

Multiple Gearset-Type Calculation Software

THE QUESTION

Is there a gear software package out there that will calculate the design of spur, helical, worm, and planetary gearsets? Also, we would like a program that calculates stresses and material selection. Finally, we would like to have the program calculate bearings loads, too. Thank you for your help.

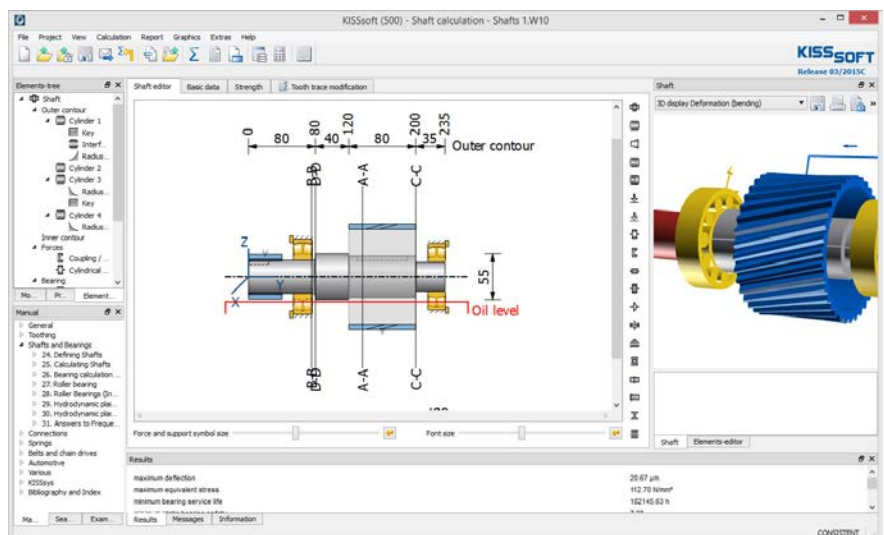
Expert response provided by: Dr. Stefan Beer-mann, KISSsoft CEO: Yes, there are some software packages available. In the U.S. the important commercial ones are *KISSsoft*, *IGS*, *ROMAX* and *MASTA*; each has its own strengths. I will only write about *KISSsoft*—for obvious reasons. So the first brief answer is: *KISSsoft* can do the tasks above—and more.

Some details: *KISSsoft* is a program that calculates machine elements. This is generally what an engineer learns at University when it comes to assessment of strength or life time of machine components. Most of *KISSsoft* is dedicated to the various gear types and configurations, including the abovementioned ones; calculating stresses is a basic functionality of all the respective software packages. Let me at this point say a few words about the meaning of stress values: if you compare stress values from gear software with those from an FEM package, you will often find significant deviations. Also, among the different software packages available, results will differ. That is because the calculated “stress” in a machine calculation software is compared to a permissible stress value. The calculation of both is defined by the method applied. As long as you stay within the method, this is perfectly fine. But don’t mix methods!

Since all the common gear software is implementing more or less the same methods, the main difference is in how the input process is tailored. In *KISSsoft* we focus on making this process as flexible—yet still convenient—as possible. Thus *KISSsoft* has a monolithic approach, i.e.—all tasks are performed using the same user interface. Depending on what the topic is you need to address—say, new design or assessment of given design—you will enter different data. However, trust the software to always keep your gear definition consistent and make proposals for suitable

input data. For material selection, *KISSsoft* provides a data base with the relevant data of some hundred steels and other material. This data base can be extended by the user if some special data set is requested. The definition of the macro geometry for a given gearset is the hardest part of the job. If you have a mistake in the input—typically due to a misunderstanding of the meaning of the input, regarding either the drawing or the software—you are subsequently calculating the wrong gears. So be careful and cross-check all available control data; again, trust the software to keep you informed whenever something looks strange.

For the design of a gearset, *KISSsoft* has some special functionalities that make first proposals; refine and optimize a given design; and, finally, optimize the micro geometry, i.e.—the profile and flank modifications. Other functions are for the in-depth analysis, beginning with the contact analysis. This module finds the real contact points on the flanks under load, with flexible teeth, shafts, and bearings. Based on this approach, more realistic stresses and transmission error—key phrase here: noise vibration harshness (NVH)—can be determined.



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What is more, power losses and heat generation, wear, oil film thickness and other negatives can be calculated. The bearing loads are also calculated here; however, I recommend using the *KISSsoft* shaft calculation for this topic, as it is more precise. Other parts of the gear software treat operational backlash, summarize data for the shop floor, and so on.

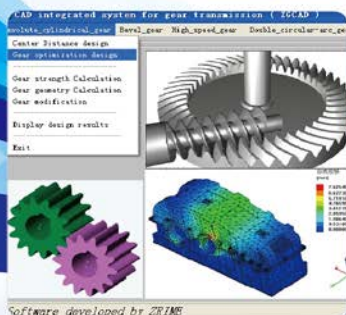
Let's summarize: with *KISSsoft* you get an easy-to-use tool for calculating spur, helical, worm and planetary gearsets, and also bearing loads with stress calculation and material selection supported by a data base. If you want to try it, contact us. (www.kisssoft.ch)

Dr. Stefan Beermann studied mathematics and computer science in Karlsruhe. His Doctoral thesis—"Simulation of Vibrations in Gearboxes Applying Spectral Simulation"—was written in collaboration with the FZG from the TU Munich. In 1996 Beermann joined Zurich-based gearbox company, L. Kissling & Co. AG, as product manager for the calculation software *KISSsoft*. In 1998 he switched to *KISSsoft* AG as one of its first employees. Today Beermann is company CEO and partner at *KISSsoft* AG— together with the company's founder, Dr. U. Kissling.



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