

Redliner Charts and Gear Inspection

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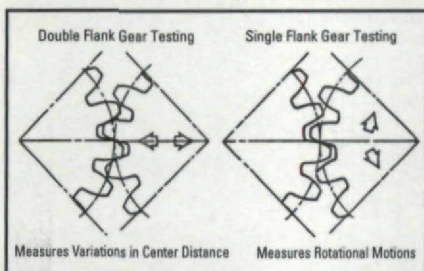


Fig. 1 — Types of composite gear inspection.

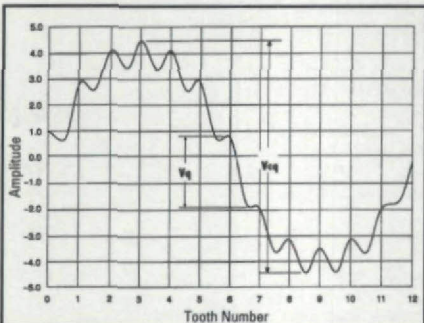


Fig. 2 — Strip chart of double flank composite test.

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Question submitted by
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Q: What are redliner charts, and who still does redliner charts?

Answer submitted by:
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A: For many years, the terms "red liner" and "red line charts" have been used by the Fellows Corporation in relation to their line of double flank composite testers. For example, they made the No. 4 Fellows Fine-Pitch Red Liner and the No. 12RL Red Liner. Double flank composite gear inspection is shown schematically in Figure 1. These instruments were in such common use that the term "red liner" became synonymous with double flank composite inspection.


The term "red line charts" apparently came from the fact that early recorders used pens that wrote with red ink. These were a constant maintenance problem, due to clogging and spatter. Later recorders used thermal writing pens and paper, thermal array printers, or even printers attached to PC computers. Double flank composite testers are made by many different companies and can use a variety of writing methods that do not produce a "red line" on the chart.

To compound the confusion even more, the term "composite" inspection has been taken to mean double flank composite inspection because it was in such common use. As can be seen in Figure 1, there is another type of composite inspection, called single flank composite, that can be used. Today, both types appear in gear quality standards such as AGMA and ISO.

Double and single flank composite testing results in charts such as that shown in Figure 2. However, they mean completely different things. As Figure 1 shows, double flank composite tests measure center distance variation as the gears roll through tight mesh. Single flank composite testing, however, measures rotational motion variation, as the gears roll through mesh at standard center distance, with backlash.

One can see that the continued use of the term "red line chart" is not a very good idea. The terms "double flank composite chart" or "single flank composite chart" would be more accurate and prevent confusion as to what the data means.

The second part of the question asks who still does redliner charts. Double flank composite inspection (to use the proper terminology) is very common in high volume applications, such as automotive transmission gears and fine pitch gearing made by cutting, molding, and powder metal processes. It is a good control of functional tooth thickness (size) and runout under certain conditions.

Double flank composite inspection can be a good control of runout before any subsequent finishing operations such as shaving and some grinding operations. However, after finishing, the chart may show very little runout, but the parts can still have a large accumulated pitch error that has all the ill effects of runout such as positional error or nonuniform once per revolution velocity. This is sometimes called "hidden runout." Single flank composite inspection will find these problems. See AGMA Technical Paper 95FTM1, *Detection of Hidden Runout*, by R.E. Smith, et al. 

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