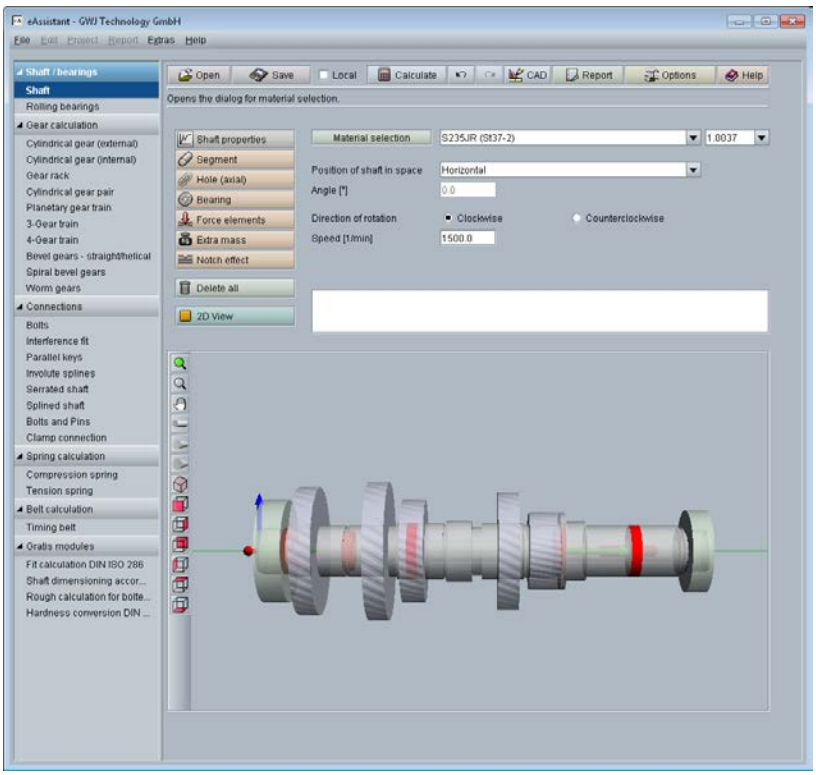
Testing 1,2,3...

What's New and Noteworthy in Software Applications in 2017?

Matthew Jaster, Senior Editor

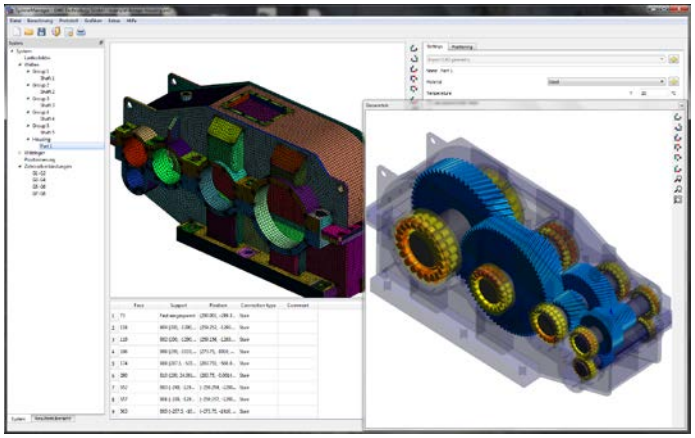
In general, people have a love/hate relationship with the term "update." We certainly don't appreciate updating our smartphones since they potentially cause more problems with each new download. Software can also have its fair share of frustrations, but it can also be an extremely valuable tool if the updates and new product developments make your job easier. Each year, developers like KISSsoft, GWJ Technology and MESYS offer software tools and consulting services for the gear industry. Some are brand new products others are upgrades from previous software packages.



Shaft calculation with GWJ Technology's *eAssistant* software.

