

Number 9

## THE BARDEN QUIET BEARING ANALYZER

Quality has always been a mainstay of Barden's operating philosophy. To meet or exceed rigorous ABEC 7 standards Barden regularly tests, inspects and analyzes bearings to ensure lot-to-lot uniformity. Such tests are also used to evaluate process improvements, new machines and better abrasives.

One such analytical device, the Anderometer, has proven itself to be a highly accurate quality control workhorse. The Anderometer measurement, a velocity unit called an Anderson, is considered the industry standard. But Anderometers have limitations regarding spindle speeds, thrust load applications and the size of the bearings that can be measured.

In 1984 the Navy contracted with Barden to provide large, high capacity precision bearings for the "Navy Quiet Running" submarine program. Proper testing of these bearings required thrust loads beyond the capability of any commercially available bearing tester. The Barden Quality Engineering Department decided to pioneer the development of a new tester. The Quiet Bearing Analyzer was the

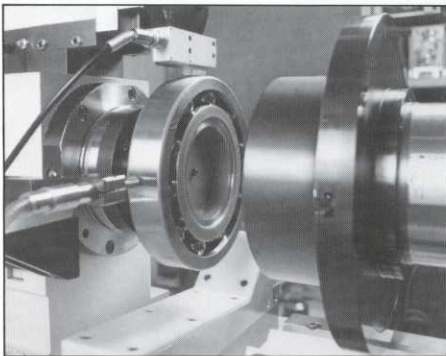
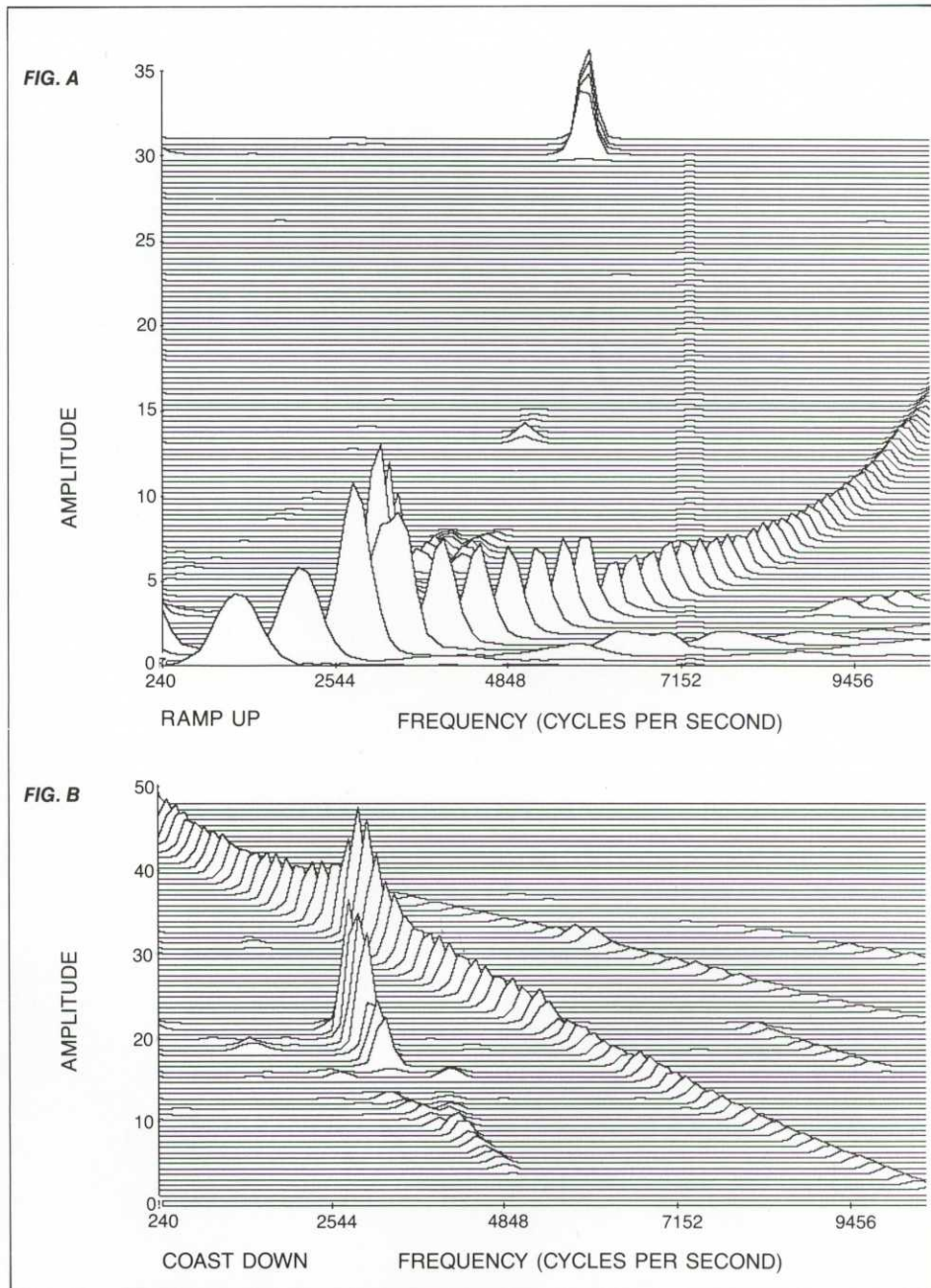


Photo by A. Wysocki

Barden's Quiet Bearing Analyzer controls speed and load application to simulate "real world" operating conditions.



