



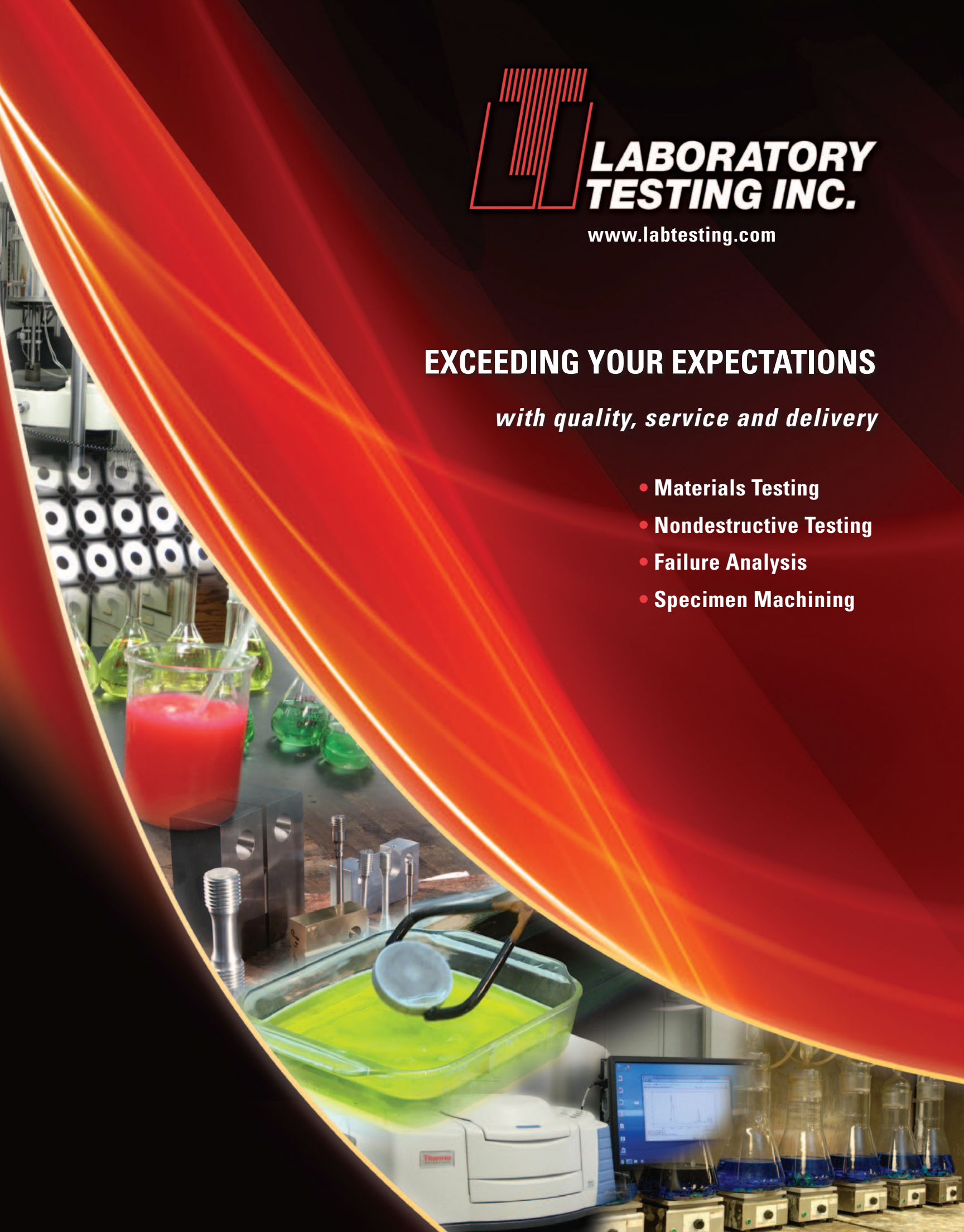
**LABORATORY  
TESTING INC.**

[www.labtesting.com](http://www.labtesting.com)

**EXCEEDING YOUR EXPECTATIONS**

*with quality, service and delivery*

- **Materials Testing**
- **Nondestructive Testing**
- **Failure Analysis**
- **Specimen Machining**



# LTI FOR ALL OF YOUR TESTING AND SPECIMEN MACHINING NEEDS

Since 1984, **Laboratory Testing Inc. (LTI)** has been inspecting, testing and certifying materials found in tubular products, bar stock, plates, castings, fasteners and other products. Our clients are manufacturers, fabricators and service providers for the Aerospace, Defense, Power Generation, Medical and other major industries. LTI holds the accreditations and approvals to comply with stringent industry requirements. We also have the technical expertise, quality system and latest equipment to meet your needs for quality, service and delivery.

