Materials Lab Equipment List

**Materials Analysis — Microscopy Equipment**

- Zeiss MA10 Scanning Electron Microscope w/ Thermo Scientific NORDAX 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 AxiosVert 40 Metallurgical Microscope — Optical microscope used for high magnification observation and identification of microscopic details.
- Keyence VK V700 Laser Scanning Microscope — Produces high-definition images and 3D measurement models with 1 nm resolution.

**Materials 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” materials, qualitatively identifying the elements present and the crystallographic structure of the “bulk” sample.
- LECO CS930A 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 CS20 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 Duradur Hardness Tester — Comes with a test with Rockwell and Superficial Rockwell methods.

**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.
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Zeiss AxioVirt.A 40 Metallurgical Microscope — Optical microscope used for high magnification observation and selection of microstructures.
Keyence VK-7000 Laser Scanning Microscope — Produces high-definition images and 3D measurement models with 1 nm resolution.

Materials Analysis — Chemical Analysis Equipment
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LECO GDS 850A Glow Discharge Spectrometer — Delivers highly accurate bulk analysis and quantitative depth profiling for coating and surface treatment analysis.
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LECO CDS 850A Glow Discharge Spectrometer — Delivers highly accurate bulk analysis and quantitative depth profiling for coating and metal analysis.

LECO TH400 Nitrogen Determinator — The preferred industry standard method for analyzing nitrogen.

LECO C200 Carbon Determinator — The preferred industry standard method for analyzing carbon.

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Materials Analysis Highlights

SEM with EDS

The scanning electron microscopy (SEM) enables us to perform sophisticated analysis of fracture surfaces. The high magnification and extraordinary depth of field of the SEM can identify precisely where a fracture has been caused by abnormally large grains, an unusual film along the grain boundary or an overload. The SEM also enables us to see fine phases distributed throughout a 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 bulk metallic and ceramic materials. The SEM uses electron excitation, photon emission, and a holographic grating to separate emission into its component wavelengths, which will tell us the elements present in the material analyzed. Unlike traditional optical emission spectroscopy, the SEM separates raw material by layer and analyzes each layer to provide a quantitative depth profile of the element 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. Extended 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 capability allows 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 metals and components have become more complex, the need for increasingly precise technologies to measure wear and other causes of failure has grown.

Two offer the abrasion and erosion testing capabilities of our lab. Our new abrasion and erosion testing capabilities allow us to repeatedly perform standardized tests to rank the abrasion and erosion resistances of our coatings. We have 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.

By using this understanding, along with our research, to serve you better than anyone in the industries we serve.

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.
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 where a fracture has been caused by abrasion, fatigue, corrosion, impact, or wear. The SEM also allows us to use fine phase contrast and X-ray microanalysis techniques to determine the nature of the fracture in more detail. SEM and EDS techniques give us the unique ability to qualitatively and quantitatively measure chemical differences between phases in areas as small as one-thirtieth 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-coded contour map of each element found in the sample. The map allows us to visually inspect chemical differences within an exceedingly small area. Applying these two microanalytical techniques allows us to research and improve our components, making them even better and more cost effective.

Materials Testing Highlights

X-Ray Fluorescence/X-Ray Diffraction & Glow Discharge Optical Emission Spectroscopy
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 the light into its component wavelengths, which will tell us the elements present in the material analyzed. Unlike traditional optical emission spectrometers, the GDS spatters 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. 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 forces of impact with a part or component; it also provides real-time measurement with extraordinary sensitivity during impact. Our drop-weight testing capability allows 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 technology to measure wear and other causes of failure has grown. To offer the abrasion and erosion testing capabilities of our new lab, our new abrasion and erosion testing technologies allow us to repeatedly perform standard tests to rank the abrasion and erosion resistance of our materials. We know that 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.

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Fisher-Barton
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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
SEM with EDS

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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 crystalographic structure of solid “bulk” samples.

Glow discharge optical emission spectroscopy (GDS-GES 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 the 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. Material 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 capability allows us to measure accurately at what force and at what time an impact with a cutting edge is imminent. By understanding these dynamics, we can change our coatings, products, or product processes based on these and other highly sophisticated tests.

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The EDS is capable of producing a colorized image of the specimen that shows the elements present. This technique is very useful in measuring very thin layers where elemental compositions are changing.

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.

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Discharge Optical Emission Spectroscopy

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Materials Analysis Highlights

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Abraslon & Erosion Testing

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Due to 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 that 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 sources of wear before your parts hit the field.

By using this understanding, along with our research, to serve you better than anyone in the industries we serve.

Mechanical Testing Highlights

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.

Drop-Weight Impact Testing

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.

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