

# **Elastoplastic finite element analysis of three-dimensional fatigue crack growth in aluminum shafts subjected to axial loading**

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## **Abstract-**

We have developed a three-dimensional cohesive element and a class of irreversible cohesive laws which enable the accurate and efficient tracking of three-dimensional fatigue crack fronts and the calculation of the attendant fatigue life curves. The cohesive element governs the separation of the crack flanks in accordance with an irreversible cohesive law, eventually leading to the formation of free surfaces, and is compatible with a conventional finite element discretization of the bulk material. The versatility and predictive ability of the method is demonstrated through the simulation of the axial fatigue tests of aluminum shafts of Thompson and Sheppard (1992a, b, c). The ability of the method to reproduce the experimentally observed progression of beachmarks and fatigue life curves is particularly noteworthy.

## **Index Terms-**

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