



High Profile Contact Ratio Gearing: Concept, Advantages, Comparison & Cautions

INSTRUCTOR:

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COURSE INFORMATION

Course Description

High Profile Contact Ratio (HCR) gears, both spur and helical, have been shown to provide significant reductions in gear mesh frequency noise and vibration levels and, depending on the specific configuration, improved load capacity as well. The design of HCR gears is, however, far from a simple task and must be carefully accomplished. In addition, HCR gears are not appropriate for every circumstance.

In this seminar we will learn just what HCR gears are and under what circumstances they can be used to advantage. Similarly, we will learn when HCR gears are not appropriate and why. We will cover the detailed tooth geometry changes that are required to effectively achieve optimum performance and benefit. We will learn how the load distribution along the involute profile changes when the contact ratio increases above two.

Because of the longer, more slender teeth on a HCR gear the heat treatment and profile modifications that are required for good performance are distinctly different from those for a standard contact ratio gear. The load capacity rating of HCR gears requires the application of modified AGMA analyses as the AGMA Standards specifically do NOT address gears with profile contact ratios greater than 2.0 thus we will also cover the changes required to successfully rate HCR gears.

Course Rationale/Students Course Designed to Serve

Engineers who are interested in designing gears which exhibit both increased load capacity and lower gear system noise levels.

Learning Objectives:

- Identify what an HCR gear is and understand when to use them
- Recognize the detailed tooth geometry requirements to achieve optimum gear performance
- Classify the changes required to successfully rate HCR gears

Required Textbooks (Provided by AGMA)

AGMA's High Profile Contact Ratio Gearing by Raymond J. Drago, PE

COURSE OUTLINE

1. The concept of High Profile Contact Ratio gearing and how it differs from conventional spur and helical gearing.
2. A review of the three different contact ratios which are important in the design of a gear set with both good load capacity and "low" noise and vibration characteristics.
3. The advantages that can be obtained through the proper design and application of HRC gears. Some examples of specific real applications will be discussed.

4. The mechanism that results in lower stresses for HCR gears will be discussed and described. Actual measured stress results will be discussed to illustrate the benefits of HCR spur gears as compared with similarly sized spur, helical and double helical gears.
5. Realistic cautions related to the design and usage of HCR gear systems in a comparative sense will be presented.
6. Specific design parameters including tooth geometry and kinematics will be addressed with regard to both benefits and load rating analyses.
7. In the application of any new concept, it is important to look not only at the “benefits” but also the possible “problems” related to the implementation of the concept. This requires good discussion of some areas in which HCR gears are specifically contraindicated.

STUDENT FEEDBACK AND GRADING PROCEDURES

Assignments

A self-graded assessment is administered during this course. Immediate feedback is given, and the material is reviewed by the instructor.

COURSE MANAGEMENT

Weather Delays and Cancellations

We will communicate any cancellations, delays or other concerns for safety prior to class via email, voicemail, and/or text message. Please be sure that we have all pertinent contact information as you travel to your class location.

Attendance for Domestic and International Students

Please be mindful that these are short, accelerated courses. Attendance is extremely important. If you are going to be absent from any class day, please contact the course coordinator.

Plagiarism, Cheating and other types of Misconduct

Plagiarism¹, cheating and other types of misconduct are unacceptable.

Students with Disabilities

Students requiring assistance and accommodation should complete the [Special Accommodation Request form](#) and submit it to Stephanie Smialek, Education Manager at smialek@motionpower.org. She can be reached at 773-302-8026.

Grievance Procedures

Students who have concerns about the class are encouraged to contact Stephanie Smialek, Education Manager, at smialek@motionpower.org or 773-302-8026.

Outline Changes

The instructor reserves the right to modify the outline during the course of the class.

LEARNING AND OTHER RESOURCES

Links for writing resources:

- grammar.ccc.commnet.edu/grammar

¹ Plagiarism is defined as “the use or close imitation of the language and thoughts of another author and the representation of them as one’s own original work.”

- www.merriam-webster.com

Links for Math resources:

- www.sosmath.com
- Khan Academy on www.youtube.com

Links for time management, study skills and note taking resources:

- www.mindtools.com
- www.testakingtips.com

Links for career resources:

- <https://www.agma.org/newsroom/jobs/>

Industry News:

- <https://www.agma.org/newsroom/industry-news/>