

Made in China: A GM Engineer's First-Hand Perspective on the Chinese Roller Bearing Industry

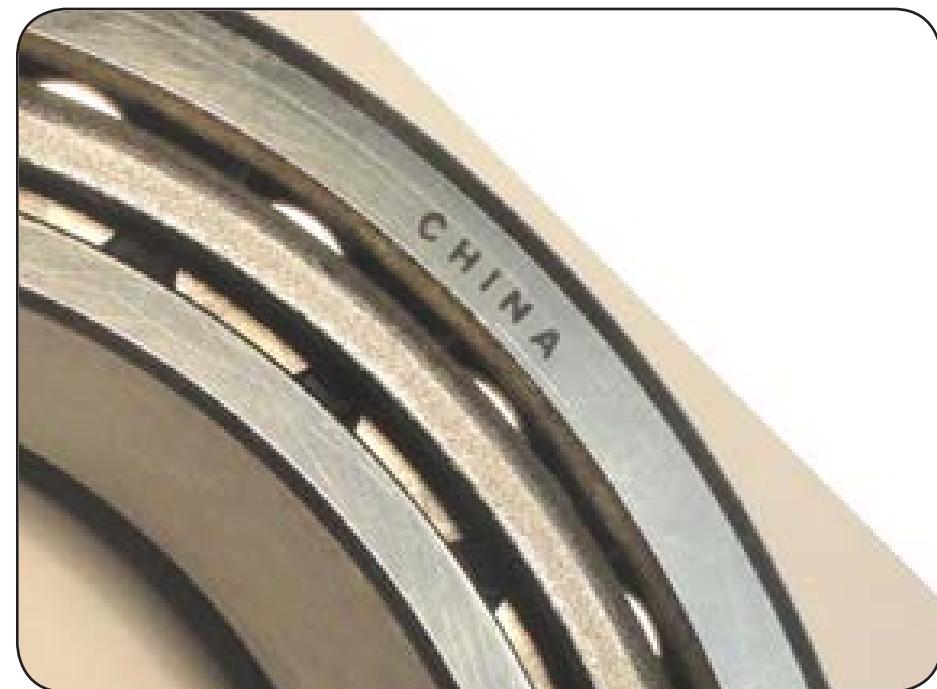
Norm Parker

Introduction

Believe me when I tell you that—as a domestic automotive engineer—I bleed U.S. manufacturing.

I have never lived more than 50 miles from Detroit, and if you live in or around its substantial 1,300 square mile metro area, it is a certainty that you are tied to the automotive industry in some fashion. When you say the sometimes dreaded words “foreign” or “Chinese” around here, people start lacing up the gloves. What makes the discussion around Chinese bearings a little easier is the understanding that the U.S. only produces about 20% of the global bearing supply and is almost always at full capacity. When we talk about purchasing bearings, we will use domestic supply when available, but there is a decent chance that we have no option other than to import.

Just recently I had the opportunity to take a 10 day tour of China to visit roller bearing facilities from the northern province of Liaoning down to Zhejiang, which is located just to the south of Shanghai. I had visited the Shanghai region 10 years prior for a manufacturing study, so it was nice to have a decade span for comparison. I was stunned 10 years ago when I saw Shanghai for the first time; I felt like I was in one of those movie scenes where the troops were quietly climbing the hill expecting to see a few tents in the valley on the other side, but when they crest the hill, they see that an entire city had been built. It looked like a country under construction. In every direction—as far as the eye could see—there were tower cranes and construction equipment. I was a little more braced for what I saw this time, but the growth is still mind-boggling. The starting point for our trip was Shenyang, in Northern China. I had never heard of this city so I didn't think too much about it. It



China produced nearly 20 billion bearings in 2013, and is on track for \$12 billion in sales in 2014—approximately 20% of the global market.

was a city of 6.2 million people with a city center that looked like a newer and nicer version of New York City. The “neighborhoods” were clusters of 12-15 30-story high-rises. There were high-end stores, gourmet restaurants and exotic car dealerships for miles in every direction. This no longer looked like a country that was “*trying*” to make it to the big leagues.

