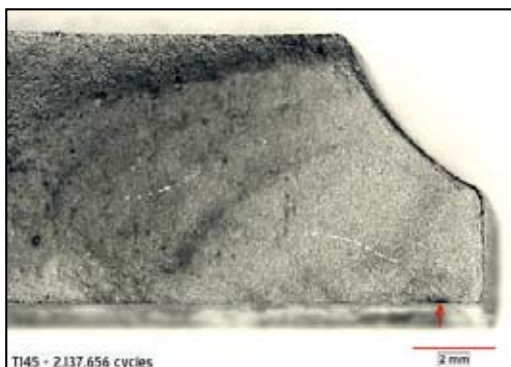


Southwest Research Institute® (SwRI®) is known worldwide for its long history of service to the global automotive industry. For more than 50 years, SwRI has been a leader in automotive research and development. SwRI's services to the automotive industries have included fuels and lubricants research, emissions research, and fleet testing.

SwRI is well known for its automotive fatigue and vibration analysis capabilities. A variety of evaluation fixtures are available and can be configured to evaluate a variety of automotive components. Multiple facilities and experienced engineering and technical staff are available to perform root cause analysis of failures as well as determination of various failure modes.

Potential failure modes can be identified and quantified, and resulting failures can be predicted using failure modes and effects analysis (FMEA). Often, when parts fail in consumer operation, original equipment manufacturers turn to SwRI for an immediate investigation, which may lead to a remedy.

When emergency testing is required to fulfill regulatory or in-field needs, SwRI can develop client programs that can be completed quickly, delivering results with well-documented, detailed information that can include metallurgical and stress analysis of various automotive components as requested.



Experienced staff conduct metallographic analysis on a crack initiation site generated in SwRI's axial fatigue test for connecting rod evaluation.

CAPABILITIES

SwRI provides fatigue and vibration testing and analysis on a wide variety of automotive parts and components, including:

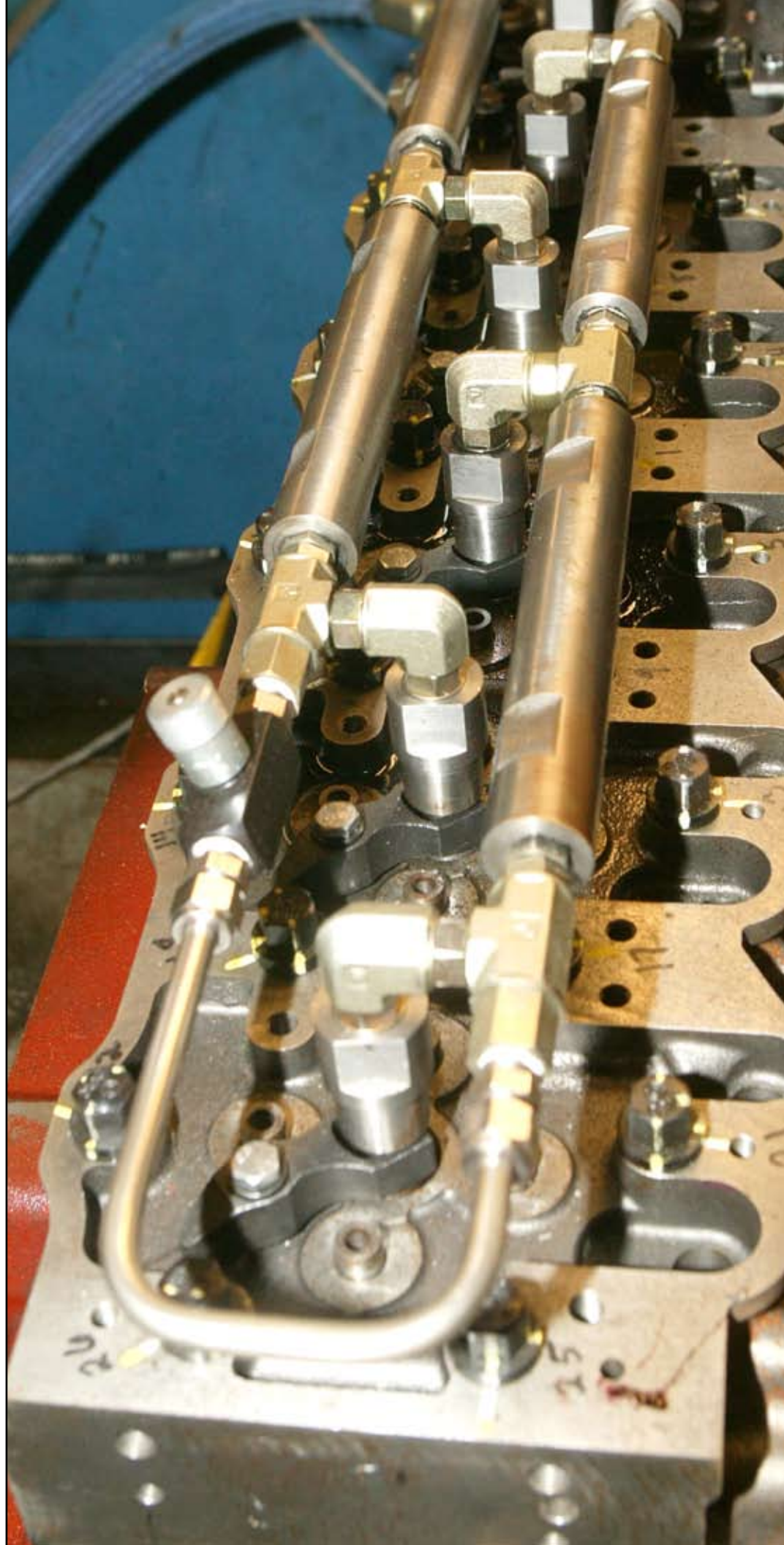
Exhaust Systems

- ❑ Automotive catalytic converters
- ❑ Diesel catalyst systems
- ❑ Diesel particulate filters (DPFs)
- ❑ Flow diverters and mixers
- ❑ Turbochargers
- ❑ Reductant delivery systems
- ❑ EGR valves and coolers

Engine Hardware

- ❑ Cylinder heads
- ❑ Rocker arms
- ❑ Crankshafts
- ❑ Connecting rods
- ❑ Engine blocks
- ❑ Intake manifolds
- ❑ Exhaust manifolds
- ❑ Brackets

SwRI's axial fatigue test rig can be used to quickly and inexpensively screen early connecting rod prototypes for axial fatigue strength before they are placed in a running engine.



Vibration Testing

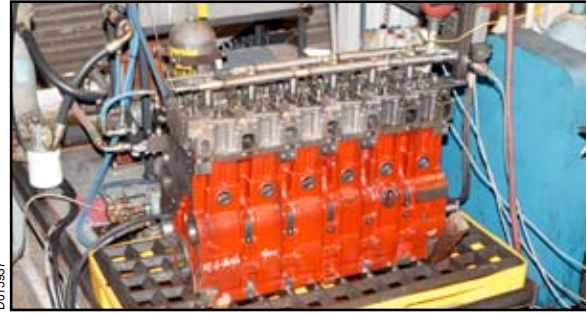
Extreme field environments can be simulated in the SwRI laboratories. Vibration test and environmental systems provide custom evaluations to meet specific client needs. Custom vibration fixturing enables even the most unique components to be evaluated under accelerated test conditions. Noise, vibration and harshness (NVH) analysis is available on a variety of components.



Automotive catalytic converters undergo full-flow thermal cycle and hot vibration testing to ensure durability for the vehicle life. Catalyst substrates and support systems are evaluated under accelerated test conditions following OEM, component supplier, or SwRI test protocol.

Fatigue Testing

Load frames for mechanical fatigue testing are used to re-create extreme forces on various components. Hydraulic fatigue testing is also available, with customized operating parameters specified according to client needs.



SwRI has several hydraulically actuated test rigs to evaluate the fatigue strength of cylinder head and block components and assemblies.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,000 employees who perform contract work for industry and government clients.

**We welcome your inquiries.
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**MECHANICAL
EVALUATION OF
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(Fatigue and Vibration)**