Napoleon Engineering Services: Rigged for Success

By Jack McGuinn, Senior Editor

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For design engineers and purchasing agents alike, bearings can sometimes be like family. Oh, you know — can't live with 'em, can't live without 'em.

In other words, bearings are vital, problematic components used in both the simplest and most sophisticated gear systems. If it has gears, it has bearings. So it is important to know whether that shipment of new bearings about to arrive and to be incorporated into the gearboxes you are assembling is in top-notch order.

That is where a company like Olean, NY-based Napoleon Engineering Services (NES) steps up to make that happen. In fact, when it comes to bearings, they make a lot of things happen.

"Actually, as the largest independent bearing inspection and testing facility in North America, we see just about everything," claims Chris Napoleon, company president, founder and chief engineer. "We also have another aspect of NES that enhances our knowledge base — we also manufacture custom bearings. As a small custom bearing manufacturing facility, we are on the ground floor with the necessary flexibility to incorporate some of the latest technology in bearing design and manufacturing. If we're not making specialty bearings for industrial and aerospace OEMs, then we are testing bearings for the bearing manufacturers and feeding "proprietary" test data to their application engineers and research scientists with information about some of the design advancements they are working on."

And the OEMs Napoleon refers to are high on the food chain — GM and John Deere are two of them.

Despite the importance of the work, the manufacturing protocols of bearing inspection and testing, while easily as important as any other, do not seem to draw much trade press love. Is it *all* about the gears?

Napoleon responds that, "Historically, many gearbox and transmission OEMs also manufactured their own gears. As a result, they were in complete control of (and responsible for) overall gear design. That is not always the case with bearings. NES was once told by a major transmission manufacturer, 'We can go anywhere in the world to manufacture our gears because we know everything about them.' They also have the in-house capability to test the gears and determine whether a new supplier or design is effective.

(But when we) told the same OEM that we needed to know more about their bearing design, they immediately (back-tracked), saying, 'We don't want

to tie the hands of the bearing manufacturer.' Testing and inspection of bearings themselves, historically, has not been performed by OEMs. (But) as OEM desire for a global supply chain increases, it becomes vitally more important that they take greater ownership in the design.)" And perhaps more to the point of the original question — it appears high-tech bearings are simply too hush-hush and proprietary to be bandied about in the press.

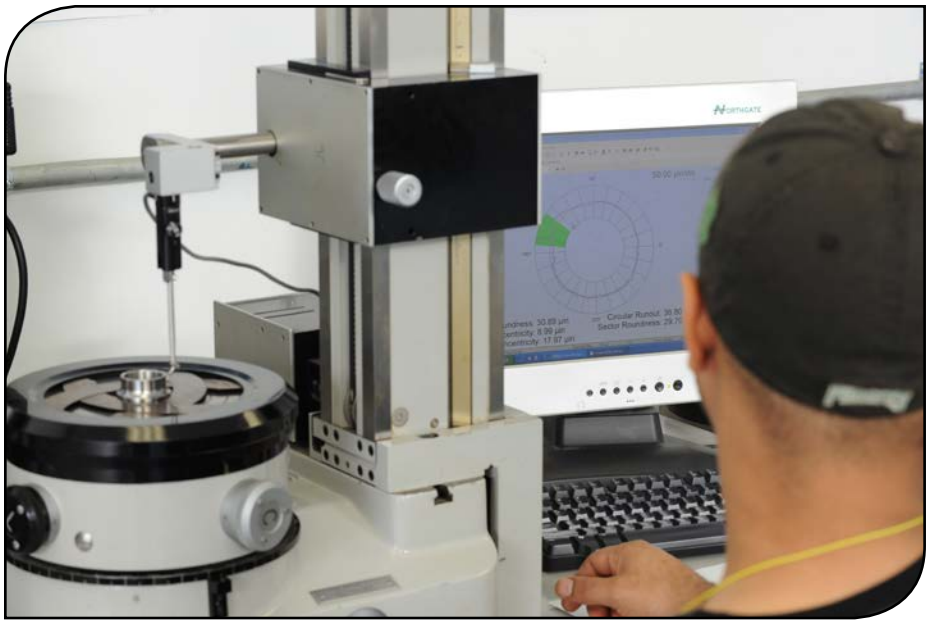
Along with the knowledge, experience and infrastructure necessary to do this kind of work is another NES asset — their Source Qualification Inspection (SQI) program. All of this experience and structure are used in conjunction with what is arguably the backbone of the company's success: their line of bearing test rigs.

"(Our) internal testing program starts with our Source Qualification Inspection program," says Napoleon. "It's a destructive test of a sample of bearings from both the original qualified bearing supplier and any number of new suppliers that the OEM desires to evaluate. The SQI involves dimensional inspection, noise testing, visual inspection, seal evaluation, material chemistry and microstructure. It's always the first step; we don't want to test product that isn't test-worthy. Following SQI we evaluate the failure mode of the bearing in the application. This SQI and test data information are provided to the OEM so they can make an informed decision about a supplier. This is a typical in-house test program and is the model for bearing testing."

