George Wyss & Dennis Richmond of Reishauer Corporation

For this interview, we spoke with George Wyss, president, and Dennis Richmond, vice president of Reishauer Corporation about gear grinding and its place in gear manufacturing today.

GT: Where do you see Reishauer's place in the total gear industry?
DR: Reishauer is in a niche within a niche industry. Somewhere between 5% and 7% of those in the industry grind gears. That means 93% to 95% of them don't. That sets us apart, and we have to do things a little differently.

GT: Can you characterize the 7% you're talking about?
DR: For the most part, they are sub-contractors—people that supply to original equipment manufacturers. Some OEMs don't see gear grinding as a technology they want to invest in. They leave that up to shops that have decades of experience grinding gears. Most of our customers make complete gears—everything from cutting raw materials to heat treating.

GT: Which market segments represent most of your business?
DR: Roughly speaking, 70% of our business is gear grinding machines under 400 mm in capacity—that is, 16" or smaller; 10% is in gear grinders up to 800 mm. The remaining 20% is composed of gear honing and thread grinding machines. The gears show up in printing presses, machine tools, material handling, off-road truck and vehicle transmissions, industrial speed reducers and increasers and cars.

GT: You mentioned cars last. Is that the smallest segment?

George Wyss, president.

DR: In the U.S. it is. In Europe automotive represents approximately one-third of our business.

GT: Why such a small U.S. segment?
DR: The machines sold to the European automotive industry are primarily used for finishing manual transmission gears. We don't make many manual transmissions in this country.

GT: What about the Japanese automotive market?
GW: The Japanese car makers build transmissions differently. They are split into two sections connected by a set of transfer gears with approximately 50 teeth. Also the final drive gear creates quite a bit of noise. It's those gears that are being hard finished. More and more American car makers are also looking into hard gear finishing. They're changing their thinking, especially where noise is critical in the final drive gear set in a transmission. In the last five or six years, some U.S. auto makers have started grinding the final drive set. So, I wouldn't count grinding out of the U.S. automotive market.

GT: So you see grinding as something the American auto industry is beginning to pick up on?
GW: The problem is actually multi-fold. A few years ago when you bought a car, it came with a lot of noise, but you not only had transmission noise, you also had wind noise. Today, most of the wind noise is gone, but you hear the transmission. You have to do something with the transmission to make it more quiet.

GT: To meet customer demand?
GW: Yes, and the alternatives to grinding to control noise can be very costly.

GT: With the cutbacks in aerospace, what markets are taking their place?
DR: New markets such as motorcycle transmissions are a good example. Harley-Davidson is now grinding gears to reduce the drive-by noise generated by the engine and transmission in its motorcycles. Five years ago no one would ever believe that you could buy a Harley-Davidson with a ground gear transmission. Another example is wind power generation. In order to efficiently use wind and water for power generation, you have to have some way to generate electricity that uses very little energy or friction. The way you do that is with precision ground gears.
GW: During the Reagan build-up years, we sold a lot of machines worldwide, but right now the demand for ground gears in the aerospace and the aircraft industry is really diminished.
DR: There's a lot of excessive capacity

out there. The machines that were sold in the 80s are now 10 to 15 years old and certainly capable of still generating the necessary quality, at least for the time being.

GW: I don't see defense aerospace coming back with all the efforts for worldwide peace. I also don't think the commercial aircraft industry will boom. There's increasing demand over the next few years, but airplanes get faster, bigger, and you use fewer of them.

DR: But if you look at the average age of an airplane in an airline's fleet, it's now nearing 20–25 years old. So I think there could be another cyclic demand for commercial aircraft, and that might coincide with the need to replace the grinding equipment.

From a maintenance standpoint, the machines are going to be 15 or 20 years old, and the new technology is so much better that I think when the demand does come back, it won't take as many machines to satisfy it because the new machines are so much more productive.

GT: How are Reishauer machines changing?

GW: I think it will be difficult in the future to come up with machines that are even faster or more productive than they are now, because if this could be accomplished, it actually reduces the demand for new machines. They will be more expensive to build, and fewer machines will be sold because they're more productive.

