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New Hampshire Ball Bearings, Inc.
A Minebea Company

inside track

nhbb.com

A Profile of the Newly Acquired CEROBEAR® GmbH

CEROBEAR is the world's preeminent specialized manufacturer of ceramic and hybrid ceramic bearings for the aerospace, defense, food and beverage packaging, fluid machinery, motor racing, and semiconductor manufacturing equipment industries. The company is committed to helping customers in these markets overcome extreme requirements for bearing performance through the application of advanced ceramic technology. In fact, every bearing made by CEROBEAR contains at least one ceramic component.

CEROBEAR's 26,000 sq ft production facility in Herzogenrath, Germany.

Founded in 1989, CEROBEAR GmbH is a spin-off from the Fraunhofer Institute of Production Technology (IPT) at the Technical University of Aachen, Germany. The Fraunhofer IPT develops systems solutions for production, focusing particularly on process technology, production machines, mechatronics, production quality, and metrology. In 1997, CEROBEAR moved into its current facility in Herzogenrath, near Aachen, laying the foundation for future growth.

Today, CEROBEAR operates an impeccable 26,000 sq ft (2,400 m^2) facility with state-of-the-art production, metrology and testing equipment. CEROBEAR's staff of more than 100 highly skilled technical employees manufactures races, rolling elements, cages, and seals in-house using mastered production technologies, such as ultra precision hard turning, grinding, and five-axis milling.

CEROBEAR is currently adding an additional 24,750 sq ft (2,200 m^2) of manufacturing and office space with the construction of a new building on the same site as the existing facility in Herzogenrath, Germany. This building is scheduled for completion in January, 2014.

Research and development continues to be a critical path to future growth for CEROBEAR. Every year, the company commits significant revenues to research and development, investing in such areas as fatigue life of advanced bearing materials, qualification of new bearing materials and coatings, and nondestructive inspection (NDI) of ceramic rolling elements. CEROBEAR also collaborates on research projects with its customers as well as US and European government agencies.

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NHBB Acquires European Company Specializing in Ceramic Bearing Technology

Present at the signing of the Share Purchase Agreement were Jens Wemhöner (left) and Gabriele Wemhöner (right), Managing Directors, CEROBEAR GmbH, and Dan Lemieux, Vice President of Business Development and Marketing, New Hampshire Ball Bearings, Inc.

Effective July 1, 2013, New Hampshire Ball Bearings has acquired all of the shares of CEROBEAR GmbH, the world's preeminent manufacturer of innovative bearings featuring technologically advanced ceramics. The two companies signed a Share Purchase Agreement on Wednesday, June 26, 2013 in Düsseldorf, Germany. As a result of the acquisition, CEROBEAR has become a part of the NHBB/myonic Business Unit within the global manufacturing conglomerate, Minebea, and operates as an independent subsidiary under NHBB. With the addition of CEROBEAR this summer and myonic GmbH in 2009, the NHBB/myonic Business Unit now operates six manufacturing facilities in the US and Europe.

Gary Yomantas

A Message from NHBB´s President

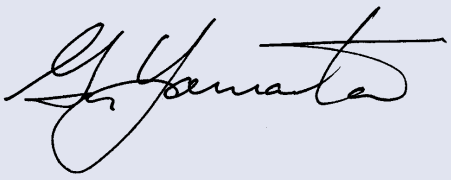
Ceramic bearing technology is gaining wider acceptance with aircraft and aero engine manufacturers as they continue their search for innovative materials and solutions that reduce weight and increase fuel efficiency. In response to this trend, NHBB is broadening its capabilities by acquiring CEROBEAR GmbH, the world's preeminent manufacturer of innovative bearing solutions featuring technologically advanced ceramics. This move enables us to partner with CEROBEAR in order to help our customers analyze the performance advantages of ceramic bearing components and incorporate the technology within legacy and new programs.

