This is the reason you sleep at night

For Trelleborg, the best result is when the job its bearings are doing is not noticed. When the noise and vibration they are there to isolate, is not even considered an issue.

TEXT: DONNA GUINIVAN
PHOTOS: MALOU VAN BREEVOORT

Anyone looking at a laminated bearing in the basement of a building could be forgiven for thinking that it was just a large lump of black rubber. But like many things that appear simple on the outside, there is a huge amount of application expertise and polymer engineering beneath its unassuming exterior.

"Buildings all over the world are supported by mounts that prevent occupants feeling vibration or hearing noise," says Ashley Haines, Design Manager for Trelleborg's laminated Andre bearings. "Longevity and proven track record are vital in this business when the minimum life of 60 years is required for a building. It is important to structural engineers and architects that our product has a long and respected history."

Andre bearings were the first laminated bearings to be used in infrastructure projects.

"In 1957, Andre bearings were the first ever fitted to support a bridge, the Pelham Bridge in Lincoln, England," continues Haines. "Today hundreds of thousands of bridges around the world are mounted on laminated bearings. It's now standard construction practice."

The innovation was the result of a collaboration between the Andre Rubber Company, WS Atkins Engineering Consultants and the Tun Abdul Razak Research Center. The Research Center was backed by the Malaysian Rubber Producers Association that sought to promote adoption of natural rubber in new applications. This same team was the first to specify laminated bearings as vibration isolators beneath a building.

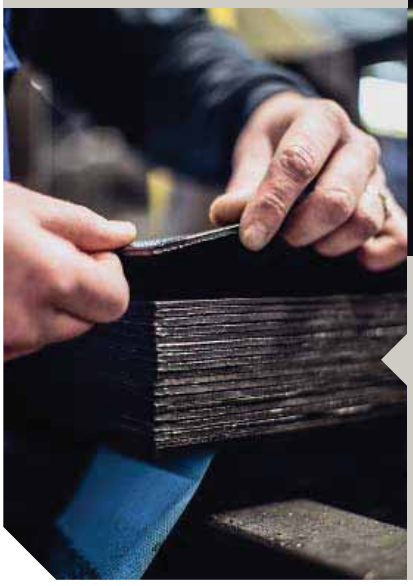
"In the 1960s, ground-borne vibration caused by the London underground was becoming an issue," says Haines. "Bearings were installed under the luxury Albany Court apartment block that literally sits on top of the busy St. James's Park tube station. Recently an inspection has taken place of the bearings and nearly 50 years on they are still in good condition, performing as they were intended, with no perceptible vibration felt in the building."

Involvement in these early projects gives Trelleborg direct access to test data that allows the characterization of rubber compounds in building isolation bearings.

"Perhaps differently to other applications, we do not spend research and development time compounding new rubber formulations. Instead we need to fully characterize the rubber compound of our bearings. Specifiers require this. They expect to be able to rely on the technical standards we give, especially when the building they are constructing may represent an investment of 500 million dollars or more."

HOW TO BUILD ANDRE BEARINGS IN SEVEN, NOT SO SIMPLE, STEPS

1
Raw rubber compound is delivered from an external mixing plant. It is then preheated and homogenized in a calandering process. After this, the compound is formed to a specified width and thickness on heated rollers.



2
The first step in building a bearing which is a sandwich construction of steel plates and rubber layers laid-up by hand.