China produced nearly 20 billion bearings in 2013 and is on track for \$12 billion in sales in 2014, or approximately 1/5 of the global market. By conservative estimates, there are well over 1,000 individual bearing manufacturers in China today, and this is only the beginning. Historically, high-quality bearing manufacturing companies have been concentrated in the U.S., Japan and various parts of Europe. In the last 5-10 years however, Chinese manufacturers have

started getting serious about competing in high-end markets, including automotive, heavy industry, aerospace and other high-performance niches. The major Chinese manufacturers are no longer content with just being known as the cheap source for power tools and household goods. They are spending real money on R&D, hiring top-notch talent and investing in new equipment. Since my previous trip 10 years ago, I have felt like Paul Revere, riding around shouting, “The Chinese are coming! The Chinese are coming!”

Today I am telling you, “The Chinese are here (told you).”

Both Chinese- and non-Chinese-owned corporations have a massive presence in the country. All of the top eight global bearing manufacturers have established manufacturing capability in China, and many are adding technical centers to support the en-



Modern high-rise apartments, offices and hotels dominate the skyline in Shenyang.

tire region. They frequently tout their global standards and claim that wherever they make a bearing, the quality is the same. I am not going to attempt to qualify or refute that claim; what I am going to say is that no matter where or who you buy a bearing from, the same level of scrutiny should apply.

Evaluating the Manufacturer

What we need to know to evaluate a bearing manufacturer are: the **cost drivers**, the **process** and the **business**.

Cost drivers. Steel can account for a large portion of the overall cost of a bearing. This is a tempting area to cut costs, and part of the poor reputation that China had developed in previous years. Today, modern steel mills produce GCr15 along with international grades 52100, SUJ2 and 100Cr6 to global quality standards. Two mainstay bearing steel suppliers in China are Shanghai No. 5, a subsidiary of Baosteel, the world's second largest steel supplier, and Xingcheng Steel, the largest rolled bar steel supplier in the world. There are many other qualified steel suppliers, but these two behemoths are recognized globally as quality suppliers. Some non-Chinese companies will still bring in Japanese steel for production. With the quality of Chinese steel continually improving, I don't expect this will last forever. As good practice, I always advise having your metallurgy department give you an a/b quality analysis or spend a couple thousand dollars to have an outside lab do it for you. You may be surprised at the results.

Energy costs have typically been lower in China, though with increasing pressure for cleaner production, cost is creeping. Many areas still have requirements for rolling blackouts. This is disruptive for a factory—but is scheduled—and most factories have adapted fairly well. Unscheduled blackouts do occur with some frequency and can be a concern in heat treat operations. You should ensure your supplier has contingency plans for unscheduled blackouts.

Labor is normally thought of as the reason companies go to China. In a high-quality bearing facility most of the equipment is automated and requires one operator for every 1-2 grinding machines. The labor in terms of price-per-part is usually not significant enough to justify the millions of dollars it takes to move a production facility to China.

Capacity is a recurring issue; when times are good, manufacturers have no extra capacity. When times aren't good, manufacturers have under-utilized facilities. One attractive reason for having manufacturing in China is the ability to support the sizeable Chinese and Asia markets while being able to effectively outsource everywhere else.

Another draw for China is the availability of investment money. People, governments and countries are investing in China; the money is flowing and readily available.

R&D is a significant cost no matter where it occurs. Large Chinese companies are spending more and more in this area as a means to increase competitiveness. Large companies are also actively hiring experienced bearing personnel from other countries with expertise in the areas they are looking to develop. Many Chinese companies have established U.S. offices with R&D labs to support the U.S. market completely within the U.S. They are staffing these offices with local experts that understand the applications, know how to run sophisticated analysis software, and develop rapport with customers.

