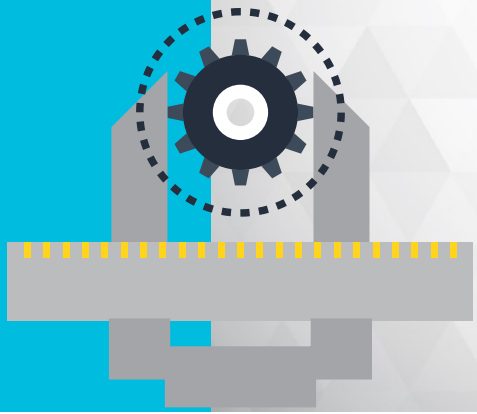
Ensuring Reliability Through
MATERIALS ENGINEERING, CHARACTERIZATION, AND TESTING



BUFFALO MANUFACTURING WORKS

Operated by EWI

As standards for product quality and performance continue to increase, it is critical that manufacturers are able to ensure that products will perform to specifications, especially for applications in which an unexpected failure can carry serious health and safety risks.

Failure in a critical part of a supply chain can be catastrophic, but companies often lack the adequate in-house testing capabilities to even explain why a product failed. Advanced materials engineering, characterization, and testing are critical to understanding failures, finding solutions and, ultimately, increasing the reliability of products.

Advanced materials engineering, characterization, and testing is critical to:

In-process testing to reduce material costs & improve throughput	Ensuring compliance to new regulations	Meeting increased customer expectations	Bringing new products to market faster
Understanding and explaining product failure	Improving on past processes	Implementing net new processes	Delivering longer lasting, higher quality products

Increasing confidence in product performance and reliability requires solving challenges and optimizing processes at every stage of production.

In-situ testing

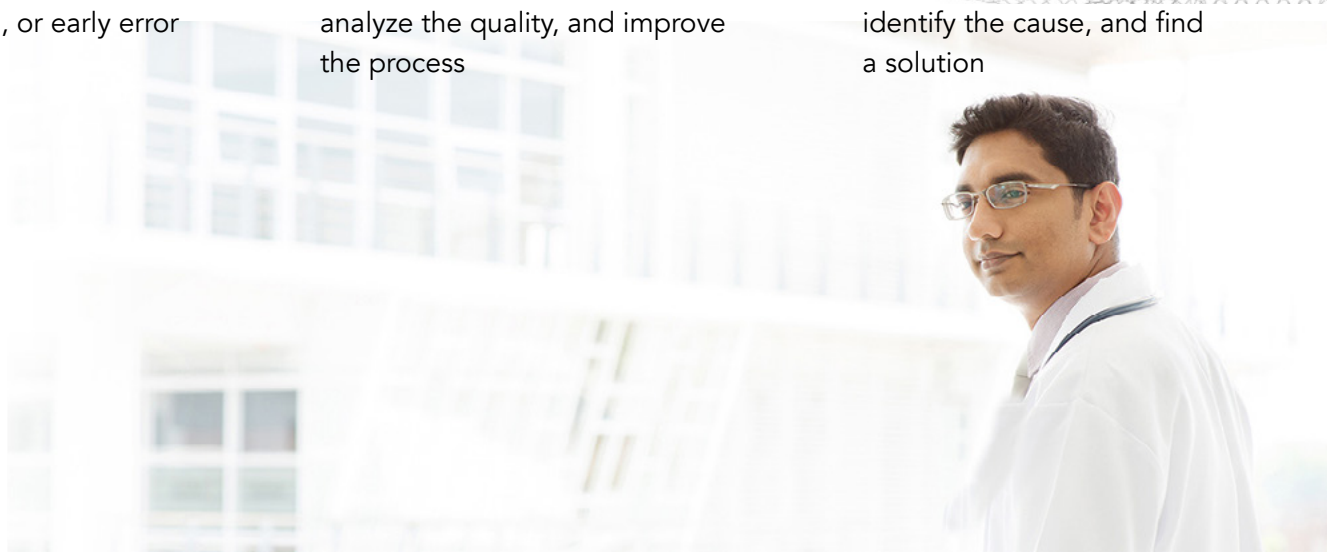
- For continuous optimization, early rejection, or early error recognition

Ex-situ measurements

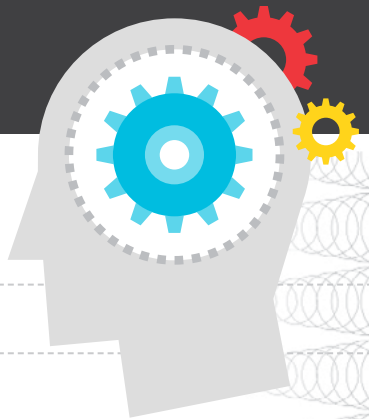
- To take the output of a process, analyze the quality, and improve the process

Failure forensics

- To isolate the failure, identify the cause, and find a solution



Three technologies particularly critical to identifying and understanding the underlying cause of failure:



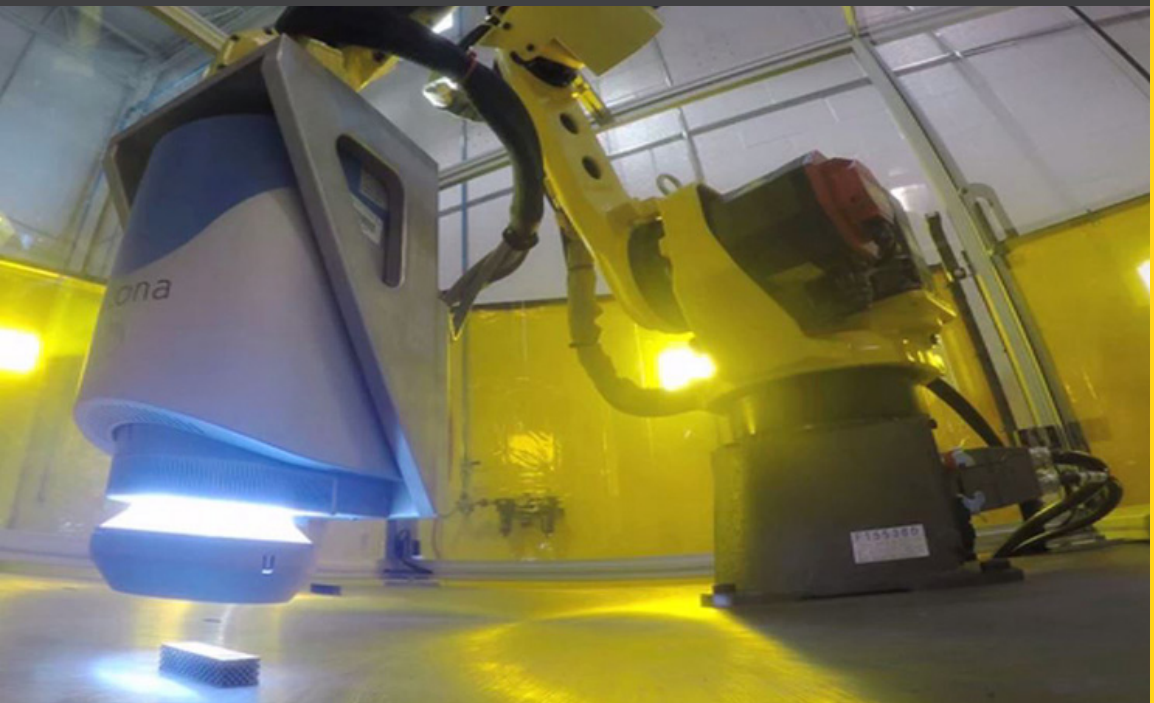
- Optical 3D Surface Metrology, Characterization, and Visualization
- Industrial Computed Tomography
- Scanning Electron Microscope

However, technology is only as good as the user—it is necessary to have the engineering expertise needed to apply these technologies as well as the experience necessary to interpret results.

Optical 3D surface metrology, characterization, and visualization enables the high accuracy and precision needed by today's manufacturers.

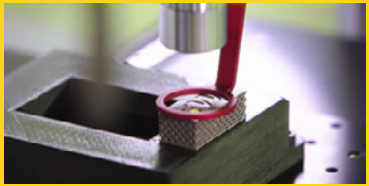
Applications include:

- Measuring roughness and form
- Understanding wear and its causes
- Measuring microstructured geometries
- Validating precision manufacturing of tools and metal parts



Alicona IF-Robot

Robot-assisted 3D surface measurement instrument that provides flexible positioning to measure roughness, form, and orientation in high resolution and repeatable accuracy.



Bruker NP Flex

The first optical metrology system to handle micro to macro features effortlessly on samples of widely varying sizes.

Detailed measurement of internal features is critical for quality control, failure analysis and material research across various industries—industrial CT is the gold standard in nondestructive evaluation.

Applications include:

- Characterization of 3D printed parts with complex geometries or multi-material builds
- Composite material characterization
- Failure forensics
- Measurement of internal dimensions without sectioning the sample
- Quality control of metal and plastic parts
- Verification of complex internal structures

Nikon CT systems at Buffalo Manufacturing Works

XTH 225:

- Dual Tube: 180 keV and 225 keV
- 1 µm focal spot with the 180 keV tube (holds for <3W power, spot size rises linearly to 20 µm at 20W)
- 450W power with the 225 keV tube
- Dimensional measurements to 4+L/42 microns

XTH 450:

- 80 µm spot size for <100W power
- 113 µm spot size for <450W power
- Curved Linear Detector Array to minimize scattering in thicker parts
- Dimensional measurements to 4+L/42 microns
- Max Sample Size: 600 mm diameter, 600 mm height

Scanning Electron Microscopes are used to inspect material topographies at a nanoscale.

