Kish Method for Determination of Hunting Mesh

Jules Kish

When designing a gear set, engineers usually want the teeth of the gear (*Ng*) and the pinion (*Np*) in a "hunting" mesh. Such a mesh or combination is defined as one in which the pinion and the gear do not have any common divisor by a prime number. If a mesh is "hunting," then the pinion must make $Np \times Ng$ revolutions before the same pinion tooth meshes with the same gear space. It is often easy to determine if a mesh is hunting by first determining if both the pinion and the gear teeth are divisible by 2, 3, 5, 7, etc. (prime numbers). However, in this age of computerization, how does one program the computer to check for hunting teeth? A simple algorithm is shown below.

Kish Method

(1) Designate the larger number of teeth on the pinion or gear as *Nmax*.

(2) Designate the smaller number of teeth as *Nmin*.

(3) Find the integer part of the fractional remainder of *Nmax/Nmin* as follows:

$$Nremain = \left(\frac{Nmax}{Nmin} - \text{integer part of } \frac{Nmax}{Nmin}\right) Nmin$$

(4) If *Nremain* = 1, the mesh is hunting.
If *Nremain* = 0, the mesh is not hunting.
If *Nremain* > 1, then:
Set *Nmax* = *Nmin*,
Set *Nmin* = *Nremain*,
Go back to Step (3) and repeat until *Nremain* = 1 or 0.

As an example, consider the following:

Example #1	*Example #2*
$Np = 28, Ng = 91$	$Np = 29, Ng = 91$
$Nmin = 28$	$Nmin = 29$
$Nmax = 91$	$Nmax = 91$
$Nremain = \left(\frac{91}{28} - 3\right) 28 = 7$	$Nremain = \left(\frac{91}{29} - 3\right) 29 = 4$
$Nmin = 7$	$Nmin = 4$
$Nmax = 28$	$Nmax = 29$
$Nremain = \left(\frac{28}{7} - 4\right) 7 = 0$	$Nremain = \left(\frac{29}{4} - 7\right) 4 = 1$
Therefore, the mesh is not hunting.	**Therefore, the mesh is hunting.**

The Kish method is easily programmed, and checks for hunting teeth can be performed in the computer. The method works for any tooth combination. As seen above, each time a new *Nmax* and *Nmin* are set, the fractional remainder becomes smaller until finally the remainder is either 1 or 0.

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