GOT A GEAR QUESTION?

Ask the Expert!

Welcome back to *Gear Technology*'s Ask the Expert—a regular feature intended to help designers, specifiers, quality assurance and inspection personnel in addressing some of the more complex, troublesome gearing challenges that never cease to materialize—whether on the drafting table or the shop floor. Simply email your question—along with your name, job title and company name (if you wish to remain anonymous, no problem)—to: *jmcguinn@geartechnology.com;* or, you can submit your question by visiting *geartechnology.com*.

QUESTION #1

Refurbishing a Ball Mill

We are refurbishing an Allis Chalmers ball mill. The herringbone bull gears and pinion gears are worn. Can these gears be reversed?

Can herringbone gears be reversed?

The answer is yes—but both pinion *and* gear must be reversed.

By reversing only one member, the set will not match because the gear and pinion will have the apex running in the same direction.

Also, by reversing both members, we are assuming the set can be reversed from a dimensional standpoint.

I cannot tell you if dimensional issues will be a problem without seeing drawings.

Please feel free to call OCG if you have further questions. Once we see drawings and better understand the application, we can provide a more definitive answer.

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QUESTION #2

Bevel Gears: Backlash/Contact Pattern Optimization

It is very difficult to set by trial-and-error a pair of bevel gears for ideal backlash and contact pattern for regular, on-site gear technicians, as it involves lot of time for assembly. We have to bring in professionals—even after paying high charges for spares. Is there a faster/easier mode to arrive at an ideal combination?

Assembling bevel gears by trial-and-error is exactly the wrong way to go!

Properly made bevel gears should have their backlash and mating teeth marked on them—as well as the mounting distance each part has to be at—(in order) to obtain the backlash and no-load contact pattern. The mounting distances are meant to be used. You should measure your components and calculate the shims necessary to properly position each gear. Assemble the gears with the mating teeth engaged using the calculated shims. Only after doing that should you check backlash; it should agree with the markings. If it does, you should be OK; if not, you have made a mistake.

Backlash must be measured the same way the manufacturer did. On straight bevels, that is at the pitch diameter in the plane of rotation. But on spiral bevel and hypoids, the backlash is measured normal to the tooth surface. If you can do that directly on the gears, you can use the same number. If you have to do that outside of the gear box, you have to convert that number from the normal plane to the transverse plane—i.e., the plane of rotation. You will need to know the manufacturing cutter diameter and some of the gear geometry to do that.

That was the simplified answer.

How do you calculate the shims? How do you calculate the backlash in the plane of rotation? Both of these subjects have been carefully thought out and published by the AGMA Bevel Gearing Committee in *ANSI/AGMA 2008-D11: Assembling Bevel Gears*. There are photos and illustrations for examples of the methods and sample tooling used to assist in determining proper values. Images of incorrect patterns and the changes necessary to correct them are also included. There is even a detailed color photo annex with directions on how to take a contact pattern check if you really need to.

Far too much detail to be included in this limited description. You can purchase that document at: *www.agma.org* (AGMA members—$37; non-members—$74.)

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