KISSsoft Special Training

Precision Mechanics: Small cylindrical gears and crossed helical worm gears in plastic or sinter materials

2 days

KISSsoft AG
Rosengartenstrasse 4
8608 Bubikon
Switzerland

Tel: +41 55 254 20 50
info@KISSsoft.AG
support@KISSsoft.AG
www.KISSsoft.AG

Small cylindrical gears and crossed helical worm gears in plastic and sinter materials

A two days specialized training for design engineers who already participated in a cylindrical gear advanced training

In our normal 3 days advanced training for cylindrical gears, we don't have the possibility to analyze special problems like tolerances and quality problems encountered in the design of small gears. Furthermore, the strength calculation of plastic or sintered gears is not straightforward, because often material data is not available. As requested by participants of the advanced training courses, we now offer a two days training that covers small gears calculation and their special problems in design.

Therefore, this training is for engineers who already know how to use the KISSsoft user interface and the sizing functions in the gear calculation module. We also recommend that they have attended the advanced training course on gear calculation, because a sound knowledge of geometry and strength calculation is essential for properly understanding the contents of this course.

The specific differences compared to gears in steel and their calculation methods will be explained and several exercises will be carried out to see the problems and the possible solutions in practical cases. An overview of the material properties with advantages and limitations as well as the measuring techniques will be explained. The choice of the material and the calculation of the tooth form specialties will be treated.

The basic issues involved in the theory of worm wheels and crossed helical gears are summarized. The differences between worm wheels with and without globoid form are illustrated.

During the training, participants will individually carry out several exercises with the full version of KISSsoft calculation program.

General topics

- **General properties of plastic and sinter materials**
- **Tribological properties of plastic and sinter materials**
- **Typical failure modes of cylindrical and crossed helical gears**
- **Overview of materials implemented in KISSsoft**
- **Sizing functions in KISSsoft**: rough, fine sizing and sizing of modifications
- **Overview of the VDI 2736 and old VDI 2545**
- **S-N curves (Wöhler lines) for plastics and sinters:** their measurements and implementation into KISSsoft
- **Safety factors:** general recommendation, procedure to design plastic gears

Cylindrical gear calculation

- **Strength calculation:** static strength and lifetime calculations, load spectrum calculation, evaluation of results and reports
- **Temperature calculation:** theoretical background, measurement possibilities
- **Wear calculation**: theoretical background, methods in KISSsoft
- **Contact analysis:** background, general overview, result evaluation
- **Noise optimization:** main sources of noise, possible optimization procedures
- **Operating backlash optimization:** general inputs, interpretation of the results
- **Tooth form calculation:** tolerances, special tooth form modifications for small gears

Calculating the injection mould

The theoretical tooth form, which has been optimized as described above, is calculated using the mid-value of the tooth thickness deviations. The result is the required tooth form, which can be transferred to a CAD program via the DXF or IGES interface. In further calculations, you can take into account also the manufacturing processes:

- **Modifying the injection mold to compensate for shrinkage/expansion**
- **Display the eroding wire / spark gap**
- **Monitoring the wire diameter during erosion process**

Crossed helical gear calculation

- **Basic geometry and forces**
- **Differences between globoidal and cylindrical worm wheel**
- **Efficiency calculations, self-locking gear pairs**
- **Strength calculation:** static and lifetime calculations, differences between VDI 2545 and VDI 2736
- **Wear calculation:** method according to Pech, limitations of Pech method
- **Tooth thickness optimization**
- **Graphical contact analysis:** visualization with 3D skin model

Various

- **Non-circular gears:** design possibilities, advantages and limitations
- **Importing tooth form as a .dxf**