



Dennis Tanrikulu

CASE CARBURIZED TAPERED ROLLER BEARINGS. . **MADE IN THE USA**

Do you know who the world's second largest producer of case carburized tapered roller bearings is?

Why it is NTN! Since 1918, NTN has been producing all types of anti-friction bearings. We have been producing tapered roller bearings for many decades. We manufacture both cup and cone assemblies. The smallest being a 5 mm bore; up to custom large bore products. In addition to tapered roller bearings, NTN produces a complete line of anti-friction roller and ball bearings.

You will find NTN tapered roller bearings in a variety of applications, from steel mill work rolls, large construction equipment, agriculture machinery, wind energy, gear boxes, pumps & compressors, as well as class 8 trucks. These are just some of the many applications for NTN products.

NTN produces tapers in six manufacturing facilities both in the United States, as well as in Japan. In the United States, NTN has two manufacturing plants dedicated to tapered roller bearing production: Macomb, IL and Hamilton, AL. These plants are ready to meet the needs of your customers with competitive lead times.



Macomb, IL Facility

The Hamilton, AL and Macomb, IL facilities manufacture Bower brand product. Back in 1985 NTN purchased the Bower plants from Federal Mogul. Today, if your application requires a Bower taper assembly you only need to contact your local NTN representative for assistance

These plants have undergone many changes since they were first acquired. NTN has invested heavily to support the needs of the market. Currently, the Macomb, Ill facility is in the middle of a phased in plant expansion. Once the expansion is complete in 2008, we will have over 700,000 sq ft of manufacturing space under roof.

Over the last three years we have invested over \$15 million in upgrades resulting in added capacity at Macomb. Our expansion plans are not just limited to the U.S. market. NTN has embarked on an aggressive expansion plan for our large bore bearing facility located in Kuwana, Japan. This capacity is being added to service the ever-increasing needs for large bore product used in the Aftermarket.

Many large OEM customers have come to rely on the NTN brand for uncompromised quality and reliability. Should your customers call for either a standard product or custom engineered solution, you can count on NTN to meet the demands of the application.

*Best Regards,
Dennis Tanrikulu, VP Aftermarket Sales
NTN Bearing Corporation Of America*

SALES OFFICES:

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INNOVATION

NASCAR RACING WHEEL BEARING HUBS

NTN has a long history of involvement in many forms of motorsports including supplying components, providing technical support, and team sponsorship. Through this involvement, we have found that in most forms of racing, a great deal of energy is spent improving the overall efficiency of the car in order to gain a performance advantage. NASCAR's Truck, Busch, and Nextel Cup series teams are no different. NTN's involvement in racing and existing world class tapered bearing technologies led to the development and production of NTN's Formula racing wheel hubs for use in NASCAR stock cars.

NTN's Formula hubs play a role in this quest for reduced lap times. NASCAR rules mandate the basic size, bearing type, and material used for the wheel hubs used on these vehicles. Even given these strict parameters, NTN was still able to provide a more efficient package by adopting its "ECO-Top" technologies for tapered roller bearings. There are two tapered roller bearings in each hub which have ECO-Top features to improve performance. The low torque technologies of an ECO-Top bearing provide double digit efficiency gains while NTN's "ET" (Endurance Tapered) material and "AS" (Austenite Strengthening) special heat treatment increase the durability well beyond the already robust standard tapered roller bearings made by NTN.

While still relatively new to this market, NTN's Formula hubs are gaining popularity. NTN's hub efficiency, overall high build quality, and consistency are attributes enjoyed by numerous teams from the Craftsman Truck Series all the way to the Nextel Cup Series.



Formula Racing Wheel Hubs



Looking back, did you have a brother who was smaller, weaker and unable to withstand the punishment you could?

If so, you have a lot in common with the tapered roller bearing (TRB), big brother to the angular contact ball bearing (ACBB).

How so?

