

Tooth Forms for Hobs

by
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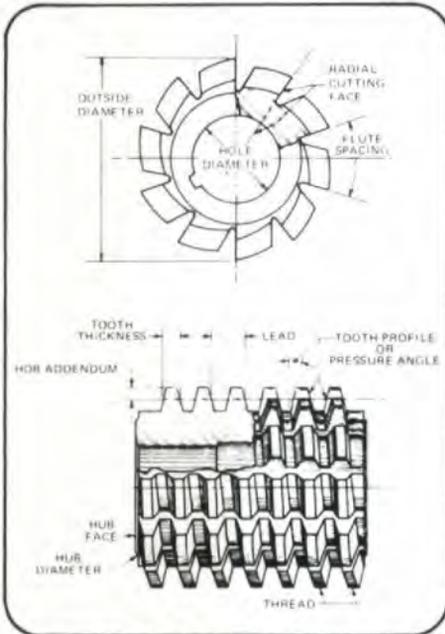
The gear hobbing process is a generating type of production operation. For this reason, the form of the hob tooth is always different from the form of the tooth that it produces. For example, an involute form of gear tooth is produced by a hob having angular straight sides. A straight-sided spline tooth is produced

by a hob having a curved tooth shape. The amount of fillet radius that a hob will produce is normally different from the radius on the tip of the hob.

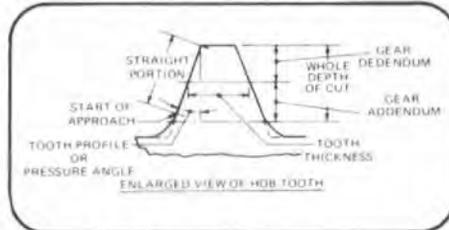
It is not necessary for users of hobs to be students of hob generation or to delve deeply into the complexities of such studies. They can specify on the draw-

ing what is desired on a particular gear, spline or special tooth form, and the hob manufacturer can develop the tool.

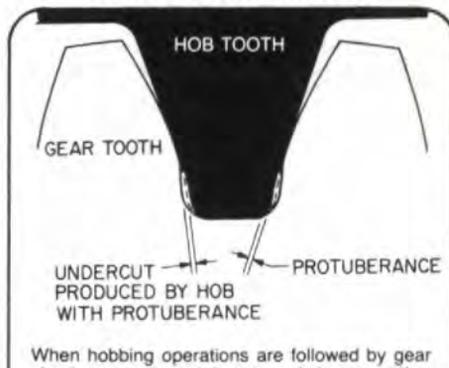
The following illustrations of hob teeth and produced forms are given to aid hob users in understanding the basic relationships between hob and produced part.



Hob Nomenclature

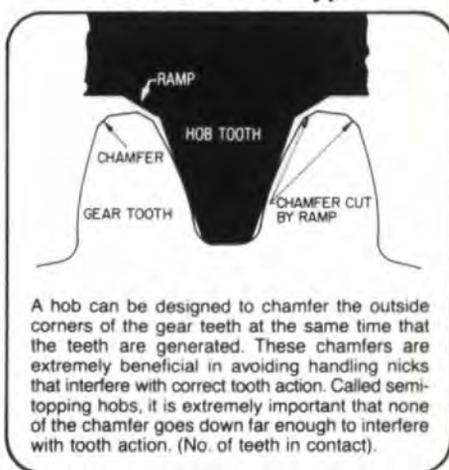


Tooth Nomenclature



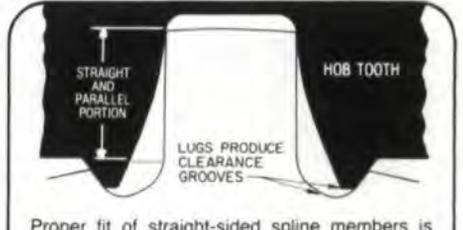
When hobbing operations are followed by gear shaving operations, it is extremely important that the tip of the shaving cutter does not dig into the gear tooth fillet and leave a 'shaving step'. This can be avoided by a protuberance-type hob with projections on the tip of the teeth. These protuberances actually undercut the gear tooth profile in such a manner that the shaving operation can produce a blended fillet profile. The protuberance depth must be carefully calculated so that the active profile of the tooth is not destroyed in the bottom portion of the gear teeth.

Protuberance Type



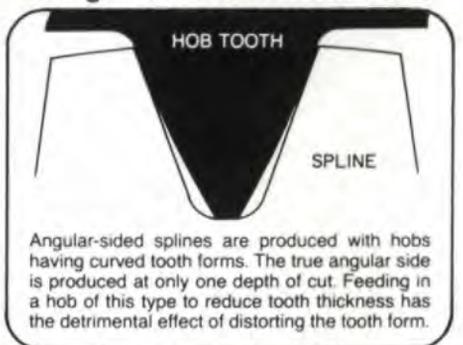
A hob can be designed to chamfer the outside corners of the gear teeth at the same time that the teeth are generated. These chamfers are extremely beneficial in avoiding handling nicks that interfere with correct tooth action. Called semi-topping hobs, it is extremely important that none of the chamfer goes down far enough to interfere with tooth action. (No. of teeth in contact).

