

1 GEAR TOOTH MODIFICATIONS

Intentional deviations from the involute tooth profile are used to avoid excessive tooth load deflection interference and thereby enhances load capacity. Also, the elimination of tip interference reduces meshing noise. Other modifications can accommodate assembly misalignment and thus preserve load capacity.

(1) Tooth Tip Relief

There are two types of tooth relief. One modifies the addendum, and the other the dedendum. See Figure 1.1. Tip relief is much more popular than root modification.

Care should be taken, however, not to modify excessively since that will cause bad effect in meshing.

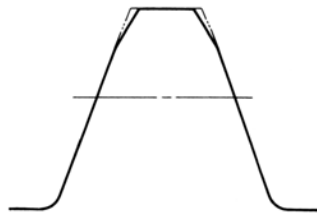


Fig. 1.1 Tip relief

(2) Crowning and End Relief

Crowning and end relief are tooth surface modifications in the axial direction.

Crowning is the removal of a slight amount of tooth from the center on out to reach edge, making the tooth surface slightly convex. This method allows the gear to maintain contact in the central region of the tooth and permits avoidance of edge contact with consequent lower load capacity. Crowning also allows a greater tolerance in the misalignment of gears in their assembly, maintaining central contact. The crowning should not be larger than necessary as otherwise it would reduce dimensions of tooth contact, thus weakening durable strength.

End relief is the chamfering of both ends of tooth surface. See Figure 1.2.



Fig. 1.2 Crowning and end relief

(3) Topping And Semitopping

In topping, often referred to as top hobbing, the top or tip diameter of the gear is cut simultaneously with the generation of the teeth. See page 387 "The Generating of a Spur Gear". Also, refer to Figure 3.5, 3.6 and 3.7 in that section. An advantage is that there will be no burrs on the tooth top. Also, the tip diameter is highly concentric with the pitch circle. Semitopping is the chamfering of the tooth's top corner, which is accomplished simultaneously with tooth generation. Figure 1.3 shows a semitopping cutter and the resultant generated semitopped gear. Such a tooth tends to prevent corner damage. Also, it has no burr. The magnitude of semitopping should not go beyond a proper limit as otherwise it would significantly shorten the addendum and contact ratio.

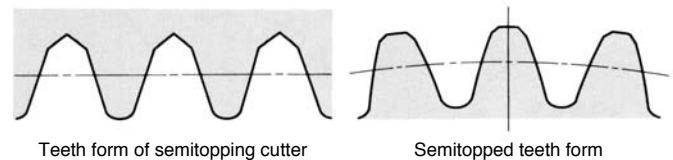


Fig.1.3 Semitopping cutter and the gear profile generated

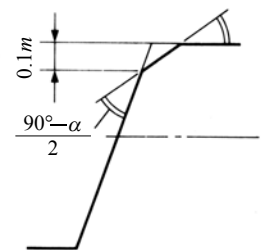


Fig.1.4 Recommended magnitude of semitopping