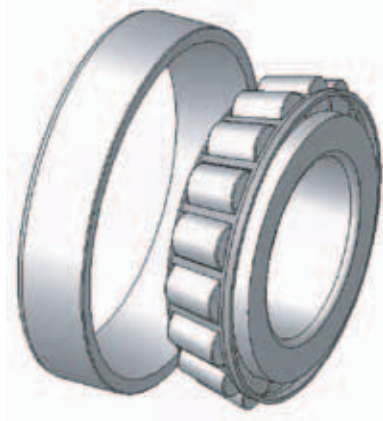
The tapered roller bearing (TRB) is the angular contact ball bearing all grown up. To put it another way, it's the ACBB on steroids! Tapered roller bearings are angular contact bearings that can withstand very high, combined loads. Fitted oppositely with an identical bearing, they provide high assembly stiffness, particularly when pre-loaded. Their load capacity and versatility makes them the second most commonly used bearing, right behind the ubiquitous radial-contact ball bearings.

Widely used in the truck and automotive market, tapered roller bearings support various combinations of thrust and radial loads and can be disassembled into parts, or subunits; the inner ring and roller/cage assembly or "cone" and the outer ring or "cup". Subunit dimensions are standardized under ISO or ABMA standards and unified subunits are interchangeable within each dimensional standard. High precision tapered roller bearings are generally not interchangeable.

NTN manufactures tapered roller bearings in a variety of series to meet industry application requirements. All the bearings in a series have the same internal construction and load carrying capability. Any cone within a given series may be combined with any cup in the same series, resulting in the same load rating. In addition, NTN makes various types of single

TECHNICAL TIP

THE NTN TAPERED ROLLER BEARING

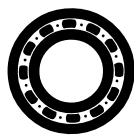


row, two-row and four-row tapered roller bearings consisting of a variety of cone and cup configurations.

In recent years, NTN has focused its attention on developing tapered roller bearing products that offer enhanced life through increased fatigue strength. This has been accomplished by research and development of more specialized heat treatment processes.

In addition to improvement in overall life, improved indentation resistance and better seizure resistance has been realized, all resulting in reduced size requirements and a more reliable bearing.

When it comes to brothers - big, little, weak or strong - the old adage rings true; you can't pick your relatives. But, happily for industrial consumers of bearings, the market is rich with highly engineered precision tapered roller bearings supplied by NTN, the clear choice when a thoroughly researched, precisely manufactured product is required!



PETER LORENTZ
Sr. Product Analysis Engineer
NTN - Wheeling Test Lab

The rolling-contact bearing is one of the most critical elements of any application to the extent that it impacts the machines performance. For example, if one of the axle bearings of an automobile or a railway car breaks down, a serious accident could occur.

By their very nature, bearings will become unserviceable in the course of time even if they are installed correctly and operated properly. The rolling elements, raceway and rolling contact surfaces are repeatedly subjected to compressive loads causing surfaces to eventually flake.

The life of a rolling-contact bearing is defined as the total number of revolutions (or the number of operating hours at a given constant speed) before flaking occurs. The bearing may also become unserviceable due to a variety of other reasons. These problems, which are distinguishable from normal fatigue issues, are avoidable by proper bearing selection, handling and maintenance.

Unfortunately, breakdowns due to improper application, bearing design, and maintenance are more frequent than fatigue type. Therefore, it is important to be knowledgeable regarding bearing failures modes and their causes.

Improper Fit



Fitting surfaces are glazed, matted and sometimes spalled. Fitting of ring is loose causing fretting corrosion due to relative motion between surfaces.

TAPERED ROLLER BEARINGS: COMMON FAILURE MODES

Excessive Radial Loading



Fatigue spalling and debris denting, possible chipping of roller surface due to edge loading with back end of cone raceway.

Inadequate Lubrication



Peeling is a cluster of very small spalls that can include small cracks. Tends to occur if lubrication characteristics are poor.

