Beginning Gear Training

Gearing. An Industrial Training Course. The Salem Company, Woodstown, New Jersey, 1991.

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Gearing is a self-training course for teaching the basic fundamentals of gears and gearing to those totally unfamiliar with the subject.

The study guide is broken down into eight sections, and each section has its own introduction, study material, self-study questions and answers and section summary. The framework of the book is quite good.

I especially liked the little historical introduction in each section, as it tends to make the subjects a bit more interesting and is a nice lead in to each topic. The summary at the end of each section is good, and the self-study questions and answers are very helpful, as they tend to make the student review and think more about what was covered.

However, the study material itself could use a little help. There are a number of errors, omissions and questionable definitions. For example, a pinion is defined this way: "A gear with a small number of teeth (under approximately 20 to 25 teeth) is called a *pinion*." Actually, a pinion is defined as being the smaller member of the two mating gears; therefore, a pinion can have any number of teeth. The correct definition is found on the next page of the book.

One self-study question includes the term "DP," but up to that point in the book, DP (Diametral Pitch) has not been defined.

When defining parts of gear teeth, such as addendum, whole depth, circular pitch, etc., the author should have included the abbreviations of the terms instead of adding them later in the book.

Two more serious errors: Pressure angle is not shown correctly in the drawings, and the author states that "circular pitch gears" are only used in old machinery, which is not the case. It also would have been helpful, in the course of the discussion, to point out why there are different PAs.

Whole depth (WD), is defined as whole depth = $\frac{2.157}{DP}$, but there are other proportions, such as WD = $\frac{2.25}{DP}$, WD = $\frac{2.35}{DP}$, etc., depending upon how the gear is manufactured.

Stub depth teeth are mentioned and covered nicely, but pointing out that stub teeth are stronger, but also noisier would have been helpful.

Fine pitch gears are defined as "smaller than 20 DP" This is correct, but the statement, "Those bigger than 16 DP can be called coarse pitch," is not. The dividing line between fine and coarse pitch gears is 20 DP.

The section on worm gearing is nicely done. It is difficult to explain linear and rotary motion on a two-dimensional drawing, and the author does it very well. In defining lead, the author states, "rhymes with reed." Very good!

However, the definition, "The angle of the [worm's] thread is called *lead angle* or *helix angle* is not correct. The helix angle is measured off the axis of the worm or gear, and the lead angle is measured off a line perpendicular to the axis. The helix angle is the complement of the lead angle. Helix angle = 90° minus the lead angle. The worm has a lead angle; the worm wheel has a helix angle.

In the "Helical Gears" section, it would have been better if the author had used TDP (Transverse Diametral Pitch) when calculating the pitch diameter of a helical gear, even if the TDP is an even number. This is common practice.

Other minor quibbles: When defining internal gears, only spur gears were mentioned: internal gears can also be helical. I also wish that when defining herringbone and double helical gears, the authors had explained why they are used.

A small "wish list" for the book would include a short explanation of compound gear ratios; an explanation of involute (the word was not found, which I found unimaginable when covering spur and helical parallel axis gears); and examples of typical gear drawings with gear data blocks included.

In spite of these shortcomings, I think *Gears* is an acceptable effort on a very complicated subject. The section on torque was done very well. The drawings throughout are clear, understandable and of good image quality. The material covered is very basic, but as the introduction states, it is a study guide for "beginners," "wanting to become familiar with industrial gearing."

I would recommend this book, (or sections of it) for initial training of people new to the gear industry. What is needed after *Gears* is a follow-up advanced study guide for specific types of gearing, where more necessary detail could be included. ✪

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