

Durability Testing and Analysis at The University of Alabama

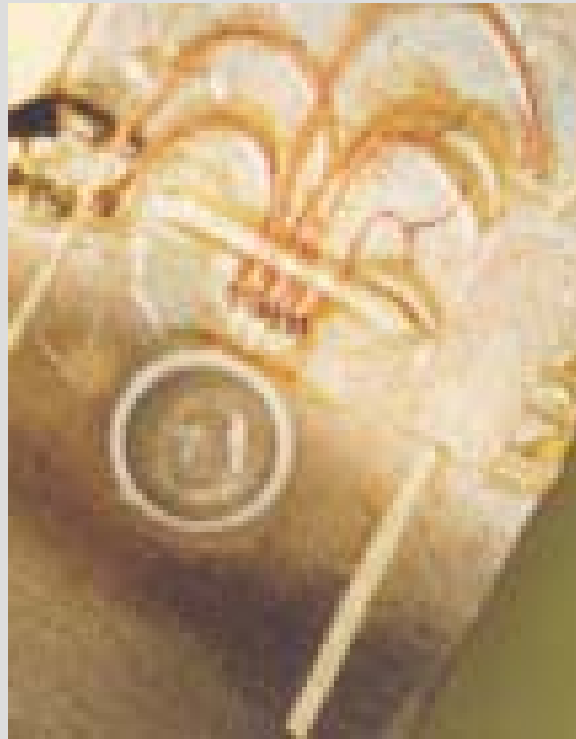


The Structural Durability and Fatigue Performance Group was established by **Dr. M. E. Barkey** and associated students at the University of Alabama in 1996.

The group focus is on all aspects of structural durability and material fatigue, and places particular emphasis on ground vehicle applications.

Specializing in Testing and Analysis of Automotive Joints

- **Manufacturing of Specimens with a Thompson 100 KVA spot welder**
- **Strain Gage and Microscopy Facilities**
- **Data Acquisition and Control Systems**



Selected Automotive Projects

- **DaimlerChrysler Corporation:**

 - Strength Characterization of Welded and Weld-Bonded Joints

 - Fatigue Analysis of Spot Welds under Combined Tension and Shear

- **Ford Motor Company:**

 - Fatigue Characterization of Riveted Aluminum Joints

 - Fatigue Characterization of Adhesively Bonded Joints

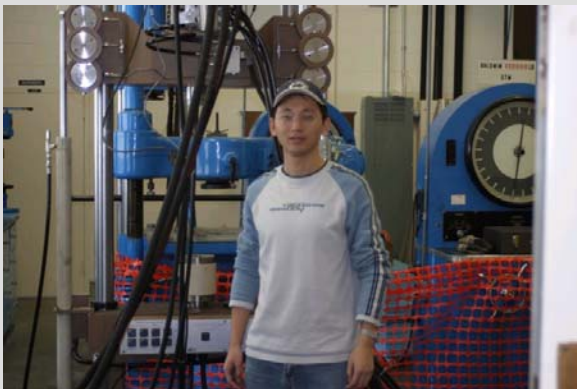
- **General Motors Corporation:**

 - Multiaxial Plasticity Modeling for Fatigue Analysis

Facilities

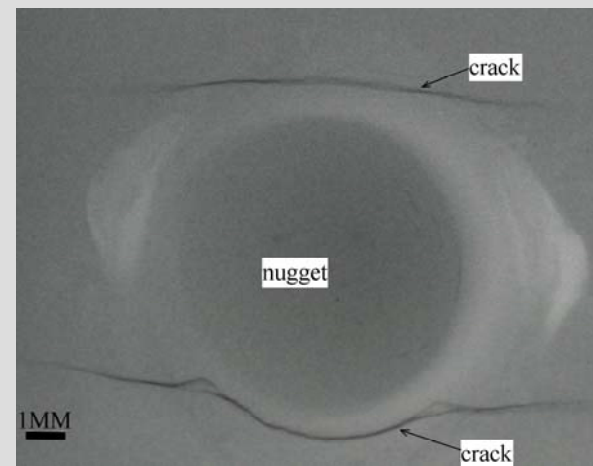
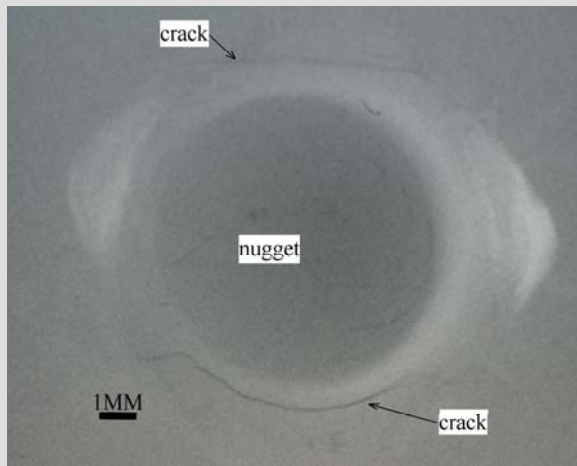
The servo-hydraulic lab capabilities include uniaxial specimen testing in load, displacement, or strain control, and structural actuators for component testing.