Excessive Axial Loading



Localized damage on rolling contact surfaces; heavy abrasive scratches, peeling, and/or smearing damage along with localized heat discoloration.

Rust and Corrosion



Rusting or corrosion of bearing ring at spacing equal to the distances between the rolling elements.

Excessive Endplay



Localized damage on rolling contact surfaces; mild polishing to smearing damage with possible heat discoloration.



TALES

FROM THE ROAD - *By Roberto Carriedo*

I have been traveling with the NTN Technical Training Unit (TTU) for almost two years now and have seen and done a lot. During my time with the TTU we have conducted trainings at end users, distributors, and OEM customers. The facilities have ranged from motor shops to steel mills to beef processing facilities. Some of these places really make me appreciate the people that work in these environments.

One waste energy plant that we conducted training at could easily make an appearance on the Discovery Channel's *"Dirty Jobs with Mike Rowe."* The plant burns garbage from the city and uses the steam generated to create energy for the city. Air freshening sprays are used outdoors to lessen the smell of garbage. Let me tell you, I question if that is sufficient. We conducted seminars that covered topics such as mounted units, spherical roller bearings, ball bearings, and also conducted hands on training. At the end, the attendees were very pleased with the training and have asked us to come back the next time the mobile unit is in town.

When we are on the road we try to have fun as well during our down time. Being an avid fisherman, I have hit some of the best places to fish while traveling with the unit. I purchased a spare rod and reel to keep on the TTU, so that we can stop anywhere and fish. One of the most memorable trips was when we drove the TTU from Helena, MT to Salt Lake City, UT. Although we did get skunked on that trip, (since I am not a trout fisherman, I could not land one for the life of me) we still had a lot of fun.

I can honestly say that I have experienced some of my best moments with NTN while on the TTU. The best part about traveling with the TTU is the experience that I gain from meeting new people and seeing different applications. I believe that being able to see all of these applications is critical to learning the bearing industry. Not only do I get to travel the country, I also get to see the actual

applications that our bearings go into. This gives me a better feel for what is critical in each application. Many times, I use this information as a reference when selecting bearings for similar applications.

"The TTU Having A Little Fun!"



NTN Tailgating -
Notre Dame vs. Michigan State Football Game
(Sept, 22, 2007)



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ROBERTO CARRIEDO

Application Engineer - Aftermarket Engineering Dept

An important part of NTN is its employees who know the products better than anyone else in the industry. By working daily with a variety of customers and applications, NTN's engineers gain the knowledge that makes them the company experts. One such expert is Applications Engineer Roberto Carriedo. Roberto graduated from Southern Illinois University-Carbondale. Providing engineering support to the aftermarket, he shares his expertise with customers through the several training platforms NTN offers. Outside of NTN, Roberto enjoys playing football, baseball and

WE ASKED ROBERTO TO SHARE SOME PERSONAL INSIGHT ON THE FOLLOWING SUBJECTS...

How does NTN training programs meet customer needs?

Before any training session, we obtain customer information from sales to tailor the training to that customer's needs. Sometimes we have a mixed audience in which case we try to cater to the different topics and interests. To avoid excluding a group from the training, we find a common ground and show examples of relevant applications. Ultimately however, the technical training NTN provides is valuable to all customers because it helps keep their costs down and equipment running properly.

What is the most challenging aspect of a Technical Training Unit (TTU) session?

We often receive questions that are too general, such as "What bearing will fit this shaft size?" but it is much more involved than that. We try to get more detail on the application to best assist the customers and then show them how to find the information they need. The goal of every training is for the customers to learn something, to leave with more knowledge than when they came.

What is beneficial about training through the TTU?

For NTN, the TTU provides face-to-face interaction with customers and allows us to work with a variety of applications because every customer is different. For the customers, we come to their facility where they will often have failures and/or applications ready for us to look at. Additionally, being at their location allows them to be available in their plant if needed.