Materials Lab

the fisher barton group

History of Research & Innovation

Fisher-Barton was founded in 1973 with five employees in Watertown, Wisconsin to manufacture lawn mower blades. Today, we are a multi-national manufacturer with operations all across the United States and Vietnam. A core value of our business is an understanding of the materials that go into our products. Materials excellence, innovation and customer success are the cornerstones of our global leadership. They're also at the heart of our new Materials Research Lab, located not far from our first plant.

While the new lab has very unique capabilities, it is deeply rooted in our history. In 1983, our first metallurgical lab was created. From this modest lab, we were able to develop hundreds of innovations. It also was where we discovered and refined the materials and processes for which we'd be awarded 16 patents, including our patented **MARBAIN®** material. The new lab represents our investment in the future of innovation at Fisher-Barton and the customer success it breeds.

Materials Lab

The materials we work with have changed dramatically in the last 40 years. While we continue to work with medium and high carbon steel, we are regularly providing solutions to our customers from all types of materials, including tool steels, carbides, ceramics, and nano-structured materials and coatings. Our new lab meets these changing needs. It's been designed to support even greater product and process innovations using a much wider array of materials. The lab also allows us to optimize testing across a series of the most state-of-the-art instruments. Our new capabilities and expertise will provide you with the data and knowledge you need. We put the tools to meet your requirements in one place. What's more, our new sample prep capabilities ensure consistency and reproducibility.

Materials Lab Equipment List

Materials Analysis—Microscopy Equipment

Zeiss MA10 Scanning Electron Microscope w/ Thermo Scientific NORAN System 7 Energy Dispersive Spectroscopy — Used for high-magnification imaging with a high-energy electron beam and analyzing emitted X-rays for elemental/chemical characterization.

Zeiss Stemi 2000C Stereo Microscope — Optical microscope used for low magnification, three-dimensional observation.

Zeiss AxioVert 40 Metallurgical Microscope — Optical microscope used for high magnification observation and verification of microstructures.

Keyence VK 9700 Laser Scanning Microscope — Produces high definition images and 3D measurement models with 1 nm resolution.

Material Analysis—Chemical Analysis Equipment

Thermo Scientific ARL 9900 X-ray Fluorescence and X-ray Diffraction — Contains X-ray Fluorescence (XRF) spectrometers integrated with X-ray Diffraction (XRD) for analyzing complex, unknown "bulk" samples, quantitatively identifying the elements present and the crystallographic structure of the solid "bulk" sample.

LECO GDS 850A Glow Discharge Spectrometer — Delivers highly accurate bulk analysis and quantitative depth profiling for coating and surface treatment analysis.

LECO TN400 Nitrogen Determinator — The preferred industry standard method for analyzing nitrogen.

LECO C230 Carbon Determinator — The preferred industry standard method for analyzing carbon.

Mechanical Testing Equipment

Instron 9350 Drop Weight Impact Tester — Produces the time history of applied force and deformation during a test, as well as Charpy V-notch impact toughness testing.

MTS 322 Universal Testing Machine — Delivers the time history of applied force and deformation, in addition to mechanical properties and customized fatigue testing.

Falex ASTM G76 Airjet Erosion Wear Tester — Produces data to rank materials by their solid-particle erosion resistance.

Falex ASTM G65 Dry Sand Rubber Wheel Abrasion Wear Tester — Produces data to rank materials by their abrasion resistance.

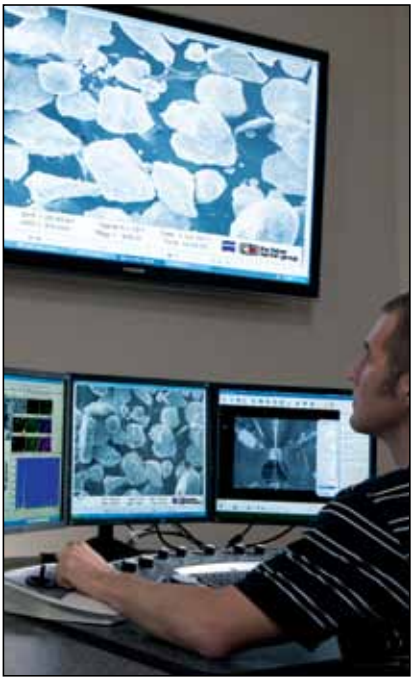
Clemex CMT Automated Microhardness Tester — Knoop and Vickers hardness testing with walk-away capability that virtually eliminates operator errors for the most consistent, accurate results.

