World Bearings

with forecasts to 2005 and 2010

- The world bearing market for anti-friction bearing products is forecast to grow 6.5 percent per year through 2005 to US$42 billion.

- The Asian bearings market is expected to perform well, with the large markets of China and India projected to see some of the best growth in the world.

- Strongest regional gains in bearings consumption are expected in Latin America and Eastern Europe, although they will remain relatively small players on a global level.
World Bearings, a new study from The Freedonia Group, provides you with an in-depth analysis of the major trends in the world market for bearings and the outlook for product segments and major markets -- critical information to help you with strategic planning.

This brochure gives you an indication of the scope, depth and value of Freedonia’s new study, World Bearings. Ordering information is included on the back page of the brochure.

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The world bearing market for anti-friction bearing products is forecast to grow 6.5 percent per year through 2005 to US$42 billion.

The Asian bearings market is expected to perform well, with the large markets of China and India projected to see some of the best growth in the world.

Strongest regional gains in bearings consumption are expected in Latin America and Eastern Europe, although they will remain relatively small players on a global level.

North America and Western Europe will see the weakest gains in bearings demand through 2005, largely a result of their mature markets as well as slow-growing bearings-consuming sectors such as motor vehicles and industrial machinery.

While basic bearing technology is well-established and well-understood, there is some potential for performance-enhancing product differentiation, along such parameters as "smart bearings" (which incorporate electronic sensors) and nontraditional materials of construction (e.g., plastics, ceramics, advanced alloys and the like).

Among the world’s leading bearings manufacturing companies are SKF (Sweden), NSK (Japan), Koyo Seiko (Japan), NTN (Japan), Timken (US), FAG Kugelfischer Georg Schaefer (Germany), INA (Germany) and Ingersoll-Rand (US, via Torrington). Combined, these firms accounted for approximately three-quarters of the world’s bearing market in 2000.
**Study Highlights**

### World Bearings Demand

*Sample Table*

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<th>Item</th>
<th>1995</th>
<th>2000</th>
<th>2005</th>
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<td>1110</td>
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<td>4030</td>
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<tr>
<td>Africa/Mideast</td>
<td>482</td>
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</table>

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**World Bearings Demand by Region**

- **Western Europe**: 25.0%
- **North America**: 24.4%
- **Asia/Pacific**: 38.6%
- **Eastern Europe**: 6.1%
- **Africa/Mideast**: 2.3%
- **Latin America**: 3.6%

Order form on last page
Tables and Charts are featured for each region and country. Historical data and forecasts are presented for 1995, 2000, 2005 and 2010.

For each country/region, the following are given:

- Population
- GDP/capita
- Gross Domestic Product
- % fixed invest
- Gross Fixed Investment
- $ bearings/000$ GDP
- $ bearings/000$ GFI

Bearsings Sales by Application
- Industrial Machinery
- Motor Vehicles
- Aerospace & Other

- net exports

Bearsings Shipments by Type
- Ball Bearings
- Roller Bearings
- Other Bearings & Parts

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Order form on last page
The Market Environment Section discusses key indicators that drive demand for bearings, including motor vehicle production trends and Freedonia’s uniquely developed macroeconomic indicators.

This information provides you with an understanding and an analysis of the climate in which the global bearings industry operates and helps you build your market strategy to sustain long-term growth.

**Bearings Technology & Materials Trends**

Two technological parameters worthy of special note as the bearings business enters the new millennium are the rising use of advanced materials of construction (for rolling elements, housing, components, etc.), and the potential applicability of so-called “smart” bearings. With respect to the former, a considerable amount of research and product development activity has occurred in the area of alternative materials to traditional steel and other metals (cast iron, bronze, etc.) in bearings applications. Ceramics, plastics, and advanced metals and alloys have all been deployed as bearings materials. For example, for pumps and other rotating machinery, Carbone-Lorraine offers bearings that are available in graphite, carbon-graphite or silicon carbide materials of construction, and that exhibit corrosion-resistance, low-friction properties and self-lubrication capabilities. On a somewhat different track, Imo Industries’ Boston Gear unit has developed linear bearings featuring black oxide coatings for corrosion protection and plastic balls designed for quieter operation. In the advanced metals area, Thomson Industries offers ball bearing balls made from Inco Alloys’ (Inco Limited) MONEL corrosion-resistant nickel-copper alloy.

Smart bearings, a byproduct of the automotive electronics arena, are bearings fitted with electronic sensors allowing the bearings to help control certain characteristics of the machinery or equipment on which they are deployed, in particular speed. The initial generations of smart bearings, which first appeared in the late 1980s, were deployed with anti-lock braking systems (ABS) on motor vehicles. Although commercialization has proven slow, vendors have been examining the potential for smart bearings in non-automotive settings -- such as earth moving equipment and industrial machinery -- and for measuring and controlling parameters in addition to speed -- including temperature, vibration and load. An example of a commercially available smart bearing product is Timken’s SENSOR-PAC, which incorporates a Hall-effect sensor for detecting wheel speed and helping control...
World Supply & Demand

This Section highlights the key issues that have affected the global bearings market over the past ten years and summarizes contributing growth factors.