At NHBB, we enjoy a wealth of experience designing and fabricating complex, high performance ball and cylindrical roller bearings for the aerospace market. But when it comes to implementing ceramic bearing technology within these critical applications, we are not as knowledgeable as CEROBEAR, a leading expert in ceramic technology development for bearings, bearing components, and related systems. By combining our strengths, NHBB and CEROBEAR are now positioned to further develop ceramic and hybrid ceramic rolling element technology and other solutions for increased use in the aerospace industry.

Moving forward, NHBB will assist CEROBEAR with establishing a greater market presence within the global aerospace industry by concentrating on aerospace companies that rely on NHBB for expert advice and exceptional service. The product development departments for NHBB and CEROBEAR will immediately begin collaborating on various product development projects related to aero engine bearing technology. Already, colleagues from both companies have come together to review technical competencies and potential development initiatives. These collaborative projects will be prioritized based on their alignment with our customers' needs.

NHBB and Minebea will also play an important role in the expansion of CEROBEAR's production capacity. In the near term, we will support the ramp-up of production in CEROBEAR's new facility that is currently under construction in Herzogenrath, Germany. Eventually, NHBB and Minebea will provide strength and support to CEROBEAR's plans to establish a manufacturing presence in the US.

On the whole, innovation is one of the most important pillars of our business. By acquiring a technology company as accomplished as CEROBEAR, we are investing in advancements in bearing technology that will meet our customers growing needs for years to come.



Letter from CEROBEAR Management

NHBB's production excellence and heritage as one of the leading aerospace bearing manufacturers and CEROBEAR's innovative bearing material and production technologies complement one another perfectly to provide a valuable contribution to the upcoming aircraft designers' requirements for reduced weight and fuel consumption and increased cost effectiveness.

CEROBEAR® ceramic bearing technology

CEROBEAR's integration into the NHBB/myonic Business Unit will enable us to dramatically increase our participation within the international aerospace bearings market, and it will also generate a new line of products and technologies that will enable the entire Business Unit to more fully serve the needs of customers as well as accelerate future growth.

The warm welcome from all sides of the Business Unit, and the productive discussions in the first weeks of our membership in the NHBB family, have already shown that there is a great number of promising synergies waiting to be explored.

We are very much looking forward to an excellent cooperative effort in making our now extended Business Unit the leading bearing solutions provider in the aerospace market.

Jens Wemhöner

Gabriele Wemhöner

Products and Solutions

CEROBEAR's products emanate from a deep knowledge of ceramic materials and an unwavering commitment to superior performance and quality.

CEROBEAR designs and manufactures customized, high performance bearing products designed to provide improved reliability and lifetime under extreme operating conditions. Its product lines include ceramic and hybrid ceramic ball and roller bearings, which are summarized below:

Ceramic

Made entirely from silicon nitride or zirconia, CEROBEAR's ceramic bearings are nonmagnetic, noncorrosive, extremely hard, and much lighter than steel (approx. 60% less). They maintain their strength in extreme temperatures (up to 1900°F) and operate in dry conditions or with media lubrication (e.g., water). As a result, CEROBEAR's all-ceramic bearings are used in a wide range of hypersensitive or sterile applications, including autoclaves, ultra clean mixers, MRI machines, and semiconductor manufacturing equipment.

Hybrid Ceramic

CEROBEAR's hybrid ceramic ball and roller bearings feature races made from high performance corrosion- and heat-resistant steel and silicon nitride rolling elements. Compared to conventional steel bearings, hybrid bearings are lighter, operate at higher speeds, generate lower friction, and require less lubrication. The chemical stability of ceramic prevents seizure, fretting, cold welding, or adhesive wear between the rolling elements and raceways, especially in "oil-off" situations. CEROBEAR's hybrid bearings are specified when steel rings are required for proper fit and function but reduced weight, higher speeds, and increased reliability are desired. Possible applications include aircraft engine gearboxes, racecar transmissions, and high speed machine tools.