- MTS 30 GPM Silentflo pump
- Two 11 kip MTS structural fatigue actuators
- MTS 810 and Satec Uniaxial Test frames, each with 50 kip capacity
- MTS 5.5 kip actuator with load frame
- MTS FlexTest SE controller upgrade for 50 kip MTS frame for 2005



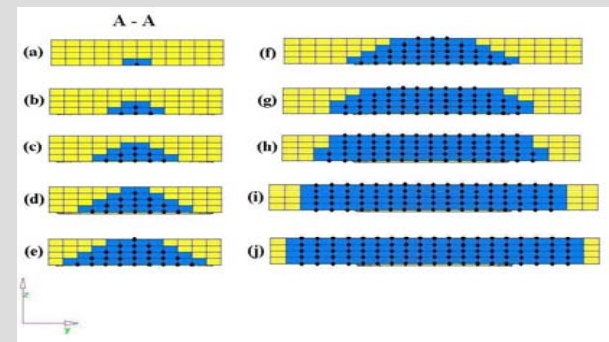
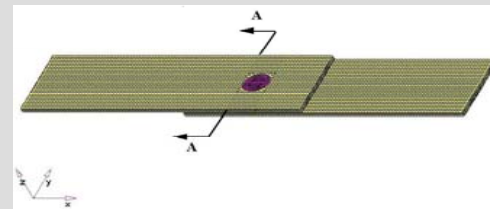
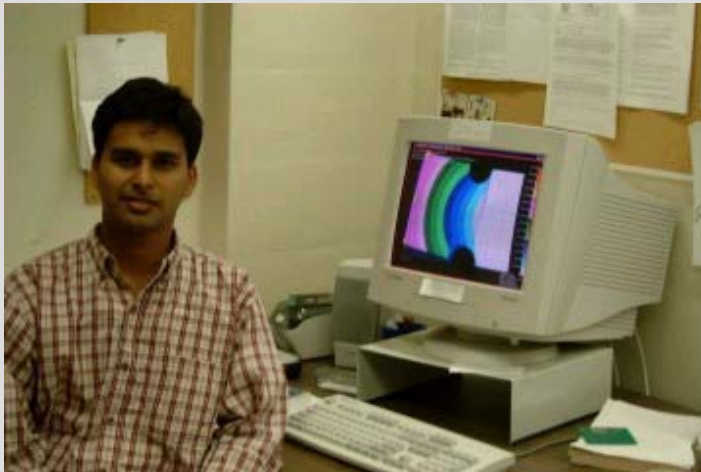
X-Ray Evaluation of Joints

- Mini-Shot X-Ray Cabinet
- Spot Weld Inspection for Fatigue Cracks



Computational Durability

- Elastic and Non-Linear Finite Element Analysis, Fatigue Analysis
- ABAQUS, HyperMesh for Windows 2000, SOMAT LifeEst, MatLab
- Various other programming languages and software



Selected Publications

G. Wang and M. E. Barkey “Experimental Investigation of Fatigue Cracking and Its Influence on Dynamic Response Characteristics of Spot Welded Specimens,” Experimental Mechanics, Volume 44/3 pp. 512-521, 2004.

Y. Guo, M. E. Barkey and D. Yen, “Modeling of Rolling Contact Fatigue for Hard Machined Components with Process-Induced Residual Stress,” International Journal of Fatigue, Volume 26, pp. 605-613, 2004.

H. Y. Wang and M. E. Barkey, “A Strain Space Nonlinear Kinematic Hardening/Softening Plasticity Model,” International Journal of Plasticity, Vol. 15, pp. 755-777, 1999.

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