

KISSsoft Special Training

Contact Pattern Analysis for Cylindrical Gears, Bevel Gears and Planetary Systems (2 days)
with optional Workshop (1 day)

Contact Pattern Analysis for Cylindrical Gears, Bevel Gears and Planetary Systems

This special training course about contact analysis for calculating cylindrical-, bevel gear pairs and planetary systems will cover the theoretical foundations of contact analysis, which are required for sizing and optimizing gear units with regards to noise, transmission error, transverse contact ratio and tooth trace modifications.

The first part of the training course uses the calculation of the face load factor as an introduction to the more detailed theory of contact pattern calculation. The course explains essential issues such as modeling and stiffness and goes into detail about how to check and interpret the results.

The second part of the course covers special contact analysis topics such as consideration of shaft deformation and planetary gear units. Participants will reinforce what they have learned by using the powerful sizing and optimization functions.

With the objective to deepen the content of the two- day training, we offer an additional workshop day. The trainer will take care of the individual questions and goals of the participants. Participants are encouraged to bring their own projects along and to work on these during the workshop day with the support of the trainer. The seats for this additional day are restricted to 10.

This training course is designed for engineers who are already familiar with cylindrical gears and planetary gear units and have already completed an advanced training about gear calculation, because a sound knowledge of geometry and strength calculation is essential for properly understanding the contents of this course.

Topics in the "Theory" Part

Introduction to the Theory of Face Load Calculation

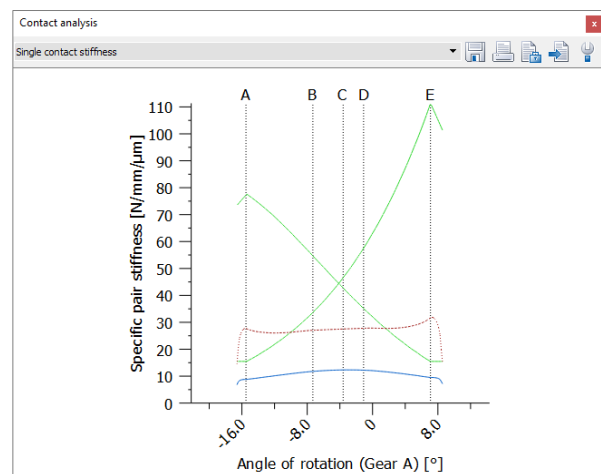
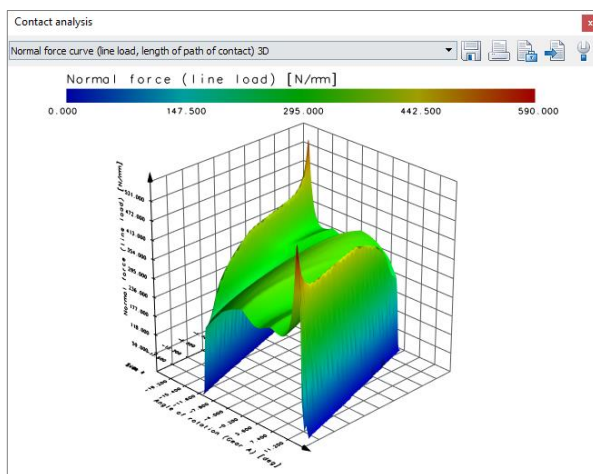
- Face load factor $KH\beta$ according to ISO 6336-1, Appendix E
- Taking into account manufacturing allowances in $KH\beta$ calculation according to ISO 6336-1, Appendix E
- Importance of tooth pair spring stiffness
- Characteristics of tooth pair spring stiffness according to ISO 6336-1
- Use of face load factors in load spectrum calculation

Theory of Stiffness Calculation

- Tooth pair spring stiffness according to the Weber/Banaschek analytical method
- Importance of system, tangent and secant stiffness
- Possible methods for calculating contact stiffness
- Importance of the correction coefficient for Hertzian stiffness
- Differences to the FE approach and comparison with other programs commonly used in Germany
- Defining the slice coupling factor
- Approximation and effects of helical gear teeth
- Defining the border weakening factor and its consequences on the buttressing effect

Interpretation of the most important Results

- Importance and interpretation of the transmission error
- Effect of transverse contact ratio and overlap ratio on the transmission error
- Identification of entry and exit impact
- Meaning of change of normal angle at the beginning of the profile modification
- How to identify and resolve numerical problems
- Importance and interpretation of the progressions of normal force, stress, and kinematics



Topics in the "Extended Contact Analysis, Planetary Systems, Sizing and Optimization" Part

Extended Contact Analysis

- Defining the gear/planetary gear unit coordinate systems
- Defining the shaft coordinate system
- Importance of the inclination/deviation error of axis
- Taking the shaft calculation into account
- Problems of consistency in the shaft calculation
- KISSsys as an effective data management tool for designing/analyzing entire multi-stage drives

Contact Analysis with Planetary Gear Units

- Analytical model for planetary gear unit calculation
- Options and limits of planetary gear unit calculation
- Importance of calculating iterative load distribution
- Importance and correct configuration of axis alignment

Contact Analysis with Bevel Gear Units

- Analytical model for bevel gear unit calculation

Interpretation of the most important Results for Planetary Gear Units

- Meaning and interpretation of planetary stage transmission error
- Load distribution for planets

Sizing and Optimization of Modifications

- Defining profile and tooth trace modifications and their effects
- Sizing and optimizing modifications manually
- Sizing and optimizing modifications for load spectra
- How to use modification sizing effectively
- How to use iterative wear calculation

Optional Workshop

Deepening and practicing the learnt optimization strategies on an individual basis supported by our trainer. Participants are encouraged to bring their own projects with them in order to work on them during the workshop.