Customized Solutions

To fully support customer needs, CEROBEAR engages in bearing customization. Its engineers will adjust bearing tolerances, contact angle, or bearing stiffness, and incorporate special features like anti rotation slots, integrated threads, extended inner or outer rings, oil ducts, and seals to achieve the exact performance criteria required of each individual application. CEROBEAR is also committed to meeting challenging build schedules and supply chain requirements through quick prototype development, shorter lead times, and flexible lot sizes.

Visit cerobear.com to learn more about CEROBEAR's advanced technology, products and solutions.

CEROBEAR Launches into Aerospace Market

CEROBEAR's aerospace heritage began in early 2000 with the first flight of ceramic cylindrical rollers in the bearings of the US Space Shuttle's main engines. Performing reliably at 36,200 rpm in temperatures of -423°F (-253°C) while being lubricated by liquid hydrogen, CEROBEAR's solution improved the time between overhaul for the engines by factor 12. Today, many other applications in aviation and space, including satellites, servo actuators, auxiliary power units, and gearboxes, take advantage of the low weight, low torque, and superlative reliability of CEROBEAR's hybrid ceramic rolling element bearings.

Industry Expert Leads Aerospace Business Development Efforts

Tony Taglialavore is the Aerospace Market Business Development Manager for CEROBEAR GmbH. He works with a team of three project/application engineers that focus exclusively on the development and profitable growth of aerospace business, worldwide.

Tony has been with CEROBEAR for two years. He spent 25 years at Saint-Gobain Corporation in a wide range of roles, most notably as Business Development Manager of the CERBEC Si_3N_4 ball business, a position he held for 15 years. In that role, CEROBEAR, NHBB, and most bearing companies in the industry were customers.

Tony graduated from the University of Illinois in 1984 with a BS in Ceramic Engineering.

For comments or questions about *Inside Track* contact:

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A Profile of the Newly Acquired CEROBEAR GmbH cont...

CEROBEAR's entry into the aerospace market was through its product development capabilities; in 2000, it developed a highly reliable ceramic roller solution for the US Space Shuttle's main engines (see article on pg. 3).

To learn more about CEROBEAR, visit cerobear.com.

CEROBEAR's core competencies:
Customized bearing solutions from prototype to serial production
Transforming material properties into bearing performance
Computer-aided machining of advanced materials
Hard-turning of steel up to HRC68
Diamond grinding of silicon nitride (Si_3N_4) and zirconia (ZrO_2)
Advanced clamping technology for all types of materials and bearing customization
Ceramic roller finishing
Analysis, calculation and lifetime-prediction for bearings with ceramic components
Nondestructive testing and computer-aided inspection of ceramic bearing components
CEROBEAR's quality certifications:
EN 9100 aerospace quality management system
DIN EN ISO 9001 quality management system
BS OHSAS 18001 occupational health and safety management system
DIN EN ISO 14001 environmental management system

Ceramic Rolling Element Testing Under Development

NHBB signed an exclusive sublicensing agreement with Ceramic Quality Solutions (CQS) to conduct nondestructive testing of silicon nitride rolling elements using testing hardware developed by CQS.

The sublicense grants NHBB the exclusive right to utilize CQS's CERAQUAL™ testing technology in the aerospace market. It also formalizes an agreement between NHBB and CQS to collaborate on creating an industry standard for proof testing ceramic balls and to gain approvals from aerospace customers for the utilization of CERAQUAL™ as a testing protocol for ceramic rolling elements.

The test equipment developed by CQS is based on acoustic testing of ceramic balls under a proof load, a patented test method developed by Aerospace Corp. The invention established a new, more reliable technique for measuring the integrity of ceramic rolling elements by detecting crack propagation sound waves resulting from minute cracks or imperfections under a proof load.

NHBB's goal is to prove the reliability of the testing technology in order to qualify ceramic rolling elements for use in critical aerospace applications.