Struers DuraJet Hardness Tester — Capable of testing with all Rockwell and Superficial Rockwell methods.

Materials Analysis Highlights

SEM with EDS

The scanning electron microscope (SEM) enables us to perform sophisticated analysis of fracture surfaces. The high magnification and extraordinary depth of field of the SEM can identify precisely whether a fracture has been caused by abnormally large grains, an unwanted film along the grain boundary or an overload. The SEM also enables us to see fine phases distributed throughout the material. The SEM is frequently used in combination with Energy Dispersive X-ray Spectroscopy (EDS) to give us the unique ability to qualitatively and quantitatively measure chemical differences between phases in areas as small as one-tenth the diameter of a human hair. These differences can occur as the result of subtle changes in a mixing or heating process.



The EDS is capable of producing a color-contour map of each element found in the sample. The map allows us to visually inspect chemical differences within an exceedingly small space.

Applying these two microanalysis techniques allows us to research and improve our components, making them even better and more cost effective.

Materials Analysis Highlights

X-Ray Fluorescence/X-Ray Diffraction & Glow Discharge Optical Emission Spectrometry

X-ray fluorescence technology can quantitatively identify unknown constituents in a variety of materials, not only metals, but other solids, like ceramics. Once the material's elements are identified, it can be examined further using X-ray diffraction. X-ray diffraction can be used to identify the crystallographic structure of solid "bulk" samples.

Glow discharge optical emission spectroscopy (GD-OES or GDS) can be used to qualitatively and quantitatively measure the elements present in bulk metallic and ceramic materials. The GDS uses electron excitation, photon emission, and a holographic grating to separate emitted light into its component wavelengths, which will tell us the elements present in the material analyzed. Unlike traditional optical emission spectrometers, the GDS sputters away material layer-by-layer and analyzes each layer to provide a quantitative depth profile of the elements present. This technique is very useful in measuring very thin layers where elemental compositions are changing.

Because so little of the sample is destroyed, we're able to analyze very thin films of material. Layered material analysis is important at the interface of a coating and a base material, where wear and adhesion issues become paramount. These and other capabilities of our lab are enabling customers to understand and improve their products.

Mechanical Testing Highlights

Drop-Weight Impact Testing

Impact-testing technology in our lab enables us to not only control a number of variables affecting the force of impact with a part or component; it also provides real-time measurement with extraordinary sensitivity during impact. Our drop-weight testing capabilities allow us to measure accurately at what force chipping of a coating will begin or at what time during an impact with a cutting edge chipping is imminent.

By understanding these dynamics, we can change our coatings, products or product processes based on these and other highly sophisticated tests.

Abrasion & Erosion Testing

As coatings and other changes in the production of metal parts and components have become more complex, the need for increasingly precise technologies to measure wear and other causes of failure has grown.

Few offer the abrasion and erosion testing capabilities of our new lab. Our new abrasion and erosion testing capabilities allow us to repeatedly perform standardized tests to rank the abrasion and erosion resistance of our materials. We know materials wear differently in varying locations throughout the world, and with the high cost and time associated with field tests, we are able to use our expertise and standardized testing to isolate the primary source of wear before your parts hit the field. We use this understanding, along with our research, to serve you better than anyone in the industries we serve.

Fatigue Testing

Another important mechanical testing capability is fatigue testing, during which we subject a component to cyclic loads to determine if it will fail when and where its design predicts. This test either confirms the safety of the design or provides us with information that helps a customer with the component's redesign.

One of the primary missions of the new Materials Research Lab is to continue to provide our customers with superior products while saving valuable time and money. Mechanical lab testing is a great illustration. We know that field testing is expensive and time-consuming for our customers. One of our goals for the lab is to dramatically reduce the design cycle time and minimize time in the field and the money spent there by optimizing a part or component before it is deployed.

Our Goal

Throughout our history, Fisher-Barton has been proud to provide the materials expertise that has fueled the innovation, driving great successes for our customers. Our new Materials Research Lab is built on that strong tradition of innovation and is focused on the continued growth of those customers.

We look forward to serving you in the new lab. Please call **262-522-2257** to learn more about how we can help.

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