The process. In-house manufacturing vs. purchased components will affect cost. If there is a true differentiator between Chinese manufacturing and the traditional, large bearing companies, it would be in the processes that are done in-house vs. purchased. Traditional manufacturers often like to control as much of the process as possible in an effort to develop and control proprietary methods and to quickly contain any quality issues. For instance, purchasing bearing rings in the U.S. is nearly unheard of—but it is fairly common in China. In fact, there are well established ring manufacturers that will supply rings with various levels of heat treatment or completely



Figure 1 General bearing shows off a state-of-the-art cmm in their new metrology and material labs in Ningbo, China.



Figure 2 Hatebur amp 70 high-speed forge general bearing state-of-the-art grinding lines.

green. This is a different model than we are used to, but is working for many companies. If the supply base is well controlled and managed by the parent company and all of the components have traceability back to the bar stock it started with, it becomes more difficult to quantify the added risk. Many of the top 10 bearing companies regularly purchase components from well-known Chinese bearings suppliers, though usually not for high-performance parts. This goes right back to the scrutiny argument that one should know where every component of a bearing is coming from. One should treat every component in a bearing as a stand-alone part that falls under the same level of quality control as any other part; inner ring, outer ring, cage, rollers. These sub-component suppliers are still *your* suppliers. Good quality manufacturers will welcome and encourage a visit to their suppliers.

Forging is substantially more expensive than simply turning bar stock into a bearing race, but anything with high-performance demands must be produced with a forged billet for fatigue and strength properties.

For lightly loaded ball bearing applications, or for small ball bearings, turned bar stock is frequently used in lieu of forging. The cost of modern high-speed forging equipment can be the barrier to competing in higher quality/volume markets for many smaller companies. Modern, horizontal forgers turn rolled bar into bear-

ing cones and cups at sewing machine speeds.

Finish grinding operations are the heart of bearing manufacturing. In high-production finish grinding a series of grinders are set up in sequence with automated transfer lines between each machine. Each grinder will have an operator that may cover 2-3 machines who pulls parts for in-

spection and logs measurements on a schedule, making machine adjustments as needed. This is the area to really focus on to assess the ability of the company to be able to produce millions of bearings a month within single digit microns of tolerance. Ideally, finish grind leads right into final assembly and the bearing will not need to be touched again until it is ready for packaging.

Honing tapered bearing raceways and large ribs is not a requirement to meet international bearing standards, but is most likely what you will receive with any of the top 6 global companies—and even the top 3-4 Chinese companies. Honing is not cheap; it can require a multi-million dollar, dedicated machine that also adds processing time, energy costs, floor space, operators, maintenance and process con-

trols. Honing improves efficiency and wear properties for tapered bearings and noise levels for ball bearings, but generally does not affect durability. If the application is not sensitive to preload, torque or noise, honing may not be needed.

Final assembly can make or break your bearing quality, and thus should be fully automated—with minimal human involvement. Clean room assembly is becoming more commonplace, either in a dedicated room or machinery that is completely enclosed creating an effective clean environment. Set up correctly, final assembly is the process than can catch most things that went wrong upstream outside of steel quality. There should be redundant checks for mass, height measurement, torque, noise, vibration, roller count and orientation along with 2-3 wash stations. Often, smaller companies will try to forego expensive, automated machines in favor of cheap manual labor. This is not acceptable for high-quality and high-volume parts, but can be suitable for very large industrial bearings or low-volume, custom parts. Regardless—redundant quality checks should be in place.

The business. Local support is obviously not free, but many foreign companies have learned that this is not an area to try and skimp on. Local support can be a huge benefit when developing new products, quickly evaluating issues and consulting for general technical support. Local support usually means experienced personnel that will answer calls and emails on the spot, be



Rich Oblizajek and Rick Peterson of C&U in their new metrology lab in Plymouth, MI.



ZWZ National Research Center, Wafangdian, China.

on site within hours, along with decent in-house metallurgical and metrology capabilities. Labs are expensive and the potential benefits to your company should be taken into consideration when comparing prices to a company with one sales rep working out of their house. Determine how much you would spend on an outside lab to run the same level of analysis and testing that your local support is going to provide and rough that into a value-per-piece-price.

