



New Hampshire Ball Bearings, Inc.  
— A Minebea Company —

# inside track

## Precision Heats Up Product-Line Expansion Efforts

With the recent purchase of a larger-capacity heat treat furnace, the Precision Division has initiated a new phase in its long-term plan to expand its product offering. Since 2004, Precision has increased the maximum outside diameter (O.D.) size it can produce from 1.125" to 1.5000".

The furnace made by Abar Ipsen features a much bigger hot zone than the existing oven and a two-chamber design capable of both gas and oil quenching. "The new furnace is cleaner and easier to use than our existing equipment," says Doyce Dugan. Doyce is a Unit Manager in Precision's Quality department. "In addition, the oven's increased capacity will enable us to process the larger chassis sizes more efficiently and provide a boost to our production capacity overall."

To accommodate the new equipment, Precision plans to enlarge the current

heat treat facility and install an integrated furnace control and data collection system which will link all the heat treat equipment together in one easy-to-use interface. The expansion is valued at over



*Precision established a manufacturing cell on the Grind Floor specifically for producing larger chassis sizes up to 1.5000".*

a million dollars. The new furnace is expected to be operational by October.

Previous initiatives in support of this product launch include the purchase of new machining equipment and a reconfiguration of the manufacturing floor. In total, Precision has added four new turning machines capable of machining larger-size rings and retainers. It also established a manufacturing cell on the Grind Floor specifically for producing the larger chassis sizes.

"The ability to produce larger standard bearings gives us more opportunities to serve our customers," says Precision's Sales Manager Alan Paynter. "Furthermore, it matches the needs of NHBB's customers with Precision's manufacturing strengths, namely, our ability to apply volume production methods to a larger range of chassis sizes."

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## HiTech Gages Future Metrology Needs

HiTech's recent investment in metrology equipment, coupled with various in-house engineering developments, has significantly strengthened its measurement and, hence, its manufacturing capability. HiTech has focused on building additional measurement capabilities in both component fabrication and assembly.

On the acquisition side, HiTech invested close to \$350,000 in measurement systems last year. HiTech's most significant purchase was a Zeiss scanning coordinate measurement machine. This high-accuracy, 5-axis semi-automated CMM performs sophisticated geometric relationship checks on complex components.

According to Alex Dorchies, HiTech's Supervisor of Gage Engineering and Metrology, state-of-the-art equipment

such as the Zeiss scanning CMM is critical to HiTech's long-term business strategy. "HiTech has a deliberate metrology development program in place to prepare for our future," says Alex. "Namely, the servicing of a growing market for complex, high-quality and high-value assemblies in critical aerospace applications."

Occasionally, HiTech's search for commercially available measuring equipment fails to provide an adequate solution. To meet the needs of manufacturing, HiTech's



*HiTech's proprietary Contact Angle Gage.*

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## Lean Manufacturing Key to Unlocking Production Gains at Astro

NHBB Astro recently implemented a series of lean manufacturing initiatives in conjunction with the adoption of APS, a theory of constraints-based scheduling system, that have led to faster production throughput, shorter lead times, and improved on-time delivery performance.

One change in particular has led to major gains in efficiency with only a modest investment in new equipment. Astro created a new line within final assembly dedicated solely to processing single-piece conformity tests, which are essential for verifying manufacturing tolerances of spherical bearings. Astro performs a first-piece conformity test on many bearing orders prior to starting the production lot.

Before the change, Astro processed first-piece conformity checks on the standard production lines. This method was disruptive, as it forced machine operators to perform “production type” set ups for single pieces in between lot production runs.

According to Process Analyst Keith Taylor, the old way of handling conformities multiplied production problems. “Setting up for just one piece slowed down production,” says Taylor. “And when a rush order came through, conformities would be set aside only to return later and slow things down again.”

Running conformity tests on a separate and complete manufacturing line has eliminated such waste. The new approach has reduced the number of set ups performed on the standard production lines, and since tooling is now calibrated and tested on the conformity line, production line set ups are performed much more efficiently as well.

The idea for the conformity line originated from a four-day value stream mapping event that targeted a specific product family. The event was facilitated two years ago by one of Astro's largest customers. Value stream mapping is an

important lean analysis tool that forces a company to look at a process through the entire value stream, essentially from beginning to end, versus an operational-specific analysis.

Recognizing the tool's value, Astro expanded the analysis to the entire final assembly process. A cross-functional team drew a visual representation of the current process. Using this “current-state” map to identify potential time delays, bottlenecks, and inefficiencies, the team was able to create a “future-state” map that eradicated such waste uncovered by the value stream mapping event.