Semi-Topping



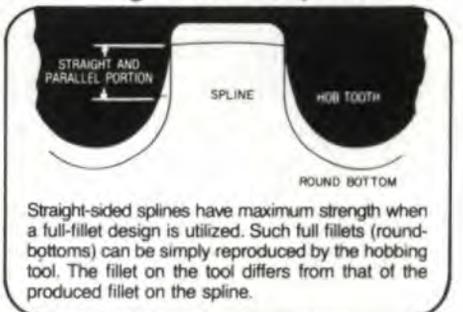
Proper fit of straight-sided spline members is achieved by hobbing a clearance groove in the area where the straight side meets the minor diameter of the spline. Small projections can be provided on the corners of the hob teeth to provide a blended clearance groove.

Straight Side Clearance Groove



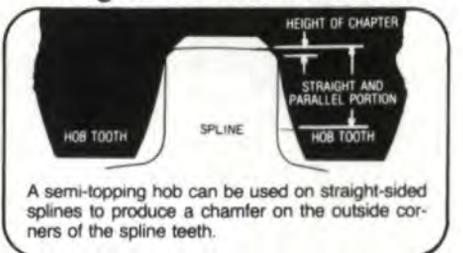
Angular-sided splines are produced with hobs having curved tooth forms. The true angular side is produced at only one depth of cut. Feeding in a hob of this type to reduce tooth thickness has the detrimental effect of distorting the tooth form.

Angular Side Spline



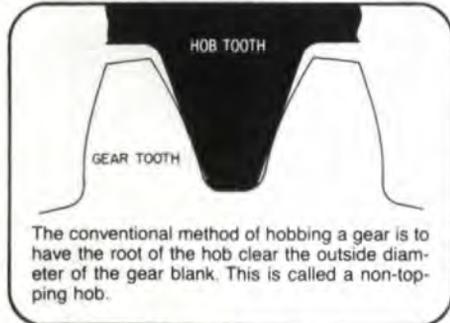
Straight-sided splines have maximum strength when a full-fillet design is utilized. Such full fillets (round-bottoms) can be simply reproduced by the hobbing tool. The fillet on the tool differs from that of the produced fillet on the spline.

Straight Side Round Bottom



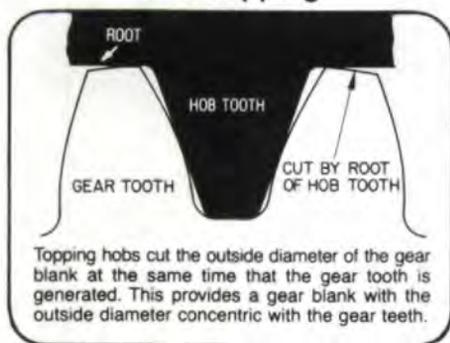
A semi-topping hob can be used on straight-sided splines to produce a chamfer on the outside corners of the spline teeth.

Semi-Topping Flat Root



The conventional method of hobbing a gear is to have the root of the hob clear the outside diameter of the gear blank. This is called a non-topping hob.

Non-Topping

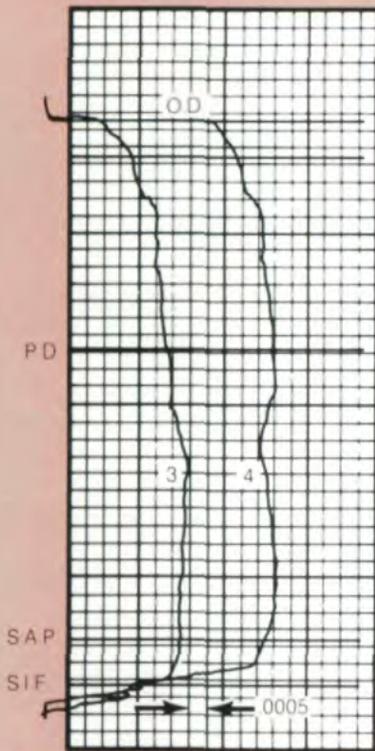


Topping hobs cut the outside diameter of the gear blank at the same time that the gear tooth is generated. This provides a gear blank with the outside diameter concentric with the gear teeth.

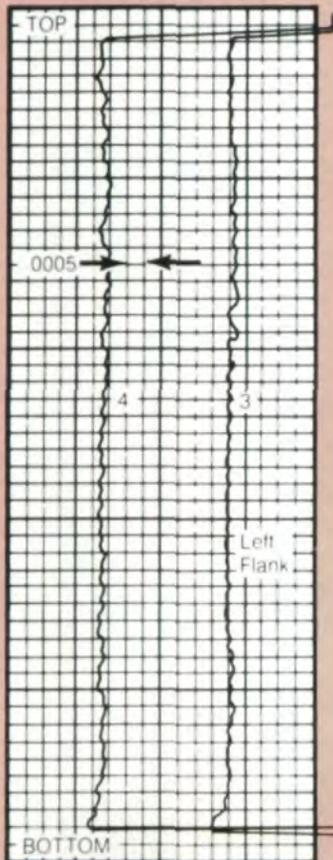
Topping

HARD GEAR . . .
(continued from page 15)

Example 4—Involute Charts



Example 4—Lead Charts



The worth of any new technology can be best determined by its acceptance in the marketplace. It is apparent that by having the skiving hob available, more and more uses are being found for this bridge between the extremely accurate ground gears, and those that had previously been ground only because there was no way to correct distortions, even though an AGMA class 8 to 10 gear

would be acceptable. The technology has thus advanced from one of being essentially a "pre-grind technology" to one that now encompasses also "finishing of hard gears by skiving".

This article was reprinted from the American Gear Manufacturers Association, Technical Paper.

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