Above are examples of "waterfall" spectra, which are a collection of spectra sampled during increments of time. Figure A represents a ramp up (increasing RPM), Figure B represents a coast-down (decreasing RPM).



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result. We believe it to be the only instrument of its type in existence today.

The "QBA's" principal uses include functional testing of lot samples and evaluating bearing vibration vs. raceway surface finish, ball quality, cage design, lubricant quantity, speed, thrust load and grease type.

The QBA's versatility allows Barden engineers, through the adjustment of speed and load application, to simulate "real world" operating conditions. For example, thrust loads can be applied ranging from 20 lbs. up to 1,500 lbs. while running speeds can start as low as 0 RPM and go as high as 4,400 RPM.

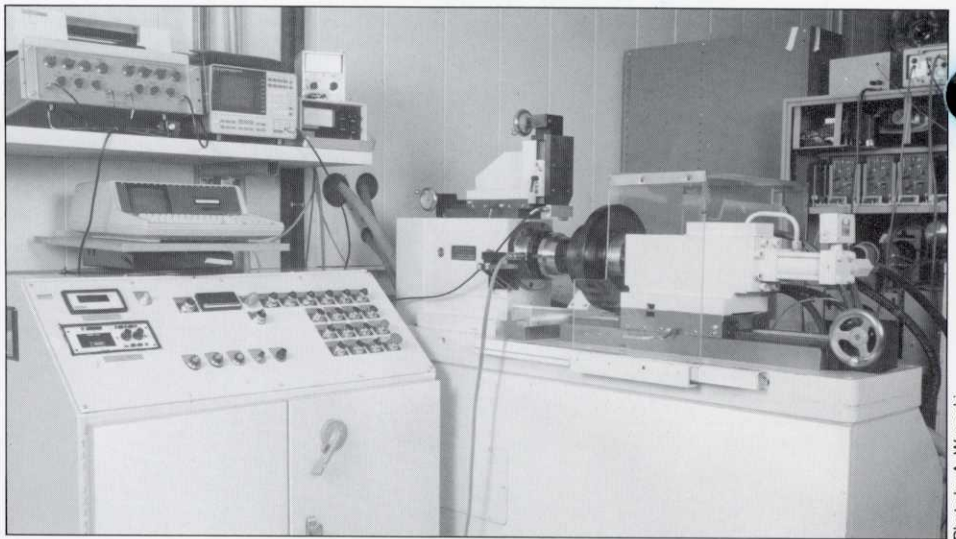
The critical spindle assembly is an oil hydrostatic unit with 10 millionths inch accuracy. The measuring system electronics were built around standard components assembled by Barden's Quality Engineering Department.

Because of the designed-in flexibility of the QBA, existing Anderometer databases can be correlated with new QBA measurements. Historical comparisons of vibration characteristics are now possible.

Many other unique features—including thrust load servo force control and a displacement transducer for reading low frequency radial motion, for example—give Barden the means to even more accurately analyze bearing performance.

Barden has always been a leader in the design and manufacturing of precision quality bearings. The Quiet Bearing Analyzer is just one of the many commitments Barden has made to ensure that our bearings will be "the finest that can be made."

As a fitting tribute and recognition of this fact Barden has recently become certified by the Navy to self-inspect bearings shipped per NT4 limits in MIL-B-17931E. (Navy Quiet Running). Barden is the ONLY bearing manufacturer ever to be so designated.



The "QBA" evaluates bearing vibration vs. raceway surface finish, ball quality, cage design, lubricant quantity, speed, thrust load and grease type.

Photo by A. Wysocki

Some of the characteristics that make the QBA exceptionally versatile include:

**Thrust load**—20 to 1,500 pounds.

**Thrust Load Application**—

Hydraulic piston with load cell and servo force control.

**Spindle**—Hydrostatic, very stiff and quiet with a temperature controlled oil supply for continuous operation.

**Speed**—Variable 0 to 4,400 RPM with digital tachometer readout.

**Transducer**—Self powered velocity type, linear within AFBMA STD. 13 or ANSI B3.13 specifications from 50 to 10,000 Hz.

**Vibration Measurement**—Single channel spectrum analyzer with stored programs, controlled by an HP 85 computer.

**Test Records**—A three-inch printer in the computer prints out

the vibration reading for each bearing, keyed to the serial number, plus the bearing nomenclature, date, lot number and operator identification.

**Spectra**—A six-color plotter is also available and vibration amplitude vs frequency curves are easily plotted. Spectra at various inner ring rotational speeds and at various thrust loads may be overlaid on the same plot for analysis.

**Low Frequency Motion**—A displacement transducer reads the low frequency radial motion of the stationary outer ring. This non-repetitive motion is a measure of ball-size variation.

**Mil Specs**—The QBA is designed to test bearings designated NT4 in Navy Quiet Bearing specification MIL-B-17931E.