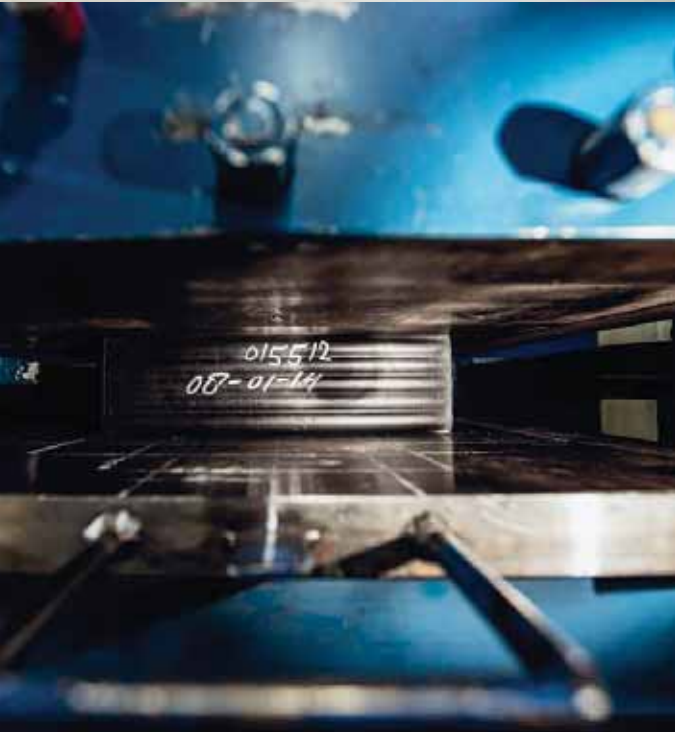
3
Unique to each project, the thickness of the layers within the bearing is specified based on the building's isolation performance requirements.

4
An outer layer of rubber compound is wrapped around the construction to protect the steel plates.

5
The completed bearing that's been vulcanized, where the rubber layers are bonded to the steel shim plates and giving the bearing its definitive shape.

7
Two identification labels with a unique serial number – yellow label – and project details – white label – are adhered to the bearing, ensuring traceability of the product.

6
Each bearing undergoes a compression test to ensure it meets specifications.



Inherently all polymers stiffen with age, but the bearings must remain flexible to isolate noise and vibration in the long term. Tests on the Pelham Bridge bearings in 1994 showed that after 37 years they had stiffened by less than 10 percent, an amount that could easily be allowed for in the design stage.

"The structure above and below the bearings in Albany Court has a number of datum levels used to investigate the creep of the bearings long-term," continues Haines. "An inspection in the 1980s predicted that the creep deflection was in-line with predicted behavior. It will be interesting to see if the latest inspection gives creep results that continue to track the predicted path."

Trelleborg tends to focus on the most technically demanding projects.

"We are always challenging ourselves to push the performance of laminated bearings as building isolators to the limits," continues Haines. "We work with structural engineers to try and design a mounting system that is as compact as possible. This lowers overall costs in construction, reducing the investment in steelwork and concrete around the bearings and most importantly frees up valuable letting space, contributing to long-term building yield."

ANOTHER IMPORTANT ASPECT of bearing design is fire resistance. Buildings need to achieve a two hour rating, which means that in the event of a fire, the building will stay structurally sound for two hours to allow time for people to evacuate. The bearings must retain their structural integrity.

"As a hydrocarbon-based material, natural rubber compounds will burn," says Haines. "Protection is partially afforded by the physical bulk of the laminated bearing that prolongs the time for the temperature rise at the core to reach a critical level. Further resistance is added with a specialty ethylene propylene diene monomer flexible shroud that acts as an intumescent barrier. At a certain temperature a chemical reaction occurs and the shroud, originally around eight millimeters thick, grows as the graphite in the compound exfoliates and expands, reducing the rate at which the heat energy conducts through the bearing."

THIS IS AN AREA where Trelleborg undertakes a substantial amount of testing.

"After two hours in the heat of a furnace, our shrouded bearings may not look that pretty but they will still function."

Each bearing project has its individual idiosyncrasies and after all the years Haines has supported customers specifying bearings, he never ceases to be excited by the buildings the mounts protect.

"We've been involved in projects all over the world. From concert halls to museums, office blocks to apartments, we've done them all. I get a real buzz knowing that our products, though unseen, are contributing to the enjoyment of a beautiful building. More than two hundred million people a year will pass London's Park House complex in Oxford Street, never knowing it's so quiet above the retail units inside because of our bearings. When visiting Los Angeles, I stare in wonder at the Frank O. Gehry's Disney Concert Hall with its stainless steel curves, contrasted against the angular concrete form of Our Lady of the Angels cathedral. Though so different, they are probably the most beautiful buildings we've ever worked on." ■

ASHLEY HAINES

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Background: Started with the Andre Structural Bearings business in 1991 as Technical Manager and has continued in that role through Trelleborg's acquisition in 2005.

Interests: Coaching cricket, walking and supporting Burton Albion (my local division two soccer team).

FOR MORE INFORMATION

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