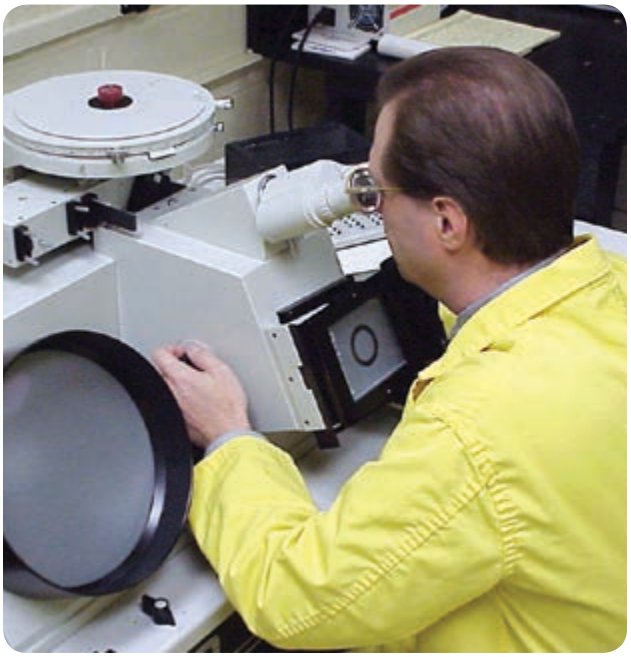
Failure Analysis Laboratory

BWXT Nuclear Energy, Inc. (BWXT) Failure Analysis Laboratory (FAL) is equipped with a wide range of digital photography and metallurgical instruments used to support failure analysis investigations. The laboratory is operated by an experienced staff of engineers and technicians trained in failure analysis techniques including microstructural characterization of metals and deposits, fractography, corrosion processes, welding metallurgy, and mechanical testing.

Projects conducted typically involve:

- Identifying the mechanism or cause of damage or failure of components in service and recommending corrective actions to prevent reoccurrence
- Solving material-related problems in manufacturing or fabrication of components
- Identifying service-related environmental impurities that contribute to material damage or failure
- Characterizing materials and evaluating their compliance with specifications and their condition after service



Optical metallography

Experience

Most FAL projects involve radioactive components originating from pressurized water reactors or boiling water reactors, although non-radioactive samples have been examined as well. Recent projects include: reactor vessel head degradation, leaking bottom-mounted instrumentation nozzles, pressurizer heater tube cracking, steam generator tube failures, filter debris analysis, and investigations involving cracking in springs, pipe weldments, and valve hardware. BWXT is experienced with many alloy systems used in nuclear facilities including zirconium alloys; inconel alloys; stellite alloys; and various stainless, carbon and alloy steels.

Services

A summary of metallurgical and failure analysis services offered on radioactive components removed from service includes:

- Visual and stereovisual examinations
- X-ray radiography
- Dimensional inspection
- Liquid penetrant inspection
- Machining/sectioning
- Rockwell hardness testing

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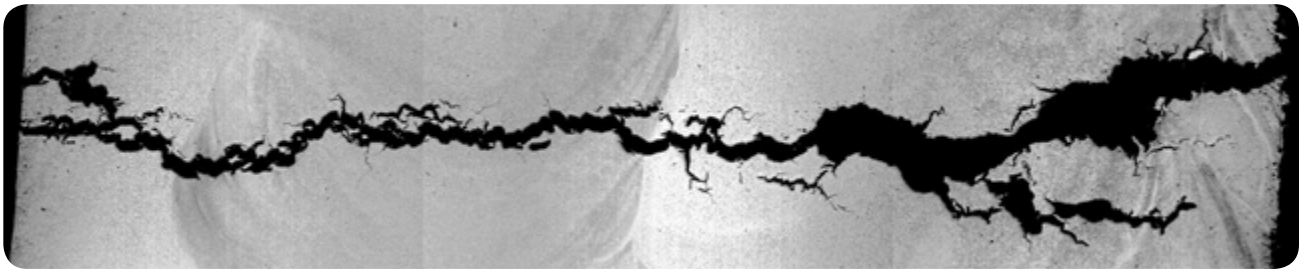

Cracking through Alloy 182 weld material

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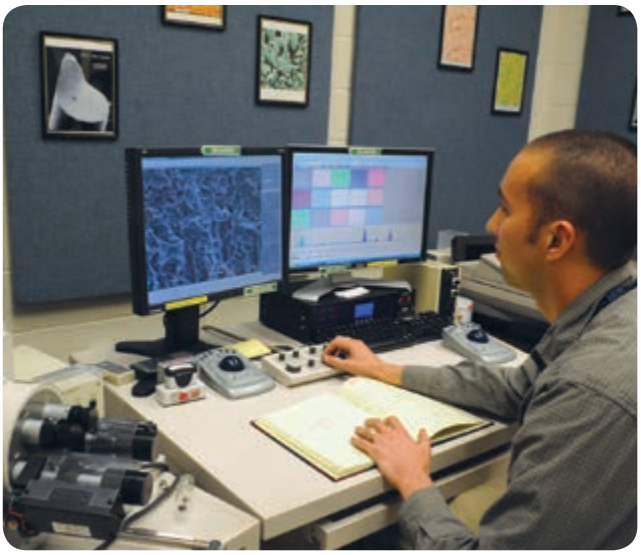
Services (continued)

- Automated microhardness testing
- X-ray diffraction
- Microstructural examination
- Scanning electron microscopy
- Energy dispersive spectroscopy
- X-ray fluorescence
- Bulk chemical analysis
- Mechanical testing
- Formal reporting

Support services

- Fatigue and fracture mechanics testing
- Sub-zero and high temperature testing
- Helium/hydraulic leak rate testing
- Hydraulic burst testing
- Sample heat treatment
- Quality assurance program (NQA-1, and 10 CFR 50, Appendix B)
- Reactor vessel surveillance program
- Post irradiation examination
- Analytical chemistry
- Radiochemistry
- Decontamination
- Nondestructive evaluation



Scanning electron microscopy

In addition to our in-house capabilities, BWXT has solid working relationships with other laboratories providing additional analytical capabilities for radioactive samples. The project manager directs and oversees the work performed by these laboratories. Examples of techniques used include:

- X-ray photoelectron spectroscopy
- Secondary ion mass spectroscopy
- Scanning Auger microscopy
- Scanning transmission electron microscopy
- Raman spectroscopy
- Residual stress determinations
- Electron microprobe

NUCLEAR ENERGY GOVERNMENT SERVICES ADVANCED TECHNOLOGIES

Headquartered in Lynchburg, Va., BWX Technologies, Inc. (BWXT) is a leading supplier of nuclear components and fuel to the U.S. government; provides technical, management and site services to support governments in the operation of complex facilities and environmental remediation activities; and supplies precision manufactured components and services for the commercial nuclear power industry. BWXT has more than 5100 employees and significant operations in Lynchburg, Va.; Erwin, Tenn.; Mount Vernon, Ind.; Euclid, Ohio; Barberton, Ohio; and Cambridge, Ontario, as well as more than a dozen U.S. Department of Energy sites around the country. Follow us on Twitter @BWXTech and learn more at www.bwxt.com.

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BWX Technologies, Inc.

BWXT Nuclear Energy, Inc.
2016 Mt. Athos Road
Lynchburg, VA 24504-5447 USA
t: + 434.522.5165
f: + 434.522.6860