The conformity line is one of several initiatives Astro implemented since that event. Another significant change involved the layout of the entire final assembly area. It has been reconfigured



*NHBB's spherical bearings*

into four lines, each handling different size bearings, all of which are supported by the conformity line.

Bob Hammond is Astro's Manager of Manufacturing and Continuous Improvement. He points out that the conformity line, with its focus on single-piece flow, is the ultimate in lean manufacturing. “Lean manufacturing is about identifying waste in manufacturing and developing strategies to overcome them,” says Hammond. “By implementing projects that arise from a lean manufacturing framework, Astro is better equipped to meet the needs of our customers over the long haul.”

## HiTech cont.

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Metrology and Gage Engineering department has developed a track record of designing proprietary solutions in-house.

Alex says the decision to buy or develop and build often hinges on performance: Is the standard offering easy to use? Does it perform measurements quickly? And is it accurate enough for HiTech's needs?

Past engineering efforts include the design and fabrication of a stick-out/preload gage, proprietary gages for radial and axial play, an eddy current test system, and unique methodologies for managing the deflection of thin bearing rings caused by gaging forces.

Recently, HiTech developed a proprietary system for measuring the operating contact angle of ball bearing assemblies. A need existed to replace aging equipment with a system that reduced set up time and provided faster, more accurate results. Not finding a commercial system that met these criteria, HiTech decided to engineer its own solution through an in-house design development process.

The new instrument, which took a year and a half to develop, uses minimal tooling and can be set up in less than two minutes. User interfacing and signal processing is performed by laptop computer. Contact angle is computed and displayed on the computer's monitor. No tools are required to set up and operate the machine. The results? The gage is accurate to within one quarter degree of contact angle, and throughput has improved by a factor of four.

Regardless of whether the solution provided is “off the shelf” or engineered in-house, the objective remains the same: to provide the most accurate and economical measurement solution available in a production environment.

“Our mantra is, ‘If you can't measure it, you can't make it,’” says Alex. “We continually strive to improve our measurement capability—minimize uncertainty, improve ease of use, and maximize throughput—so that we continue building the reliable products our customers have come to expect from NHBB.”

## NHBB Attends Medical Design & Manufacturing Trade Show



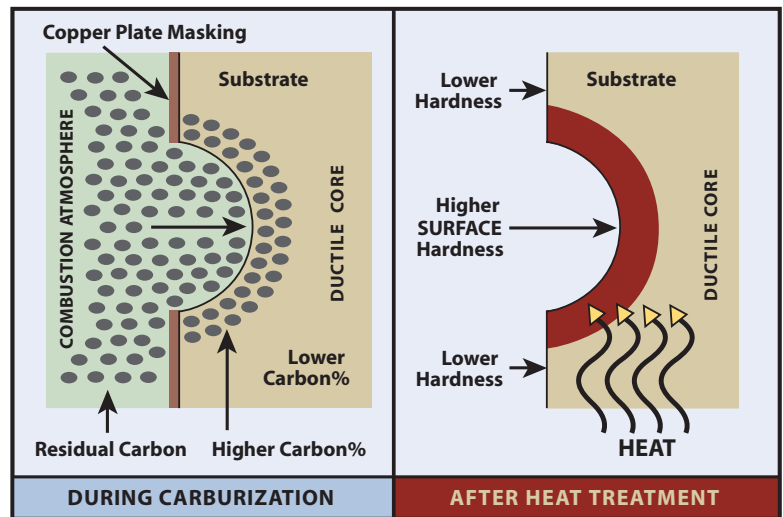
New Hampshire Ball Bearings was one of only two bearing manufacturers to exhibit at the Medical Design and Manufacturing Trade Show held June 12-14 in New York City (the other company was NMBTC, a sister-company to NHBB). NHBB promoted its full line of bearings with a primary focus on technological advances for ultra-high-speed applications, including machined retainers, ceramic balls, high-performance steels, and NHBB's patented composite metal-polymer retainer. Many current and potentially new customers stopped by the booth to preview these technologies and learn more about NHBB's manufacturing capabilities.

