of modified gear was significantly reduced.

Keywords : asymmetric spur gear tooth, G2 continuity, pressure angle, stress concentration at the root of tooth, tooth root stress
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