KISSsoft Training

Gear optimization training

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Advanced Gear calculation

Gear Design and Optimization

This seminar offers the first day a comprehensive view of the most important fundamental geometric properties of cylindrical gears and of the strength calculation for gears. The second and third day offers a more in-depth look at the current state of technology and the latest working practices in the field of gear calculation and optimization. More specialist themes will be covered in which it will be also being shown how complex problems can be solved efficiently using calculation software.

Theory

Gear Geometry, tolerances, inspection, strength, material properties, optimization:

Geometry of gears (cylindrical) with involute profile

- Profile shift, optimization of profile shift, undercut
- Grinding allowance, manufacturing profile shift
- Backlash, Tip clearance
- Reference profiles (normal profile, stubbed and deep tooth forms)
- Contact line, useable tip circle and useable root circle (SAP characteristics and problems, EAP)
- The most frequent errors found in the design of gear pairs
- Profile correction
- Internal tooth forms

Manufacturing Tolerances

- The various methods for inspection of gears
- Tolerances and allowances
- Calculation with grinding stock allowance.

Non-Involute Tooth Forms

- Theory, advantages and disadvantages, manufacturing

Strength Calculations for Gears (with involute tooth forms)

- Calculation of the root strength, theory, important formulae
- Calculation of the flank strength, theory, important formulae
- Scuffing (according to flash-temperature criteria and integral temperature)
- Static strength calculation for gears
- Woehler Line
- Load spectra
- Differences between various standards (ISO6336, DIN3990, AGMA2001)
- Crowning / Surface modification
- Safety factors (theoretical)
- Measures against gear damage

Strength calculation of non-involute tooth forms:

- Selection of materials and surface treatment (nitriding, hardening...)
- Definition of material data for strength calculations.

Bevel, Worm, Crossed-Helical, and Face Gears
• Specific geometry, specific strength calculations
• Manufacturing Processes for bevel gears (Gleason, Klingelnberg, Cyclopaloid)

Gear Design and Optimization

Short overview about some important features of KISSsoft calculation programs

• Reports and modification possibilities
• Functions common to all modules
• Help functions
• New database management tool

Introduction using a Cylindrical (Spur/Helical) Calculation

Course of a successful gear design project:

• Draft parameter definition
• Geometry optimization: Optimization of design parameters
• Profile modification and crowning

Commonly Used Strategies for Optimization of gears

• Modern strategies for the determination of noise and vibration reducing tooth forms
• Deep tooth forms
• Contact stiffness, contact of a gear pair under load
• Transmission error and Impact shock
• Profile corrections
• Well balanced root and flank strength
• Reduced and removed backlash
• Surface modifications (definition of the optimum crowning)

Cylindrical Gear Configurations (epicycles, racks, gear trains)

• Validation to standards
• Geometry and strength optimization
• Special problems (assembly, etc.)

Manufacturing

• Assessment of the manufacture of a tooth form
• Manufacture of a tooth form using several different tools
• Design and checking of master gears

Expert Topics

• Identifying required safety factors
• Duty cycles
• Micropitting
• Optimal case hardening depth (for case hardening or nitriding)
• Further calculation options

Topics treated on request
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**Calculation of gear trains (short overview on KISSsys if required)**

Presentation of KISSsys, the extension to KISSsoft for the calculation of entire systems of machine elements. KISSsys calculates the power transmission and manages the interactions between system elements.