*Representing NHBB at the show were the Precision Division's Sales Manager Alan Paynter (left), Senior Sales Engineer John Leger (right), and Eastern Region Sales Manager Mary Beth MacKenzie (not shown).*

## A Primer on Carburizing

Today's gas turbine engines require specialized bearings designed to handle greater speeds and temperatures. Such extreme operating conditions lead to higher centrifugal forces and greater thermal expansion, which cause the inner ring to increase in diameter. A greater press fit at ambient temperatures is necessary to keep the inner ring fixed to the shaft, but this causes high tensile stresses within the bearing. Because through-hardened bearing materials such as M-50 might crack under the strain, engine manufacturers have turned to carburized steel alloys, such as M-50 NiL. Carburizing is a heat treat process used on parts made of alloys with a low carbon content such as M50 NiL. As these components are exposed to a carbon-rich atmosphere at an elevated temperature, carbon diffuses into the exposed surfaces.

The ring is then heat-treated to the desired surface hardness while leaving the carbon-deficient core relatively soft. Finished carburized alloys have a thin outer case with hardness values comparable to M-50, which provides the needed rolling contact fatigue (RCF) properties. The inner core of the carburized ring is relatively soft and ductile, offering desirable fracture toughness properties that allow the bearing to tolerate high internal tensile stresses. These characteristics create a tougher bearing well suited for tight press fits. For more information about carburizing, please contact HiTech's Applications Engineering department.



## NHBB Recognizes Five Employees for Excellence

NHBB recently honored five employees for their outstanding service to customers. The employees were recognized at NHBB's annual sales meeting, which took place the week of June 4, 2007. Please join us in congratulating the following individuals for their exceptional efforts:

**Sales Engineer of the Year** **Terrie Maddox** Central Region

**Customer Service Representative of the Year** **David McIntyre** HiTech Division

**Extra Mile Award** **Alex Garcia** Applications Engineer, Precision Division

**Outstanding Achievement** **Joe Morrissey** Senior Account Manager, Western Region

**Strategic Achievement** **Mary Beth MacKenzie** Regional Sales Manager, Eastern Region



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## NHBB People on the Move

### Wilk to Assist Other Divisions with Materials Planning

**Barry Wilk** of the Astro Division was promoted to Senior Manager-Corporate Materials. In this newly created dual position, Barry will continue as the Materials Manager for the Astro Division, reporting to Operations Manager Jim St. Pierre. At the same time, he will collaborate with NHBB's Vice President of Manufacturing, Richard Bardellini, and the Division Operations and Materials Managers, to coordinate shared materials activities among Astro, HiTech, and the Precision Division. Barry, who has over 20 years of experience in materials management, has been Astro's Materials Manager for over ten years. He holds a bachelor's degree in economics and business administration from Worcester State, and he is APICS certified.



Barry Wilk

patent for the "PBO" liner system. He was instrumental in developing the L1420, L1550, and L2002 liners as well. Since joining Astro in 1983, Grant has been a Design Engineer in the Manufacturing Engineering/Design department and Manufacturing Engineer in the Teflon® and Final Process departments. He joined the Product Engineering department in 1992.



Grant Drew

### HiTech and Precision Fill Engineering Vacancies

HiTech's **Natasa Savic-Remella** has joined the Applications Engineering group as an Applications Engineer. Natasa works with HiTech customers on both new and current programs. She is responsible for technical interfacing, which involves performing bearing systems analyses, optimizing design parameters, and defining the technical details of prototype design packages. Natasa was a



Natasa Savic-Remella

Quality Control Engineer for five years before joining the Applications Engineering group. She holds a B.S. in mechanical engineering from UNH.

The Precision Division hired Engineer **Dan Gruenwald**, filling a vacancy in its Applications Engineering department. Dan is responsible for reviewing customer drawings and specifications. Before joining NHBB, Dan worked for a metal building accessory manufacturer, where he gained valuable experience in technical sales, applications engineering, manufacturing engineering, and product development. He holds a B.A. in mechanical engineering from UCSD.



Dan Gruenwald

In April, **Linda Welles** joined the Precision Division as an Inside Sales Representative. For the past eight years, Linda worked at NHBB's sister-company, NMBTC, as a Customer Support Representative for power supplies and, more recently, keyboards.



Linda Welles



**David McIntyre**  
Inside Sales Representative  
HiTech Division  
Peterborough, NH  
Years at NHBB: 3½

## NHBB in Person

Although relatively new to Inside Sales—he has been a Rep. for two and a half years—David has quickly adopted the fundamentals of good service. In recognition of his efforts, he was named NHBB's Customer Service Representative of the Year in 2007.

David manages key customer accounts for the HiTech Division. He is responsible for providing direct customer service, working with field sales and engineering to develop new business, issuing quotations, entering new orders, and monitoring existing order progress. David also works with the U.S. Dept. of State to license controlled products for export.

"My primary objective and number-one challenge is to provide the best possible service to our customers," says David.