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Anaheim, CA 92801

NIKHIL KAR, PH.D., P.E.
SENIOR MANAGING CONSULTANT
REGIONAL OPERATIONS MANAGER

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Dr. Kar's expertise is in the fields of mechanical engineering, metallurgy, materials science, failure analysis, mechanical & material behavior, laboratory testing, contamination analysis, and equipment function to determine cause(s) of failure. His consulting projects include failure analysis of consumer products, plumbing products, structural component failures/fractures, bicycles, aviation, automotive, industrial, and machine components, and medical or foreign object implants as related to personal injury, product liability, premise liability, construction defect and water loss or fire matters. He also consults on patent infringement matters and is a licensed Professional Engineer in California in both the mechanical and metallurgical disciplines. As an adjunct assistant professor of engineering practice, Dr. Kar teaches undergraduate and graduate courses for the Viterbi School of Engineering at the University of Southern California. He has qualified as an expert witness in both State and Federal Court.

Areas of Specialization

Engineering Failure Analysis
Environmental Stress Cracking (ESC)
Fractography
Fracture of Welds and Weld Microstructure
Fracture Mechanics of Engineering Materials and Products
Materials Characterization Testing and Analysis
Mechanical Behavior and Mechanical Testing of Materials
Mechanical Equipment Function / Malfunction
Microscopic and Metallographic evaluation of Arcing and or Fire damage components
Non-metallic materials – Polymers, Polymer Composites
Corrosion
Surface Analysis Characterization of Failed Electrical Components

Education

Ph.D., Mechanical Engineering, University of Southern California, 2012 M.S., Mechanical Engineering, University of Southern California, 2007
B.S. (Cum Laude), Mechanical Engineering, University of California, Irvine, 2006

Licensed Professional Engineer (P.E.)

State of California License No. M36943 (Mechanical)
State of California… License No. MT 1982 (Metallurgical / Materials)

Professional Affiliations

Journal of Failure Analysis and Prevention (JFAP)

Technical Reviewer for journal article submissions

National Academy of Forensic Engineers (NAFE)

Board Certified Diplomate in Forensic Engineering, by NAFE

Technical Reviewer for journal article submissions

University of Southern California (USC)

Adjunct Assistant Professor of Engineering Practice

Failure Analysis Society

Member

ASM International

Member

National Society of Professional Engineers (NSPE)

Member

The American Society of Mechanical Engineers (ASME)

Member

ASTM International

Member

Positions Held

Engineering Systems Inc., Anaheim, CA

Regional Office Manager (ROM), 2024 - Present

Kars' Testing and Research Laboratories – A Division of Engineering Systems Inc.

Senior Managing Consultant, 2022 - Present

Kars' Advanced Materials, Inc., Anaheim, CA

Principal Engineer, 2013 - 2022

Materia Inc., Pasadena, CA

Composites Research Manager, 2012 - 2013

University of Southern California, Los Angeles, CA

Adjunct Assistant Professor of Engineering Practice, 2014 - Present

University of Southern California, Los Angeles, CA

Graduate Research Assistant for McGill Composites Center, 2007 – 2012

Positions Held (cont.)

University of California, Irvine

Undergraduate Research Assistant for UCI Combustion Laboratory, 2005 - 2006

Continued Education, Presentations, Seminars and Webinars

CAMX – Fractography of Composites (Presenter) (2022)

ASM Webinar - Introduction to the Metallurgy of Precipitation Hardening S.S. (2020)

ASM Webinar - Grain Size: Then and Now (2021)

ASM Webinar – Weld Metallography and Microstructure (2022)

NAFE Conference attendee (2019, 2020) and presenter (2019)

Publications

Kar N.K., Bovie A., Roig T., "The Complimentary Use of 3D X-ray Micro-Computed Tomography with Traditional Metallography," Advanced Materials and Processes, January/February 2022.

Kar N.K., Kar J., "Metallurgical and Mechanical Failure Analysis of an Aftermarket Flywheel," Journal of the National Academy of Forensic Engineers (2020 Accepted).

