# **1.10 Tooth profile modification**

# **Tooth profile modification**

Regarding Tooth profile modification, modify the tooth profile that is shifted from the involute to be (concave) near part of tooth tip or fillet of dedendum. Tooth profile modification is to prevent deflection of tooth caused by load, intereference of Tooth tip caused by Pitch deviation and adds to provide smooth gear rotation.

However, needlessly exceeding amount of Tooth profile modification is not advisable as it will result in deterioration of Contact ratio. Proper amount of Tooth profile modification is highly recommended.

Commonly, modify the fillet area of dedendum for driver gear and area of Tooth tip for driven gear.

## Modification of Tooth trace (Crowning and Relieving)

Refer to Fig. 33, regarding modification of Crowning. Reduce Tooth thickness from centre towards the end of Tooth trace gradually.

Refer to Fig. 34, regarding Relieving. Reduce Tooth thickness gradually at end of Tooth trace.

The purposes of both modifications are to prevent the stress concentration by single contact. Different points between Crowning and Relieving are that Crowning prevents stress concentration caused by single contact and Relieving simply relieves the end of Tooth trace to prevent single contact.

These methods are commonly called Tooth trace modification. Excessive amount of Tooth trace modification will result in deterioration of tooth contact. This excessive modification is not advisable.



### **Topping and Semi Topping**

When cutting the flanks by Topping hob cutter, the outside diameter of gear is also processed at the same time. Semi topping method is similar but outside diameter is chamfered by hob cutter.

Method of Topping uses an external micrometer to measure the outside diameter to control Tooth thickness if module is too small and unable to use method of Sector span.

Topping cutter is designed to obtain designated Tooth thickness when machined outer diameter of gear is in place. It has an effect to reduce off-centre deviation of outside diameter as the hob cutter processes the outside diameter of gear at same time.

Semi topping prevents dent marks and burrs from occurring at Tooth tip. Semi topping has an effect to lower oscillation and noise, as smaller dent mark does not interfere with engagement. Excessive Semi topping will deteriorate Contact ratio and is not advisable.

Straight adjustment

#### **Tooth profile adjustment**

Process of hob cutter slightly cuts away both ends of fillet from outside diameter of gear in direction of Tooth trace. There are types of Straight line and Curved line profile adjustments, which can reduce the fluctuation of spring constant for gear. This has an effect to lower oscillation and noise to within expectation.

Professor Niemann has introduced other adjustments, where the outside diameter of gear is slightly (in other words, not as extreme as for Bevel gear) tapered or the outside diameter of gear is cut in an arc shape to make it a drum shaped body, which is not outlined here.

Another method is for outside diameter of Bevel gear to be slightly cut away to prevent interference at the toe.

