



TEXAS TECH UNIVERSITY
Department of Mechanical Engineering

**Design for Life: Some Foundation Concepts
for Heterogeneous Materials**

Ken Reifsnider, Presidential Distinguished Professor, University of Texas Arlington
Director, Institute for Predictive Performance Methodologies, UTARI

Abstract

So far as we know, nothing lasts forever. In engineering, “lifing” a design typically means selecting appropriate materials, avoiding “damage accelerators” like stress concentrations, and estimating the time or cycles required to cause structural failure. This is actually a “design for death” concept. *Design for Life* addresses the functionality and state of a material system (in the physical and analytic sense) during the useful life, with the purpose of designing the materials and the system for maximum intended utility and functionality during its lifetime service.

Heterogeneous materials are critical to natural structures, and increasingly essential for devices and engineered structures in our society, touching our lives as airplanes, batteries, automobiles, turbines, biomedical devices, etc. From the standpoint of “Design for Life,” they provide unique opportunities to design strength, stiffness, and functional properties, and to use microstructure to control and tailor functional behavior during service. In the present talk we will discuss the diversity of some of the successful applications of heterogeneous materials, and the development of new materials and manufacturing methods that drive new “Design for Life” methodologies. We will also identify some of the corresponding limitations that present opportunities for new contributions to this broad field of activity. Finally, we will look specifically at a new concept of “heterogeneous fracture mechanics” currently under development and discuss the application of this new multiphysics / mechanics approach to the design of composite membranes and nuclear waste confinement materials.

Biographical Sketch: Kenneth Reifsnider, NAE, is Presidential Distinguished Professor of Mechanical and Aerospace Engineering and Director of the Institute for Predictive Performance Methodologies at the University of Texas Arlington Research Center. Reifsnider has pioneered the development and implementation of composite materials in aerospace, land, and water vehicles and in energy conversion and storage devices. He is the recipient of the Silver Award from the Royal Aeronautical Society, and has given invited lectures in 18 countries. He holds four U.S. patents; has published over 200 archival articles, one signature text book, and many book chapters; and serves on the editorial board of the Journal of Multifunctional Materials. Reifsnider is a member the National Academy of Engineering, and a Fellow of the American Society of Mechanical Engineers and the American Society for Testing and Materials.

Monday, April 18, 2016
Livermore Center Room 101 | 2:00 – 3:00 pm
Coordinator: Dr. Satya Atluri (satya.n.atluri@ttu.edu)