## ONE-STOP CONVENIENCE

Laboratory Testing Inc. offers a full array of materials and nondestructive testing services to support our customers with the information, answers and documentation needed for R&D, material selection, quality control and failure investigation. Destructive test specimens are prepared to ASTM specifications in our Machine Shop. Calibration and dimensional inspection services are performed in the LTI Metrology Lab to verify the reliability of your measuring instruments and tools, and the dimensional accuracy of machined products and parts.

## EXCEPTIONAL SERVICE

Although most testing and metrology requirements are fairly routine, we know that customers occasionally need help with unique questions and situations. Our engineers, chemists, technicians and customer service staff have the experience to help with answers and solutions.

At Laboratory Testing Inc., we do whatever it takes to get your job done correctly and report the results to you on time. We help you fulfill your obligations, so you can keep your customers satisfied and your business running smoothly.



## QUALITY ASSURANCE

Laboratory Testing knows our customers depend on us for accurate workmanship, reliable results and answers about their materials and products. That's why quality is a top priority. All testing and machining services are performed according to industry specifications, customer requirements and our own stringent procedures. Details about the services performed are clearly and concisely documented in Certified Test Reports and Failure Analysis Reports.

**Specifications:** Procedures conform to ASTM, AMS, ASME, ANSI and MIL specifications. Our inspection and quality control system is in accordance with the following specifications:

- ANS/ISO/IEC 17025
- ANSI/NCCL Z 540-1
- ASME NQA-1
- ASME Section III NCA-3800
- ISO-9001
- ISO-10012-1
- 10 CFR 50 Appendix B
- 10 CFR 21
- AC7101/1
- AC7006
- AS7114
- AC7110/13
- NRC Regulatory Guide 1.28

**Accreditations:** LTI is accredited by PRI/Nadcap in materials and nondestructive testing and accredited to ANS/ISO/IEC 17025 by A2LA for mechanical, metallurgical and chemical testing, dimensional inspection and calibration services.

**We welcome audits of our quality assurance program and provide our quality manual and accreditations upon request and on our website.**

## MATERIALS TESTING: DESTRUCTIVE & NONDESTRUCTIVE

Testing is an important part of quality control for many businesses. LTI offers accredited destructive and nondestructive testing services to evaluate materials and identify potential problems. Testing is often performed to meet industry requirements or verify production processes. It can also provide valuable information for material selection or determining the root cause of a failure.

Laboratory Testing is an approved vendor for many major companies including GE Aviation, General Dynamics-Electric Boat Division, Lockheed Martin, Northrop Grumman Electronics, Sikorsky Aircraft, Rolls-Royce, Boeing, Bell Helicopter, Pratt & Whitney, Hamilton Sunstrand and more. The layout of our facility and capacity of our equipment permits the safe and efficient processing of orders and materials in almost any quantity and size.

### MATERIALS TESTED

LTI tests and inspects metals in all forms to provide information about characteristics, composition, defects and discontinuities. Polymers are tested for hardness and tensile strength and examined to determine composition. Our chemistry lab also analyzes powdered metals, ores, ferroalloys, composites and ceramics.

### MECHANICAL TESTING

Mechanical testing measures material properties and provides information on characteristics such as strength, hardness, ductility and impact resistance. Testing is performed under various conditions including temperature, tension, compression, impact and load to determine the range of usefulness and the service that can be expected from the material. The Machine Shop at LTI prepares specimens for all types of mechanical testing.

Our tensile machines have capabilities ranging from 10 lbs. to 400,000 lbs. Stress rupture machines test at temperatures up to 1850°F and automatically load at various time intervals. Fracture toughness equipment can generate 55,000 lbs. of tensile or compressive force and its environmental chamber can control the test temperature between -250°F and +1150°F.

- Bend
- Flattening
- Cone Strip
- Proof Load
- Yield Strength (full-size bolts)
- Stress Rupture
- Fracture Toughness
- Drop Weight
- Tensile/Ductility
- Elevated Temperature Tensile
- Wedge & Axial Tensile (full size)
- Hardness Test (Rockwell, Brinell & Superficial)
- Charpy V-Notch Impact
- Flaring/Expansion
- Conductivity
- Magnetic Permeability
- Hydrogen Embrittlement/Stress Durability
- Welder & Procedure Qualification (per MIL & API specifications, ASME & AWS codes, ASTM & EN standards and the Pressure Equipment Directive)



## METALLURGICAL TESTING

Metallurgical testing of samples detects surface and internal defects, reveals the microstructure and macrostructure of materials and determines conformance to required specifications. LTI's metallurgical engineers also perform failure analyses to provide insight into the cause of material failures, when performance does not meet expectations.