GWJ Updates eAssistant Software

GWJ Technology GmbH is constantly working on software enhancements and adding new features to the system in order to keep the applications up-to-date. GWJ recently released a product update for its web-based calculation software *eAssistant*. The new version comes with a variety of new features and functions including a significant improvement of the *eAssistant* framework. The software can now be launched independently of a web browser. There will be no more problems with pop-up blockers and browser zoom. Additionally, all calculation modules now include two unit systems: the metric system and the U.S. customary unit system. The user can quickly switch between the units. There are several more improvements in the software like the addition of the ANSI/AGMA 2104-D04 standard to determine the load capacity of cylindrical gears and planetary gear trains or the implementation of gear qualities according to DIN 58405, ISO 1328 and ANSI/AGMA 2015.



Gearbox with Housing with GWJ Technology's *SystemManager* software.

Furthermore, GWJ has some new developments with *SystemManager*. *SystemManager* is a true software application for complete systems of machine elements, i.e., the software is a coupled FE calculation of multi-shaft systems with gears as non-linear coupling elements. *SystemManager* runs as a desktop application, making it possible to configure and calculate entire systems with just a few mouse clicks. *SystemManager* now allows the import of 3D housings as STEP files. The software meshes the parts automatically to consider deformation and stiffness of the housing throughout the system. A further extension of the 3D elastic parts function is the support of planet carriers and imported shafts. Planet carriers can be imported as CAD models or be defined parametrically; various basic designs are available for the parametric planet carriers.

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KISSsoft Launches 03/2017 at Hannover Messe

The new version of *KISSsoft 03/2017* was released during Hannover 2017 with a number of innovations including:

- Reliability evaluation of gear units on system level
- Simplified modeling using predefined gear stages in *KISSsys*
- Calculation of root stresses with FE for cylindrical gears
- Variation calculation for the inner geometry of bearings
- Determination of the unbalance response during the vibration calculation of shafts Web demos inform users about various subjects in the calculation programs *KISSsoft* and *KISSsys*. Learn more about new developed features, about sizing and optimization strategies, see examples and much more; easily on your work desk. These web demos are free of charge, all you need is 45 minutes to get to know the various applications of the software.

Additionally, KISSsoft USA is now providing additional support through a YouTube channel (*www.youtube.com/channel/UCPk0PftMUVTfncY657Yr7Sw*). The videos are designed to help users with questions about how the software works and provide some basic engineering knowledge related to gear design. Over 20 videos are already available for viewing and cover topics such as general gear design, reverse engineering, 2D & 3D export of gear forms, shaft construction, contact analysis and report customization.

For more information:
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MESYS

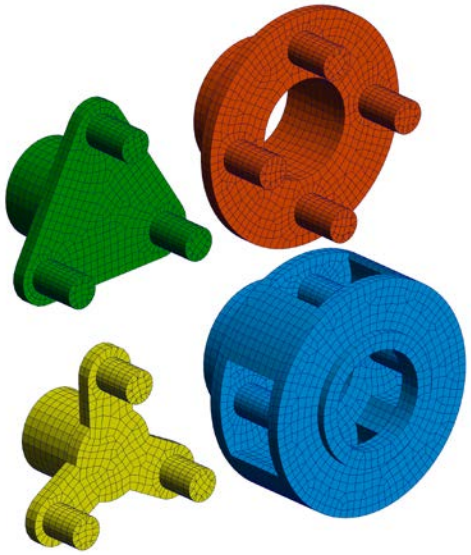
Integration of 3D-Elastic Parts into a Shaft System Calculation

In calculations for shaft systems like gearboxes the shaft are often considered as one-dimensional elements for the calculation of shaft strength, bearing life and safety factors for gears. This has the advantage of short calculation time and easy consideration of boundary conditions. An additional housing stiffness can easily be added by using a stiffness matrix which couples the stiffness at different support positions.

The *MESYS* shaft system calculation software allows the import of 3D-housings as STEP-files since 2016. The software meshes the parts automatically and generates the reduced stiffness matrices which had to be calculated by separate FEA calculations and then to be imported before.

