INDUSTRY FORUM

"INDUSTRY FORUM" provides an opportunity for readers to discuss problems and questions facing our industry.

Please address your questions and answers to: INDUSTRY FORUM, GEAR TECHNOLOGY, P. O. Box 1426, Elk Grove Village, IL 60007.

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Dear Editor:

In response to Ed Uberts letter, we have come a long way in gearing since WWII. The Europeans do use long addendum pinions in many cases. This modification does improve load capacity, sliding conditions and the working life of a gearset. When modifying a pinion tooth it is necessary to modify the geartooth or adjust the center distance accordingly but we will leave that to the designers.

I have found that Dr. Werner Vogel who compiled the book entitled "Involutometry & Trigonometry" has all of the information necessary to accurately calculate measurements over rolls for Helicals or Spurs. His derivation of the formulas is concise and complete. The span measurement method with the books supplied by MAAG of Zurich, Switzerland are also accurate so long as the facewidth allows you to use vernier calipers in the case of high helix angles.

Some of the better hand held calculators have software Engineering packages that are programmed to do the calculations with the imput of the necessary variables.

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Dear Editor:

The letter from Edward Ubert in the May/June issue caught my attention, as I have worked in the area of gear geometry for many years (although only from the U.S. viewpoint).

We at Foote-Jones/Dresser (Chicago) also use many gears of non-standard geometry, not only of our own design, but also as reproductions of gears designed elsewhere. Theories of gear geometry are outlined in Van Keuren, *Precision Measuring Tools*, Dudley, *Gear Handbook*, Khiralla, *On the Geometry of External Involute Spur Gears*, Buckingham, *Analytical Mechanics of Gears*, etc., but applying these to an arbitrary geometry so as to avoid "surprises" at assembly is not a trivial task. However, we have created a tool to do this by coding the theory into an interactive computer program, which will parse any parallel shaft, external gear set geometry in seconds. Because I have reviewed the derivations in the above literature, run the program against those from other sources and employed it thru gear assembly, I am confident that it and the basic theory are analytically correct. However, in performing measurement over wires in conjunction with program, the wire diameter must be chosen, of course, so that the wires protrude above the o.d. sufficiently to avoid interference between top land of teeth and calipers, and also so that the wires make contact in the region of the pitch line because, were they to contact a modified region of the flank (near tip or root), they would not be measuring the involute.

Regarding tooth modification, if one member of a set has modified addendum, the addendum of the other member must be correspondingly modified (or else the center distance must "float"). Thus, generally there is no interchangability when "every gear is modified to some extent."

The "addendum modification coefficient" concept Mr. Ubert mentions is not unique to Europeans, but is just one method of manipulating a design. Of course, the rules of gear geometry do not follow AGMA, DO or BS, but rather the laws of mathematics.

If Mr. Ubert would like, I would be glad to give him wire measurements for some sets he would consider to be test cases, to check his calculation method.

Sincerely,
Henry Tideman
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