

Model of Inverse Envelope Cutter with Ring-Involute Tooth

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Abstract

The design of a conical cutter is important in the manufacture of concave and convex gears. An inverse method is presented for determining the mathematical model of a rack cutter. The obtained rack cutter was used to generate concave and convex gears. The method proposed in this paper addressed design problems in the rack cutter that were used to generate a new type of concave and convex gears. Based on the two-parameter family of surfaces and direct envelope method, the conical cutter was used as the generating tool for the proposed gear type, and a mathematical model of gears with ring-involute teeth was developed according to gear theory. The contour of von-Mises stress distribution of the gear and the pinion of the proposed mathematical model is presented. Using CNC manufacturing technology, a gear with ring-involute teeth was manufactured by a conical cutter. Based on the inverse envelope concept, the mathematical model of the developed gear tooth was used to determine the geometrical and mathematical models of the rack cutter with ring-involute teeth. To illustrate the effectiveness of the method, a numerical example is presented to demonstrate the geometric model of a gear with a gear ratio of 3:2.

Key words : Inverse envelope; Rack cutter