Applications include:

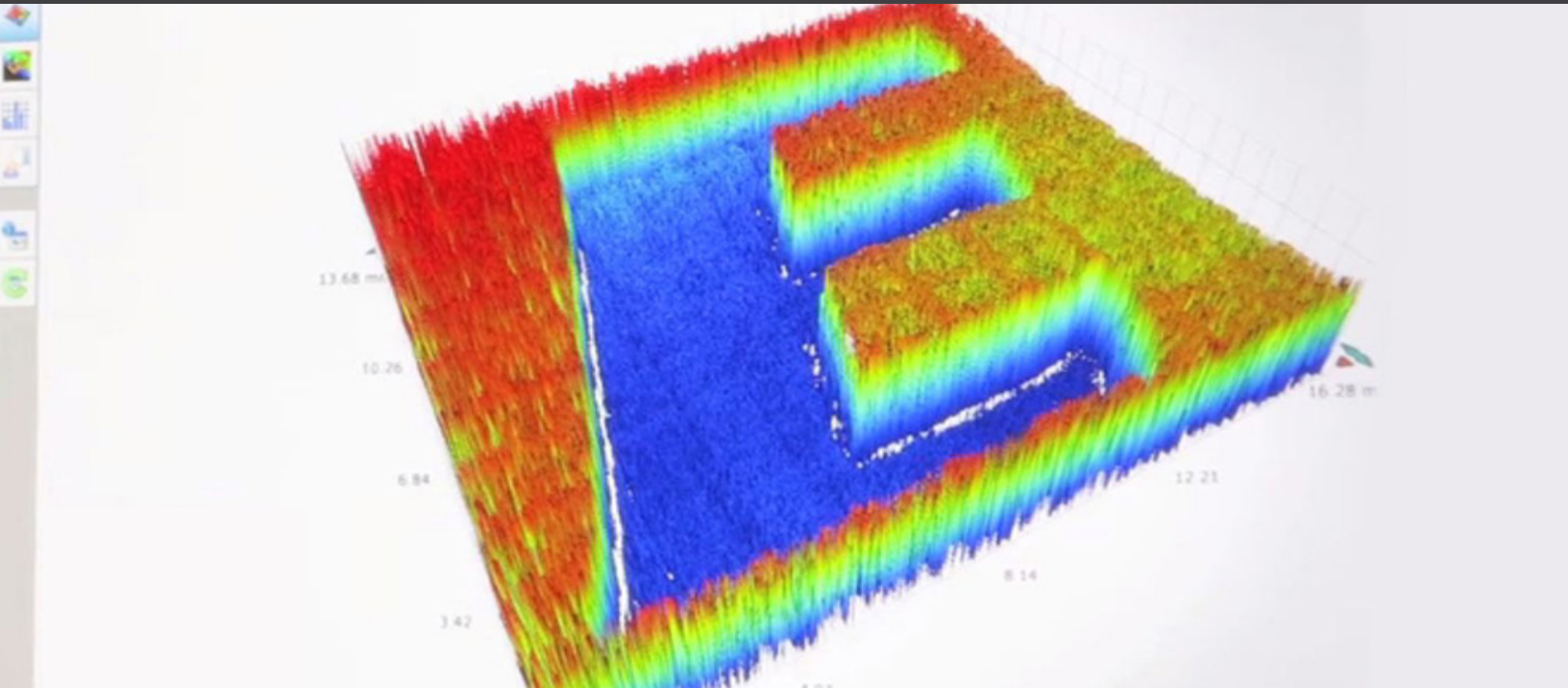
- Elemental analysis with an energy dispersive x-ray detector
- Morphology assessment
- Microstructure analysis such as grain orientation and phase identification with an electron backscattering diffraction detector
- Size distribution and defect analysis

Hitachi S-3700N

A variable pressure scanning electron microscope with large chamber, energy dispersive x-ray, and electron backscatter detection capabilities that is optimized for the characterization of metals, ceramics, composites, and plastics.

Sample projects:

- Automated inspection of sealing surfaces
- Dimensional and cross-sectional analysis of medical device components
- Surface roughness measurement and analysis of dental specimens
- Characterization of powders for additive manufacturing
- Inspection of internal components, critical features, weld joints, presence of burrs, chips



Equipment and capabilities available at our precision measurement lab:

- ***Alicona IF-Robot***
- ***Beckman Coulter Multi-wavelength Particle Size Analyzer and Tornado Module***
- ***Bruker Nano Inc. NPFLEX 3D Metrology System***
- ***Hexagon Metrology Global Performance Silver Edition Metrology Frame (CMM)***
- ***Hitachi High Technologies Ultra Large Chamber Variable Pressure SEM***
- ***Machine Vision Test Lab***
- ***Nikon XTH 225 and 450***
- ***Novacam Technologies MicroCam-4D Profilometer***
- ***PDI Precision Devices Surfanalyzer***
- ***Polytec Inc. Laser Vibrometer HSV-100***

About our capabilities

Buffalo Manufacturing Works and EWI lead the way in materials engineering, characterization and testing. We apply our advanced examination solutions across industrial sectors and across the product lifetime from initial process optimization, to in-process monitoring, to failure forensics. Our team helps manufacturers boost product performance and reliability through materials development, selection, and characterization, powder processing expertise, measurement and testing capabilities, forensic failure analysis, and coatings and surface engineering technologies.

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We Manufacture Innovation