This information helps you:

- Focus your sales and marketing efforts on high growth areas.
- Propose new areas for development

Bearing Products - Roller Bearings

Roller bearings feature a greater rolling surface area in contact with the inner and outer rings than is the case with ball bearings. Roller bearings can thus generally support heavier loads. Roller bearings are classified according to the shape of the roller used. The main categories include cylindrical, spherical, needle and tapered. Like ball bearings, roller bearings demand is expected to see healthy growth through the next several years, but per annum growth will modestly lag that of ball bearings, as the heavier-industry applications in which roller bearings are typically used are more mature in developed countries, and somewhat less subject to secular expansion in developing areas. Roller bearings have also seen their use decline relative to ball bearings in certain applications over the past several years -- especially light vehicles -- and this trend is expected to continue for a time. Again, however, given the diversity of applications, per annum growth differentials between the major generic bearing types are not expected to differ significantly for the foreseeable future.

Cylindrical roller bearings have cylindrical rollers that are in linear contact with the raceway. Such bearings have a large radial load capacity and are suited for handling heavy loads and high speeds. For high-speed applications, machined brass cages are commonly used. However, cylindrical bearings lack thrust-load capability. Common applications include metal rolling mills, heavy equipment, construction and aerospace equipment. In early 2001, SKF announced that it had developed a new kind of high-precision cylindrical roller bearing, said to enable high-speed spindles to achieve high rigidity without design compromise. New features of this bearing include a large number of small ceramic rolling elements and a high-tech engineered polymered cage. Made of lightweight, glass fiber reinforced poly-ether-ether-ketone, the cage is said to have good wear resistance, low friction and good stability at high speeds. The use of silicon nitride rollers...
The Country Sections analyze supply and demand trends and consider the threats and opportunities in each country and region.

**China**

Aggregate demand for anti-friction bearing products in China totaled $3.4 billion in 2005, making the country the world’s third largest bearings market behind the US and Japan. This directly reflects the substantial amount of industrialization that has occurred in the economy since the initial reforms were implemented some two decades ago. This has involved significant expansion of industries that are users of bearing products, including motor vehicles, machinery, aerospace equipment, lower-end electrical and electronic equipment, and process manufacturing. The diverse Chinese industrial sector utilizes most types of anti-friction bearing products in moderate to sizable quantities.

China has also emerged as a major producer of bearings over the past decade or so, with domestic shipments estimated at some $3.6 billion in 2000—making the country the world’s third largest producer of bearings, behind Japan and the US. Due in no small measure to trade with the US, with which the country ran a $135 million surplus in 2000, China is also a fairly significant net exporter of bearing products, with volumes more than doubling over the last decade. China’s exports have focused on regional neighbors such as Japan, South Korea and Taiwan; Germany and other West European nations; and the former Soviet Union.

The Chinese industry is a particularly important supplier of single-row radial ball bearings, as well as integral shaft and angular contact ball bearings, tapered roller bearings, and ball and roller bearing components and parts.

The Chinese anti-friction bearings market is projected to increase 10.3 percent per year through 2005 to $5.5 billion, still among the fastest rates of growth expected in any country in the world, but a deceleration from gains achieved during the pre-Asian crisis period (i.e., prior to about 1997). Aside from normal maturing, the Chinese bearings markets are expected to grow at 10.3 percent per year through 2010, still among the fastest rates of growth expected in any country in the world.

---

**Table: Argentina - Bearings Supply & Demand**

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<td>Population (million persons)</td>
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<td>34.8</td>
<td>37.0</td>
<td>39.2</td>
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<td>GDP/capita</td>
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<td>8390</td>
<td>9220</td>
<td>10540</td>
<td>12490</td>
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<td>Gross Domestic Prdt (bil 1998 US$)</td>
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<td>341</td>
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<td>% fixed invest</td>
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<td>Gross Fixed Invest (bil 1998 US$)</td>
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<td>$ bearings/000$ GDP</td>
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<td>$ bearings/000$ GFI</td>
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<td>Industrial Machinery</td>
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<td>Motor Vehicles</td>
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<td>net exports</td>
<td>-32</td>
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Gain a better global understanding of your competition and analyze your company’s position in the industry with information about:

- industry composition & market share
- product development
- manufacturing
- market leaders
- marketing & distribution
- financial requirements
- mergers & acquisitions
- industry restructuring

**INDUSTRY STRUCTURE**

**Product Development & Manufacturing**

Although not generally considered a particularly technology-intensive business (compared to such activities as aerospace, electronics, biotechnology and the like), intense intraindustry competition has prompted anti-friction bearings manufacturers to more closely examine technology-driven product differentiation as a potential lever of competitive advantage. Beyond this, special-purpose bearings (including miniature ones used in computer and electronic equipment) and bearings designed for use in harsh or physically demanding environments inherently involve relatively more sophisticated technological inputs. For example, certain aerospace-related applications require highly specialized, lubricant-free bearings capable of rotating in a vacuum. Operating conditions for most other types of bearings, even many commodity-type ones, have become more severe as well, prompting producers to constantly upgrade product designs and production processes, while developing superior and/or alternative materials such as ceramics, engineered polymers and advanced metal alloys. The industry must meet requirements for both mass-produced products (e.g., motor vehicle bearings) as well as small-lot bearings for less bearings-intensive applications (such as machine tools). Western bearings producers spend close to two percent of total revenues on R&D, which is near the lower end of the average range for all developed-world manufacturing industries.