You can only raise the technology of the equipment to the level of the tool. That is the key factor. If you look at grinding wheels today, there's a limit on how fast you can grind. Once you've eliminated all the idle times in the process, you are down to the tool. What's the grinding capability or the specific removal rate of the wheel? I think we are almost at the limit unless grinding wheels are going to be a lot more productive in the future.

I think the ultimate goal is to produce a gear for the least cost. Tooling and equipment has to be affordable for the customer, but I think the investment plays a secondary role. You may have to invest more in order to produce something at reasonable cost. You have to look at the cost per piece.

DR: The point is, if someone hasn't invested in new gear grinding technology in the last six years, they're not current. There's something on the market that's a lot better, that will produce a gear faster—up to 200 to 300% faster, depending on the age of the technology that they are using now—and make a gear for a lower perishable tool cost.

GW: There's always a relation between investment and cost per piece. Today you can produce a gear at a quarter of the cost that you could with old equipment, but the price of the equipment hasn't quadrupled; it's probably only twice as much.

GT: What about grinding wheel technology? How has it changed?

DR: Ten years ago there was a lot of interest in CBN. Some companies established processes that specified CBN. Recently an article published by the University of Aachen concluded that there was no advantage in compressive stresses gained from using CBN. With the new shift grinding machine technology we introduced several years ago, there is no productivity advantage to the single-ribbed, plated, CBN single-index grinding machine over our generating process. In fact, we now set the industry standard as far as productivity for medium pitch gears 400 mm and smaller.

Seeded gel wheels are also being used successfully, and we haven't abandoned aluminum oxide. That's been a mainstay over the years. The wheel composition has changed a little, and we are starting to see more and more induced-porosity wheels. They've given us some huge productivity gains.

GW: The basic material has not changed, but the ratios of composition have.

DR: I think that in the past we went with the approach that one wheel fits all. Now each gear has to be looked at individually, and we have to choose the optimum process for each specific part.

GT: Are there any other important trends to take note of?

DR: Many manufacturers are investigating honing, especially for high-volume applications, because the machine tool is less expensive, but I think most honing machine manufacturers are still trying to perfect the process. In most cases the gear is driven by the hone-ring. The machine doesn't require an electronic generating module. Honing machines are less expensive than grinding machines because they have fewer axes. Commercially available control components make these machines more economical to build. I think honing will definitely have a future once you have the right tool. By right tool I mean the right hone-ring and the dressing tool married to a rigid machine.

But honing won't eliminate grinding. If you want to have constant quality and process stability without tight control of the gear prior to heat treat, you can only get it by grinding. Honing by itself is not the answer to all the problems, but a combination of grinding and honing may be. In order to have honing accepted, we have to change the way we think about how we make gears in this country.

GW: Especially in the automotive industry. Eliminating shaving is quite difficult. If you talk to some engineers, especially in automotive, and tell them they don't have to shave any more, they say, then I have to roll. On the contrary, you don't have to roll either. It is hard to finish-hone a gear if you shape or roll it. You want to hob a gear, harden it and hone it without removing more material than you have to. But I don't think honing will replace gear rolling. That is by far the fastest process there is.

GT: How have the needs of your customers changed?

GW: I think the key point is that the machine operator from the past—the guy who had the expertise to know exactly what he was doing on the machine—is no longer available today. Now customers are looking for a process that allows anybody to run the machine with little or no training. If something breaks down, the customer expects us to be right there to keep the equipment going.

DR: We had a customer in Milwaukee tell us he wants to takes a guy off of the street and train him to run a grinding cell worth more than a million dollars in four hours. This individual is supposed to be totally responsible for the machine, process, quality and productivity.

GW: That's what we are faced with today. That's the trend. It's not realistic, but a lot of people expect this. They're pushing the envelope to come up with the lowest training cost and highest efficiency in terms of dollars and time. Customers assume CNC will let you train quickly, but there's more to a gear grinder than to a CNC lathe or CNC conventional machines. ✪

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