

# Firestone

World's Number 1  
Air Spring.



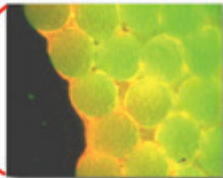
FIRESTONE INDUSTRIAL PRODUCTS COMPANY



## MATERIAL RESEARCH AND DEVELOPMENT IS TOP PRIORITY AT FIRESTONE INDUSTRIAL PRODUCTS



Light Fluorescence Microscopy

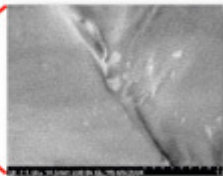


Cord Filament

INDIANAPOLIS, Ind. - As the inventor of the air spring and a subsidiary of Bridgestone Firestone Diversified Products, Firestone Industrial Products Company, LLC has made material research and development a company priority. Since the early 1930s, Firestone has studied leading-edge technologies and developments in rubber compounds in order to manufacture the highest quality, top-performing air springs for its customers. Today, Firestone's Airide™, Ride-Rite™, Sport-Rite™, Coil-Rite™ and Level-Rite™ air springs are synonymous with quality and durability.



Field Emission Scanning  
Electron Microscopy



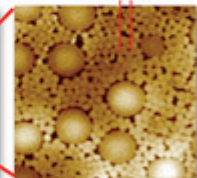
Section Magnified  
35 to 800,000X  
125 nm

### Laboratory Research

By leveraging the resources of Bridgestone Americas Center for Research and Technology (CRT), Firestone has remained on the cutting edge of air spring suspension technology since the beginning, investing significant capital into equipment that allows the company to research air spring materials and designs, conduct failure analysis and develop intellectual property. That equipment includes:



Scanning Probe Microscopy

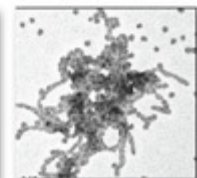


Latex Spheres

- Microscopy equipment - such as Light Fluorescence Microscopy, Field Emission Scanning Electron Microscopy and Scanning Probe Microscopy - is used to conduct fracture analysis and surface chemistry, as well as benchmark alternative compounds that can be used to make air springs.



Tunneling Electron  
Microscopy



Micelle Nanoparticles

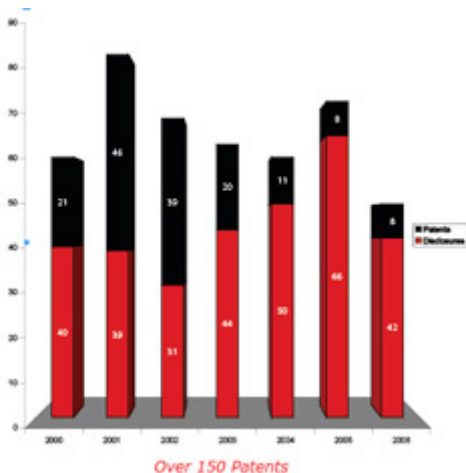
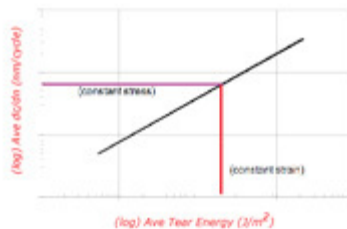
- Crack growth evaluation methods are employed to appraise the foundation compound and to measure base line improvements, which is further validated through specialized fatigue equipment used to test new concept air spring assemblies by subjecting them to different environments, such as high heat or specific ozone situations.



Crack Growth Test Equipment



Sample Grip Unit

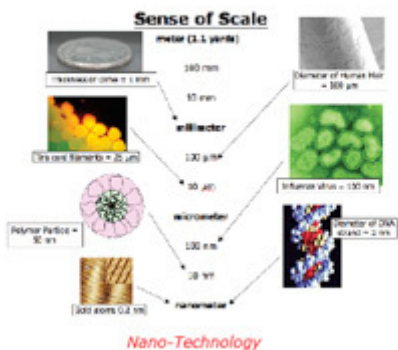


### Intellectual Property

As a testament to the company's commitment to R&D, CRT has earned more than 150 patents since 2000 covering polymers, synthesis processes, tire compounds and nano-technology.

In addition to analytical equipment, Firestone has a dedicated engineering team with a depth of product knowledge and experience. The company's global presence allows their engineers worldwide to work closely with their customer base to fully understand each application and the diverse environments to which the air spring product will be applied.

"We have a world-class compounding team at Firestone that fully understands how our product is applied in the various markets throughout the world," said Stephen Street, International Engineering Manager with Firestone Industrial Products. "We specially formulate a compound based on the air spring application, its fatigue requirements, environmental requirements, ozone requirements and more. In addition to our compounding expertise, we use the knowledge from CRT - which studies the long-term effects of compounding technology to determine where products should be in the next five years - to develop products that go above and beyond those of

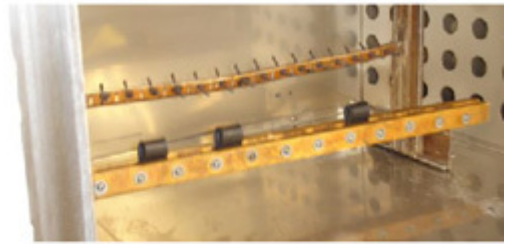


our competitors."

Firestone's Compound Material Research involves analyzing the properties of rubber and how it performs in specific environments in order to improve the strength and functionality of its products. For instance, Firestone examines the inter-ply shear stress of its rubber components to ensure product endurance and durability.

## Ozone Resistance

The company also analyzes the effects of the ozone on rubber - typically hardening, cracking and loss of adhesion as a result of rubber aging. To combat this and produce a long-lasting air spring, Firestone uses a combination of antioxidant and antiozonant waxes that form a physical barrier on the rubber's surface. Because the wax blooms to the surface of the rubber to form an ozone barrier, the air spring tends to have a "whitish" color, which is evidence that they'll last during long-term use.



Ozone Bent Loop Test

## Corporate Commitment to the Environment

In addition to these innovations, the many years of experience, and the tried and true compounds Firestone Industrial Products has developed, the company is continually studying new technologies and new compounds. One such initiative the company has embraced is a focus on "green" compounds, such as use of alternative oils and recycled rubber and carbon black.



"As an organization, we are always trying to be very conscious about our products' effects, not only on the environment, but also on the people our products come in contact with," Street said. "This includes using recycled rubber, changing our surface treatments and more. It's Firestone's goal to bring the best compounds to market that we can for our customers around the world."

*Firestone Industrial Products, a subsidiary of Bridgestone Firestone Diversified Products (BFD), specializes in air spring manufacturing and technology with a history of more than 65 years of research and development of technologically advanced air springs. With headquarters in Indianapolis, Ind., and six quality certified manufacturing/assembly plants located on four different continents, the company produces suspension products for commercial trucks & trailers, buses, railway cars, sport utility vehicles, light trucks, minivans, vans, cars and motor homes. For more information, visit [www.fsip.com](http://www.fsip.com)*