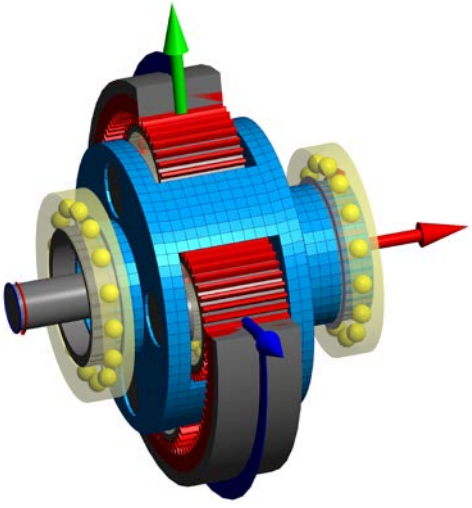
In version *04/2017* the integration of 3D-elastic parts in the *MESYS* shaft system calculation is further extended. 3D-elastic housings can not only be considered in a static calculation, but also in the calculation of natural frequencies by using a modal reduction. The influence of housing elasticity on natural frequencies is much larger than on static deformations.

For example a L-shaped spindle test stand without the right support and without considering housing stiffness shows a first natural frequency (an axial mode) of almost 22'000 1/min. Considering the elastic housing the first natural frequency is a bending mode of about 15'200 1/min, which would lead to problem for a planned operating speed of 15'000 1/min. Including the additional right support the natural frequencies of the bending modes rise to 25'000 1/min, die first axial frequency falls to 19'600. The imported CAD-model was the existing CAD-model for manufacturing. This is not optimal because of



many holes and the bolts, but it still can be used. In case the holes and bolts are deleted in the CAD-model memory usage and initial calculation time for the calculation can be reduced.

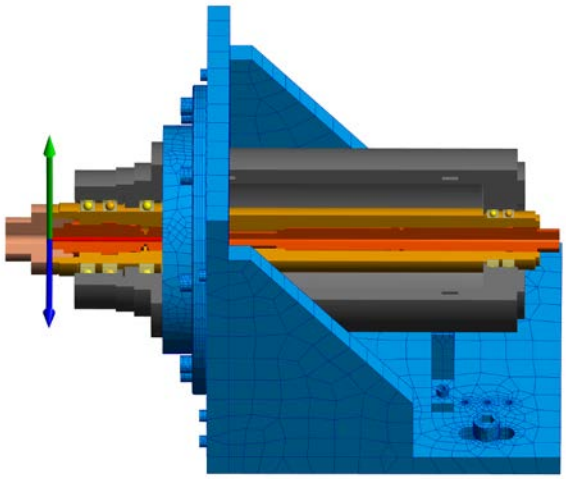
A further extension is the support of 3D-elastic planet carriers. Compared to housings the planet carries rotate in the system and therefore the calculation has to cope with large rotations. The elastic deformations of the planet carries have an influence on the load distribution of the gears and therefore should be considered at design of tooth trace corrections. The tilting of the planets will also have an influence on the bearing loads and the global torsional stiffness.



Another possibility of an integration of 3D-elastic parts in the shaft calculation is the option of 3D-elastic rotation symmetric parts, which can be defined using a polygon. These 3D-elastic parts define an additional stiffness matrix. As example a flex-pin is considered here. In some older literature equations for the deformations of a flex-pin are given based on the Euler-Bernoulli-beam without consideration of shear deformations. In an example a beam model without shear deformations shows a deflection of 15 µm, including shear deformations the deflection is 23 µm and in case of usage of 3D-elastic parts the deflection is 42 µm. The usage of a 3D-elastic parts will lead to an increase by 80 percent compared to a shear-elastic beam element. The reason is the deformation in the two interference fits where the rigid connection of the beams is much too stiff. The 3D-elastic part is providing a better model for the deformations. As the parts are taken into account like welded in the calculation the real-life deformation should still be a little larger as there could be some sliding in the interference fit.

The integration of 3D-elastic parts into the shaft system calculation allows to consider additional stiffness without the need of external FEA programs. A time-consuming and error-prone transfer of stiffness matrices is therefore not needed any more.

A full calculation in a FEA program would allow more possibilities for defining boundary conditions and would allow nonlinear calculation including contact. The shaft system calculation based on one dimensional shafts has the main advantage of short calculation time in range of seconds, which allows the use of extensive load spectra and parameter variations. With the integration of 3D-elastic parts these advantages are preserved.



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