American Gear Manufacturers Association

Technical Academy

Seminar Outline

Detailed Gear Design — Beyond Simple Service Factors

Instructor:

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1. **Basic introduction to gear rating theory and Standardized AGMA/ISO Analyses**
Methods including theoretical models for strength, durability, wear, and scoring hazard.

2. **Practical considerations and limitations associated with the application of Standard AGMA/ISO durability rating analyses.**
a. The theoretical surface contact stress model and its application to gear tooth contact conditions.

3. **Investigation of the differences in stress states among the various surface durability failure modes including pitting, spalling, case crushing, and subcase fatigue.**

4. **Extended load capacity analysis techniques** (beyond the AGMA/ISO Standard methods) including:
a. Subsurface shear stress analysis for the determination of optimum effective case depth & relation to subcase fatigue and case crushing
b. Conversion of subsurface shear stress profile into required subsurface hardness profile

5. **Consideration of friction in the calculation of Surface Compressive stresses**
a. The relation between pure Hertz type compressive stress and pitting
b. The relationship between spalling and the occurrence of a combined tension and compression state at the tooth surface due to mesh friction effects

6. **Practical considerations and limitations associated with the application of Standard AGMA/ISO strength rating analyses.**
a. The theoretical strength stress model and its application to gear tooth bending stress evaluation.
b. Correspondence between calculated stress numbers and actual measured tooth root stresses

7. **The effect of gear blank rim thickness on the tooth root stress state.**
a. Rim bending participation
b. The rim thickness factor – development and limitations

8. **Discussion of differences between fatigue, time dependent, and time independent failure modes as related to gear tooth design.**
a. Durability & Strength
b. Wear
c. Scoring

9. **Wear evaluation by the application of Elastohydrodynamic analyses**
a. Basis of the analysis development
b. Probabilistic nature of wear evaluation
c. Time dependent, non-fatigue nature of wear progression
d. Self propagating mechanism

10. **Scoring Hazard evaluation by the application of Blok's Critical Temperature Theory**
a. Basis of the analysis development
b. Probabilistic nature of the problem
c. Time independent nature of failures

11. **Optimization of gear tooth detail design parameters including:**
a. Considerations for minimum roll angles
b. Effect of and design for specific sliding (slip ratio) and entraining velocity
c. Stress balanced or life balanced gear pinion and gear relative design
d. Influence of geometric characteristics such as tooth top land, tooth thickness, etc. on optimized tooth design

12. **Considerations of fillet geometry in the avoidance of fillet interference and excessive stress concentrations due to adverse fillet geometry.**
Computer generated animated graphics will be used for examining mesh action and tooth interaction. Each section discussion will be followed by a brief question and answer period. The registration fee will include all meeting materials, scheduled meal functions and an opening evening networking reception. A certificate will be awarded to each attendee upon completion of the seminar.