

Fatigue Crack Growth in Adhesive Joints

D. L. Erdman, J. M. Starbuck
Advanced Materials Processing and Measurement Technology
Engineering Technology Division
Oak Ridge National Laboratory*
PO Box 2009 Oak Ridge, TN 37831-8048

Phone :(865) 574-0743, Fax: :(865) 574-8257, email: erdmanDL@ornl.gov
Phone :(865) 576-3633, Fax: :(865) 574-8257, email: starbuckJM@ornl.gov

ABSTRACT

Adhesive joining is recognized as a potential enabling technology for a variety of material systems being considered in automotive structures where traditional fastening methods would be inappropriate. Well known examples include fiber reinforced composites and polymers. Additionally in certain circumstances, adhesive bonding of steel structures can provide benefits such as improved stiffness and/or reduction of stress concentrations common with welded, riveted, and bolted joints. Nevertheless, there is hesitation on the part of industry to replace traditional fasteners in primary structure applications, for the most part due to the limited understanding of joint performance over the life of a structure (i.e., overall joint toughness, creep, and fatigue). Therefore, this work focuses on the fatigue crack growth in a composite-adhesive-composite joint, which could be typically encountered in an automotive structure. Methods to experimentally measure crack growth rates and quantify the growth in a useful manner are presented. This information could be useful for predicting the durability of a structure containing adhesively bonded joints.

*ORNL is managed and operated by UT-Battelle, LLC for the U.S. Department of Energy under contract DE-AC05-00OR22725