Politics in China are often a point of contention for many people. In this area we consider that China is a communist country, counterfeit parts run rampant, and the industry is loaded with dumping regulations. Twenty years ago, nobody could have a business that was free of government ownership. Any foreign interest in the country had to partner with a Chinese company that owned at least 50% of the business, and most of those partner companies were partially or wholly owned by the government. It is absolutely reasonable to question where your money is going. The point here is not to debate the ideology of communism or China. The observation is that things are quickly changing. Fifteen years ago an American could not walk down the streets of China without a Chinese security escort.

Today, the Chinese government allows wholly owned U.S. subsidiaries in the country to operate very much like they do in the U.S. Certainly, not everything is perfect, but the situation has improved dramatically and continues to improve. I have personally worked

in worse conditions than any of the 12+ factories I saw during my visit.

The point in understanding cost drivers is to know why you are receiving a higher or lower quote from someone, regardless of whether it is a Chinese company or a U.S. company with manufacturing in China. Where the money is going is an important question; is it steel, forging, grinding, labor, or something else? If you are trying to make the cheapest cordless drill possible, by all means skip forging, honing and automated assembly; the point is, you are an informed buyer. If a company offers you an "equivalent" bearing at a 25% discount, you need to understand where and why you are saving money. Do not accept a trivial answer. You are paying for it somewhere. Some companies will try to "buy" your business; meaning, taking a net loss on the price with the intent of gaining more business at a profit later. Those practices, in my opinion, drive lower quality into the market because it sends the message that we are only concerned

about price regardless of how it occurs and that we don't acknowledge the real money that other companies have spent to improve their products.

Dumping has a long, contentious history in the bearing industry. Anti-dumping legislation began in 1947 after WWII, at the dawn of free trade agreements. Bearings anti-dumping duties, as we know them today, began in 1974 when Timken started going after Japanese importers that were selling below cost in order to gain market share. Interestingly, while the U.S. keeps a close eye on the Chinese markets for fair practice, China has recently fined other foreign bearing companies for unethical pricing practices in their country. Dumping and price-fixing is not a problem exclusive to the U.S. Today, Chinese anti-dumping can be significant, depending on the company history, range of product, uniqueness of product being imported and cost of other similar goods sold from the company within China. Most of the top producers are in the single digits or have "revoked" status (zero dumping).

Counterfeit bearings are an ongoing problem. Every large bearing company has counterfeits in the marketplace, without exception. Since 2009, Chinese Customs seized almost 3 million counterfeit bearing products at their borders, en route to 50 different countries, including the U.S. The good news is, the Chinese government is actively fighting this at their borders and our customs agents are formally trained to look for counterfeiting at every port. The easiest way to protect against fake bearings is to purchase directly from



CW Bearing new HQ concept in Novi, MI.

the manufacturer or from one of their approved distributors. It is highly discouraged to buy bearings on the same site where you can buy books or antiques. It is also not recommended to buy from a smaller bearing company claiming to carry other name brand parts.

Here is where things start getting difficult: in a country that is creeping up on 20 billion bearings a year, many are good quality—but many are not. Bearings just seem to be a magnet for cheap producers and counterfeiters because you can take 60-year-old machinery with dirty steel and still produce a bearing that *looks* like any other bearing. This problem is not unique to China; they just happen to have 20% of the world's population, so the problem is proportionately larger there.

Investment

Something that may be surprising is the considerable investment that Chinese companies are today. This is both with U.S. personnel and capital going into high-quality production facilities for U.S. bearing export. Here are just a few highlights from Chinese supplier development in 2014. ZWZ breaks ground on a global automotive engineering center in Plymouth, MI while finishing a national research center for roller bearings in Wafangdian, China.