The manufacture of bearings is highly mechanized and lends naturally to automated production techniques. Computer-aided design and manufacturing (CAD/CAM), laser gauging and optical scanning devices, and highly automated material handling equipment are all commonly employed in bearings production processes. The five specific processes involved in bearings manufacture are green machining (i.e., the machining operations performed on raw materials prior to heat treatment of outer and inner rings and rollers), heat treating, finishing, assembly and inspection. Principal raw materials used include special bearings-grade alloy steel.

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Company Profiles

The Profiles Section analyzes 32 companies active in the world bearings industry. These profiles represent a sampling or cross-section of the types of companies involved in the industry.

Divisions, subsidiaries, joint ventures, etc., are discussed under appropriate parent companies.

Sources for profiles included:

- Information provided by key staff members in the respective companies
- Annual reports
- 10-K reports
- Security analysts reports
- Corporate product literature

<table>
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<th>COMPANY PROFILES</th>
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<td>Ingersoll-Rand Company</td>
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<tr>
<td>200 Chestnut Ridge Road</td>
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<tr>
<td>Woodcliff Lake, NJ 07677</td>
</tr>
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<td>201-573-0123</td>
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<td><a href="http://www.ingersoll-rand.com">http://www.ingersoll-rand.com</a></td>
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</table>

Ingersoll-Rand (I-R) is a multinational manufacturer of non-electric industrial equipment and components. In the first quarter of 2000, the Company reorganized into four new segments: Infrastructure, Security and Safety, Industrial Productivity and Climate Control. I-R recorded 2000 sales of $8.8 billion were to the US and $3 billion were to other areas. The Company employed 5,100 in 2000.

The Company is active in the world bearings industry through the Bearings and Components unit of the Industrial Productivity segment. The Bearings and Components unit primarily operates through I-R’s Torrington Company subsidiary (Torrington, Connecticut). Torrington is a leading worldwide producer of precision bearings and motion control components and assemblies. The company sells its products to original equipment manufacturers and industrial distributors worldwide. Torrington operates more than 20 manufacturing facilities throughout North America, Latin America, Europe and the Asia/Pacific region. The company also maintains research and development centers in Torrington, Connecticut and Norcross, Georgia. In 2000, Torrington employed approximately 11,000.

Among its product lines, Torrington offers the TORRINGTON range of radial and thrust needle roller bearings; and heavy-duty spherical, radial cylindrical, radial tapered, thrust and pillow blocks roller bearings. These products have applications in such markets as transportation; metal and paper; oil, gas and mining; aerospace; industrial, construction and agricultural machinery; machine tools; defense;

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<th>Companies Profiled</th>
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<td>Boston Gear</td>
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<td>Dana Corporation</td>
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<td>Glacier Vandervell Bearings Group</td>
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<td>Dover Corporation</td>
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<td>Waukesha Bearings Corporation</td>
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Global fluid handling pumps demand will grow nearly 7% annually. The developing regions of Latin America, Africa/Mideast and Eastern Europe will grow the fastest, while the industrialized nations will remain the largest markets. Centrifugal pumps will remain the most commonly used, with positive displacement pumps growing the fastest. This study analyzes the $30 billion fluid handling pump industry to 2004 and 2009 in 6 regions and 49 countries. It also details market share and profiles key producers.

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**Materials Handling Equipment**
Demand for materials handling equipment in the US will grow over 5% annually. Gains will be fueled by strength in key end-use markets such as the aerospace and electronics industries, as well as by the rapid growth in e-commerce. Industrial trucks and automated systems, particularly robots, will experience the strongest growth. This study analyzes the $16 billion US materials handling equipment industry to 2004 and 2009 by type and market. It also evaluates market shares and profiles key companies.

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**Automotive Aftermarket in North America**
The aftermarket for light vehicle components and parts in North America will grow over 4% annually. Gains will be driven by the growing size and age of the light vehicle park, with the increasing durability of newer models a limiting factor. Mechanical products will remain the largest segment while electronics grow the fastest. This study analyzes the $45 billion US, Canadian and Mexican automotive aftermarket to 2004 and 2009 by country and product. It also profiles key players and presents market shares.

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**World Batteries**
Primary and secondary battery demand will grow nearly 8% per year worldwide, driven by new and emerging portable electronic devices. The best prospects will remain in less advanced countries whose markets are growing fast. Lithium ion- and lithium polymer-based rechargeables and “superpremium” alkaline batteries will lead gains. This study analyzes the US $41 billion world battery industry to 2004 and 2009 by type, region and 24 major countries. It also evaluates market shares and profiles key firms.

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