

Capstan Atlantic

SOUND WAVES THAT MEASURE QUALITY

For almost a year now, Capstan Atlantic has been using state-of-the-art technology that utilizes sound to completely and reliably test product quality.

“The RAM NDT unit we’ve employed in our manufacturing process has enabled us to provide one hundred percent product testing,” says vice president of engineering Rich Slattery. “To put it simply, it provides a peace of mind that lets us sleep at night.”

That high confidence level is the main reason that the test system’s manufacturer, The Modal Shop of Cincinnati, OH, boasts that sales of the RAM NDT have grown at a rate of 100% annually since its introduction in 2002. According to Scott Sorensen, the company’s marketing manager, the customer list includes prominent gear, transmission and powder metallurgy specialists.

As a manufacturer of multi-level, high performance precision gears for automotive powertrain systems, Capstan Atlantic fits well into this niche. They supply parts for the Big Three automotive makers in the United States, as well as Japanese transplant facilities.

Pressing Need for Gear Production

Capstan Atlantic’s production facility involves a complex metallurgy process that begins with an iron-based, powdered alloy. Additions such as chrome, nickel, molybdenum and graphite are added for strength, ductility and wear resistance. The powder blends are compressed to varying densities, depending on the requirements of the application. The newly formed gears

are then sintered on 65’ continuous belt furnaces at a temperature higher than 2,000°F. Although the methods Capstan Atlantic employs are very robust and effectively minimize the chance of defects, the process still requires a 100% test for structural integrity. Therefore, product testing is an essential element in the quality assurance program.

Prior to investing in the RAM NDT unit, the company used a non-destructive, 100% torque test method. But it didn’t deliver the level of performance and reliability that put company minds at ease. It was subject to human interpretation, it was very slow and therefore costly, and it didn’t guarantee 100% conformance.

“We felt that the manual testing approach was too uncertain for us,” says senior development engineer Eric Day. “Because of the demanding, highly competitive nature of our industry, we wanted a testing method that qualified every single component that left our facility. We found it with the RAM NDT unit. It has made a powerful impact on our company and significantly added to our peace of mind.”

“Our previous method tested around 40–50 parts an hour,” Slattery says. “But the RAM NDT unit tests 600–700 parts an hour. The improvement in the level of effectiveness and efficiency we’ve experienced with the RAM NDT is phenomenal.”

Sound Approach to Product Testing

To understand how the RAM NDT unit works, consider the operation behind a bell or tuning fork. When

you strike either instrument, it vibrates, emitting a sound. An instrument that rings true produces a consistent sound. And this consistency in sound reveals the structural integrity of the instrument. Just like a cracked bell will not ring true, components can be tested in the same manner.

That is the basis for RAM NDT technology. When struck by a tiny anvil, components like gears emit a natural frequency as part of their structural response. This unique and measurable signature is then compared and analyzed against both good and bad product. If a gear is cracked, lacks the correct den-





At Capstan Atlantic, a variety of gears are made from powder metal and tested for defects using the RAM NDT system from The Modal Shop.

sity or misses other characteristics of a structurally sound product, the flaw will be exposed when the signature deviates from what has been identified as good product.

The RAM NDT unit tests the whole part for both external and internal flaws such as cracks, chips, voids and porosity in cast, powder metal, stamped and forged parts. Sorensen says it then produces an objective, quantitative analysis that eliminates errors involving human interpretation and judgment through the use of sophisticated equipment. A dynamic sensor captures sound, and a high-speed, analog-to-digital conver-

tor translates the sound into measurable data. Since a defective part will shift in its structural resonance, this shift is identified when compared to pre-defined data. In effect, the RAM NDT listens to the structural response of a part and evaluates it against the statistical variation from a control set of good parts in order to screen defects.

The criterion used to represent pre-defined data is established by way of templates. The resonant signature of both good and bad product is captured in order to provide objective, measurable variables for comparison. Once these templates have been established

through up-front programming, the RAM NDT is a self-regulating unit that involves little maintenance and eliminates the need for a trained operator, Sorensen says. And even better, it's very fast.

Eddy current, Magna current and Maag testing require a greater time commitment from the end user, Sorensen says. With the RAM NDT, no probes are required and the parts don't have to be dipped in solution before the testing commences.

"We've incorporated the RAM NDT unit right on our assembly line," Slattery

continued

says. "It doesn't slow our production one bit. Components pass through it right before packaging. Any product that doesn't pass inspection is removed from the line automatically. And gears that pass inspection are immediately packaged and shipped in a streamlined operation."

According to Sorensen, manufacturers need not worry about durability either. From the rugged microphone and industrial electric impactor to the NEMA smart digital controller, the RAM NDT is designed for industrial environments. Its durable, physical construction is suitable for plant-floor, high-volume test applications.

Benefits—Right on Pitch

For Capstan Atlantic, the RAM NDT not only contributes to peace of mind; it also contributes to the bottom line. According to Slattery, its RAM NDT

system saves the company "33 cents on each gear produced over the previous method." And since the company ships around 5,000 gears a day, that amounts to a total savings of \$1,660 per day. Furthermore, since the unit eliminates the need for a specially trained operator, it also reduces personnel costs. But

the best part is in knowing the company has achieved the highest level of quality assurance possible.

"When I go home at the end of the day, I don't spend the night worrying about whether or not a gear slipped through our quality system and was shipped to a customer because I know every single gear produced on our line has been thoroughly and completely tested. It's hard to put a price tag on that," Slattery says. "But it is easy to figure the consequences involved in a field failure. That's every manufacturer's worst nightmare."

For Capstan Atlantic, a defective part in a drivetrain system represents a customer "walk home." In other words, the automobile breaks down, leaving the occupants stranded. In this scenario, the cost of tear-down and customer reimbursement could easily exceed the



Newly formed gears are sintered on 65' continuous belt furnaces at a temperature over 2,000° F.

purchase price of the RAM NDT unit. But that's really only the minimum effect. And it involves proving that the defective part was an isolated event. Because otherwise, it might result in a recall—an ordeal that could easily put a company out of business.

“With our present system in place, I'm confident that everything checks out as it should,” Day says. “The level of quality assurance is far superior to our previous method.”

RAM NDT packages are available with a variety of options, from the \$23,000 manual systems package to the mid-range, semi-automated system without a conveyor that runs at \$34,000, to the totally automated RAM NDT at \$55,000.

Although there was a learning curve initially, once Capstan Atlantic employees

mastered the new system, they found it relatively easy to use. And not only did it require less engineering support, but also the data captured by the RAM NDT provided feedback that contributed to other quality improvements.



“We discovered that additionally, the unit has enabled us to recognize things about our process and make improvements upstream that have increased our product yield by reducing process variation,” Slattery says. ■

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The RAM NDT unit (top photo) is streamlined right into the production process, with gears that pass inspection going straight to the packaging department for shipment (bottom photo).