Photomicrographic equipment with optical magnification from 7X to 1000X and scanning electron microscopy (SEM/EDS) with magnification capabilities to 300,000X are used for evaluation and documentation of findings and digital imaging. Our metallurgical laboratory provides services from test sample preparation to microscopic, macroscopic and microhardness examinations.



Microhardness Examination

### Microscopic Examinations

- Microstructure
- Carburization & Decarburization
- Grain Size (ASTM E112)
- Inclusion Rating (ASTM E45)
- Plating Thickness
- Carbide Precipitation
- Ferrite by Point Count (ASTM E562)
- Alpha Case/Surface Contamination
- Intergranular Attack & Oxidation
- Sensitization
- Nodularity, Nodule Count
- Eutectic Melting

### Sample Preparation

- Precision Cutting
- 1.5" & 2" Mounts
- Thermoset & Thermoplastic Mounting
- Automatic Grinding & Polishing
- Immersion, Swab & Electrolytic Etching

### Macroscopic Examinations

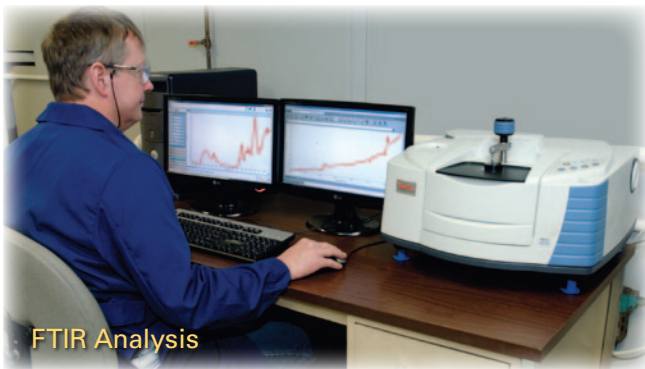
- Macro-etch (ASTM E340)
- Grain Flow
- Weld Qualification
- Surface Condition

### Microhardness Examinations

- Knoop & Vickers Testing (100 g to 10 kg)
- Surface Contamination
- Carburization & Decarburization
- Case Depth
- Profiles

### Additional Services

- Failure Analysis & Report Writing
- Scanning Electron Microscopy (SEM)
- Energy Dispersive X-ray Spectrometry (EDS)
- Digital Imaging



FTIR Analysis

## CHEMICAL ANALYSIS

Chemical analysis determines the composition of samples and is valuable in identifying and verifying materials, detecting the presence of elements and identifying unknown substances. Qualitative and quantitative instrumental analysis and classical wet chemistry are performed at LTI. Our chemists analyze metals, powdered metals, ores, ferroalloys, composites, ceramics and polymers. We are often able to help customers with special analysis requirements or orders with limited sample weight.

Trace analysis is performed using spectrometers with detection limits in the parts per million range for many metals. Gravimetric, volumetric, colorimetric and potentiometric procedures are followed for analysis in our wet chemistry lab. RoHS compliance testing is completed by wet analysis and spectroscopy methods. Testing for susceptibility to corrosion and other environmental conditions is also offered.

- Inductively-Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)
- Inductively-Coupled Plasma Mass Spectroscopy (ICP-MS)
- Energy Dispersive X-ray Spectrometry (EDS/EDX)
- Atomic Emission Spectroscopy (AES)
- Fourier Transform Infrared Spectroscopy (FTIR)
- Carbon/Sulfur/Nitrogen/Oxygen/Hydrogen Determination
- Positive Material Identification (PMI)
- Plating Identification
- Soxhlet Extraction
- Density, Porosity & Oil Content
- Classical Wet Chemistry
- RoHS Compliance Testing (Wet analysis & spectroscopy)
- Welder & Procedure Qualification (per MIL & API specifications, ASME & AWS codes, ASTM & EN standards and the Pressure Equipment Directive)

## CORROSION TESTING

A variety of corrosion tests are performed at LTI to help customers determine the impact of environmental conditions on their materials and products. The test results provide valuable information for selecting materials, treatments and manufacturing processes. The information can help compare materials, estimate the life of products and determine if a material will meet the needs of its intended application. Our staff can also identify corrosion on products and investigate the cause when corrosion occurs.

Corrosion and passivation testing are performed in accordance with ASTM practices.