NES bearing test rigs run the gamut — capable of testing bearings both simple and sophisticated — leaving no potential failure — or disaster — undetected. This is borne out by the diversity of NES customers and the technical complexity of their needs. Napoleon explains:

"NES offers several standard testing methods and rigs; however, each customer has different bearing sizes and types that they are interested in testing. They also have different test parameters for load, speed, lubrication, duty cycle or test protocols that they might want to follow. As a result, we design and build the rigs appropriately to OEM needs. The more we can standardize the test rig, the lower the overall cost of ownership — understanding that certain applications and OEM needs may dictate some very unique test parameters or control features. Those OEMs who make the investment in a test rig are also making an investment beyond just qualifying a new source of supply. They now have the ability to examine how design and manufacturing quality influence bearing life."

While NES designs, manufactures and, on occasion, sells these test rigs, the common practice is for OEMs to simply have their testing done at the NES facility on an NES rig designed and built to the OEM's needs. After all,



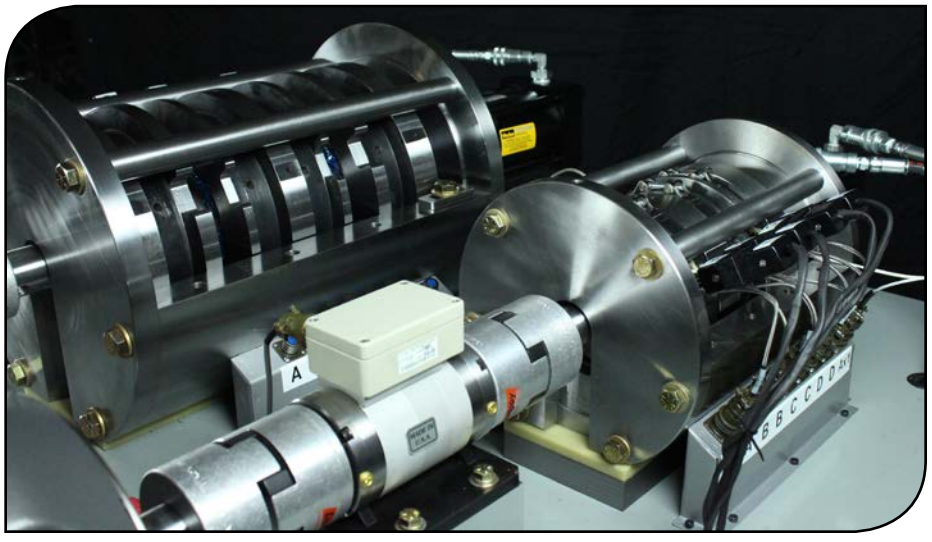
even if they bought a rig outright and set it up in their plant, chances are there would be no one there capable of knowing how to use it to optimal advantage.

As one would reasonably expect, the quality and inspection program at NES is "as good as it gets," says Napoleon. "The SQI program is very intense; its background comes from the aerospace industry. The FAA has a reverse-engineering process that allows one to become approved as a supplier for a particular application when you were not originally part of the type- certification testing process. This process is called "parts manufacturing approval (PMA)." If you reverse-engineer the type-certified product — in this case a bearing — and show the FAA that you have done your due diligence through inspection and, possibly, testing, they will grant you a PMA. Early on, NES was involved in performing the reverse-engineering of bearings for those interested in achieving PMA approval, a process that has been in place for over 40 years. It's a proactive approach to qualifying new sources of supply. Concurrent with that work, we were performing a tremendous amount of failure analysis for industrial OEMs who, as it turned out, had recently changed bearing suppliers. The industrial OEMs were engaged in a *reactive* approach to bearing qualification while the aerospace industry was *proactive*. So I created an industrial reverse-engineering program for OEMs and called it (SQI)."

Most agree that bearing standards are not as internationally well-defined or stringently enforced as needed. Accepting that premise, how does that affect various manufacturing test rigs (for bearings, in this case) and the efficacy of testing done for various — many safety intensive — applications?

"This is a great question and likely plays a fundamental role in the development of NES' products and services. Much of bearing design is not controlled by international standards and is left up to the individual manufacturer. As a result, this leaves the OEM with considerable risk when qualifying new bearing suppliers. First, the OEM needs to take ownership of the design of the bearing in their application. Secondly, as mentioned, there are few standards for testing of bearings. This isn't necessarily bad since it gives a lot of freedom to develop your own testing protocol for establishing acceptability of the product. We have found that most industrial OEMs need support in developing that protocol. That is where we come in with the SQI and the testing programs and test rigs.

"To some degree we have become the UL of bearing testing. The first thing that we always ask an OEM is what their intention for testing is. Once we clearly understand what they want to achieve and why they want to engage in some sort of testing program, then we marry that with the protocols that we have set up with one or more of our test rigs." **PTE**



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