General Bearing, who has been recently purchased by SKF, is a U.S. company that has exclusive production in China and has dominated the U.S. semi-truck and trailer wheel bearing business. They continue to expand their global footprint with cutting edge technologies in logarithmic crowning and in-house roller manufacturing, along with their own newly designed individual roller inspection machines.

The C&U Group broke ground on a new industrial park in Wuhu, China, that covers 17 million square feet and will be home to 20 manufacturing plants, an R&D center, employee housing, an inland freight terminal and a private school supporting underprivileged local children. CW is a privately owned firm in Ningbo China and is rapidly growing in the ball bearing division while also breaking ground on a new R&D center located in Novi, Mi.

Conclusion

The size and growth of the Chinese market can be intimidating—by any definition. A conversation that really stuck with me during my visits was with a general manager of a facility I was visiting who was driving me across town. He said in 1988, China was producing around one-half million vehicles a year, while the U.S. was producing nearly 16 million. He said the notion that China could ever catch up to the U.S. just seemed like nonsense, fantasy talk. Last year they produced 22 million vehicles—many of them by U.S. or European auto manufacturers. The Chinese themselves are having trouble understanding how fast they are growing and what the future holds. I was surprised that, not unlike the U.S., many older people miss the old days. They say that everything is about money now; and that there is more to life (sound familiar?). Most Chinese revere American products. Our cars are considered the best. "Made in the USA" is always considered as good as it gets, regardless of the product. George Clooney and Brad Pitt can be seen on nearly every corner on a billboard or digital screen, promoting everything from Rolex watches to luxury cars. In some ways, it helps me to know that the people I'm doing business with genuinely like me and my country—which is not always the case. In my mind, this massive industry and this massive country seem to be here for the long haul.

My job is not to like it or dislike it. My job is to simply understand it as well as I can and react in a way that makes the most sense with the best information I have at the time. **PTE**

Resources

ZWZ

Special thanks to: Ryan Hesselink, Jason Sholy. www.zwzbearingusa.com

General Bearing Corp.

Special thanks to: Gary Binienda, Rick Janssens. www.generalbearing.com

C&U Americas

Special thanks to: Rich Oblizajek, Rich Peterson. www.cubearing.com

CW Bearing

Special thanks to: Jay Click, Chris Keelean. www.cwbearing.com

PROMPK.RU

prompk.ru/ntn-snr/index_indust_rus.htm

Bearing-News.com

www.bearing-news.com/china-produced-1-8-trillion-bearings-in-2012
www.bearing-news.com/in-the-first-half-of-2012-china-produced-more-than-8-billion-bearings

Bloomberg

www.bloomberg.com/news/2014-08-19/china-imposes-28-million-antitrust-fine-on-japan-nsk.html

Freedonia

www.freedoniagroup.com/World-Bearings.html

WBOC 16

www.wboc.com/story/26325061/global-and-china-bearing-industry-size-2013-market-analysis-growth-trends-and-forecast-report-2016-marketresearchreportsbiz

Benzinga

www.benzinga.com/pressreleases/14/08/p4792219/global-and-china-bearing-industry-size-2013-market-analysis-growth-tren

SKF

www.skf.com/group/investors/bearings-market

Baosteel

www.baosteel.com/group_en

Xincheng Special Steel

www.jxc.com/en

For Related Articles Search

CHINA

at www.powertransmission.com

Norm Parker

is the bearing technical specialist for the driveline division at General Motors LLC. Located onsite at the Milford (MI) Proving Grounds, he is regularly tasked with testing theoretical models in the real world, in real time. With his bachelor and master degrees in mechanical engineering from Oakland University (Rochester, Michigan), Parker has developed a keen interest in the academic, commercial and engineering aspects of the bearing industry. Prior to joining GM, he rose through the ranks of traditional bearing companies; by so doing he acquired invaluable experience in working with some of the largest customers — with the toughest applications and demands — on the planet. Parker plans to continue expanding his expertise and providing substantial personal contributions to bearing technology through metallurgy, design and processing.