- Corrosion Testing: (ASTM A262 Practice A, B, C, E; ASTM G28 Methods A & B; ASTM G48 Methods A, B, C, D, E & F; ASTM A923 Method C; ASTM G66; ASTM G67)
- Salt Spray/Salt Fog (ASTM B117)
- Passivation Testing (ASTM A380, A967 & MIL-STD 753 Methods 102 & 103)
- Humidity Testing (AMS 2700)



## NONDESTRUCTIVE TESTING

Nondestructive testing or NDT services are used to locate internal and external flaws and inconsistencies without harming your materials or products. Our NDT inspectors are certified to ASNT SNT-TC-1A, NAS410, MIL-STD-2132 and Pratt & Whitney PWA-NDTQ to meet your industry requirements. We have Level II and Level III inspectors in all areas of NDT.

### *Ultrasonic Inspection*

- High-speed Immersion for Round Stock
- C-scan Immersion
- Contact

### *Magnetic Particle Inspection*

- Fluorescent Wet
- Visible Dry

### *Liquid Penetrant Inspection*

- Fluorescent Dye
- Visible Dye

### *Hydrostatic Pressure Testing*

- Tubing, Pipe and Fittings
- Up to 10,000 PSI

### *X-ray Inspection / Radiography*

- Film Based

### *Visual Examination*

- SNT-TC-1A Certified

### *Welder & Procedure Qualification*

(per MIL & API specifications, ASME & AWS codes, ASTM & EN standards and the Pressure Equipment Directive)

*Receipt and final inspection, and additional services are provided upon request.*

- Cutting, Trimming and Deburring
- Packaging and Shipping in accordance with ANSI N45.2.2 and Customer Specifications
- Material Identification including Line Marking, Stenciling and Electrochemical Etching



## SPECIMEN MACHINING

All types of mechanical testing are carried out on specimens prepared by our in-house Machine Shop. The machinists work with computerized numerical control (CNC) equipment to machine high-quality, economical test specimens from metals and other materials such as metal matrix composites, hardened steels and nickel-base alloys. The machine shop also provides EDM services.

All machining is performed according to ASTM A370, ASTM E8, ASTM E23 and customer specifications. LTI is on the National Institute of Standards and Technology (NIST) Qualified Manufacturers List to machine Charpy V-notch impact verification specimens.

- Flat Tensile
- Round Tensile - Threaded or unthreaded
- Flat Fatigue
- Izod Impact
- Charpy V-Notch Impact - Notched by grinding
- Stress Rupture - Notched by turning or grinding
- Stress Corrosion
- Gleeble
- Jominy
- Round Compression
- Dynamic Tear
- Compact Tension
- Fracture Toughness - Notched by EDM
- Hydrogen Embrittlement
- Face, Root & Side Bends
- Rotating Beam & Low Cycle Fatigue - Low stress ground & polished longitudinally

## FAILURE ANALYSIS

A failure analysis is completed when a product or part does not perform to expectations by becoming unreliable, unsafe or failing completely. The failure can stem from many causes including material type, manufacturing defects, environmental conditions or improper use. Failure investigations are generally required to resolve a production problem, customer claim or legal case.

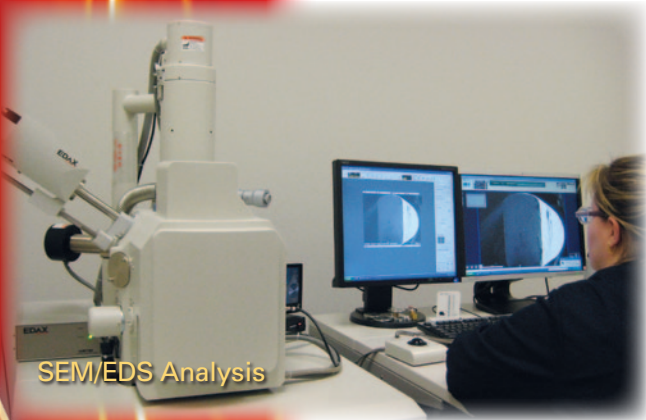
With the expertise, advanced analytical instrumentation and array of testing services available at LTI, a thorough investigation is completed to uncover the root cause of the failure and offer recommendations for preventing a recurrence. Our materials engineers summarize the data that is collected and interpret the results in a comprehensive report for our customer. LTI's engineers are also available to provide expert witness testimony.



Turning Center



Milling Center



SEM/EDS Analysis

**Contact LTI for more information on services, accreditations or pricing. We're here for you and happy to help with your business needs.**



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## **LTI SERVICES**

All services are available at our convenient PA (USA) location for time-saving efficiency.

- Mechanical Testing
- Metallurgical Testing
- Chemical Analysis
- Corrosion Testing
- Nondestructive Testing
- Failure Analysis
- Specimen Machining
- Dimensional Inspection
- Calibration

*(ask for our Metrology Brochure)*



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