Kar N.K., Bovie A., "Failure Analysis of a Composite Rudder Stock using 3D X-Ray Microcomputed Tomography," Journal of Failure Analysis and Prevention (2019 Accepted).

Kar N.K., Hu Y., Grunenfelder L., "Metallurgical and Materials PE Exam Solved Problems," PPI Publications, 2017.

Kar N.K., Roig T., Kar J., Hu Y., "Failure Analysis of a Ti6Al4V used in a RASL Procedure," Journal of Failure Analysis and Prevention (2016 Accepted).

Kar N.K., Hu Y., Kar N, Kar R., "Failure Analysis of a Polymer Centrifugal Impeller," Case Studies in Engineering Failure Analysis (2015 Accepted).

Hu Y., **Kar N.K.**, S. Nutt., "Transverse Compression Failure of Unidirectional Composites," Journal of Polymer Composites (2014 Accepted).

Jin L., Jin B., **Kar N.K.**, Nutt S., Sun B., Gu B., "Tension-tension Fatigue Behavior of Layer-to- layer 3-D Angle-interlock Woven Composites," Mater Chem & Phys 1-8, 2013.

Kar N.K., Hu Y., Ahn B., Nutt S.R., "Diametral Compression of Pultruded Composite Rods," Composites Science and Technology, 2012.

Publications (cont.)

Barjasteh E., **Kar N.K.**, Nutt S.R., "Effect of Filler on Thermal Aging of Composites for Next-Generation Power Lines," Composites Part A; 42(12):1873-1882, 2011.

Kar N.K., Hu Y., Barjasteh E., Nutt S.R., "Tension-tension Fatigue of Hybrid Composite Rods," Composites Part B, 2012.

Kar N.K., Barjasteh E., Hu Y., Nutt S.R., "Bending Fatigue of Hybrid Composite Rods," Composites Part A; 42(3): 328-336, 2011.

Selected Project Experience

Power Generation – Overhead Conductor Cable Failure

A power utility line failed at a residential home and was part of evidence collected after a residential fire. A materials failure analysis of the conductor cables indicated locations of arcing and melting at various areas along the cable length. The work involved microscopic and metallographic examination of the arc bead microstructure to understand and provide opinions on the cause of the arcing and melting damage.

Industrial Equipment – Concrete Boom Accident

A concrete boom buckled during operation and caused personal injury to a construction worker. A metallurgical failure analysis revealed that the boom buckled and separated along fillet welds that showed evidence of corrosion assisted fatigue, in weld cracks that existed prior to the accident taking place.

Industrial Equipment – Metal Bellows Expansion Joint

A leak before break condition was identified on a metal bellows expansion joint after 5 years in service. A partial circumferential crack was identified, originating at the crest of a convolution at a butt weld. The fracture surface indicated random fan like fatigue striations, an indication of flow induced vibration and a resonance condition.

Automotive - Cast Iron Fly Wheel Brittle Fracture

An aftermarket cast iron flywheel abruptly shattered in a restored mid-sixties muscle car. The shrapnel caused personal injury to a bystander. A metallurgical and mechanical failure analysis investigation revealed that the flywheel material had microstructural deficiencies, casting defects and substandard mechanical properties that did not meet the OEM flywheel material specifications.

Fire Protection System – Sprinkler Head Activation without a fire

Multiple premature fire sprinkler activations in newly built residential homes caused significant water damage and monetary losses. A multi-year investigation led to the identification of manufacturing defect in the fire sprinkler, whereby a eutectic fusible link fails under shear stress creep induced by a bent lever bar introduced during the manufacturing and assembly of the fire sprinkler.

Aviation – Helicopter Accident

A helicopter accident occurred because of the inversion of the helicopter during an emergency landing. An examination of the mechanical floatation system, cabling and handle activation was investigated.

Consumer Product – Road Bicycle Handlebar Stem Failure

The handlebar stem from a road bike separated during use resulting in a bicycle accident. A materials failure analysis of the handlebar stem was performed. Optical and scanning electron microscope examinations revealed that the forged Aluminum stem experienced a fatigue crack around the attachment bolts.