

An Analytical Solution for Dynamic Stress Intensity, K_d , under Impact Loading

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Abstract. Characterisation of failure of components subjected to impact fatigue has received much interest in recent years. Critical stress intensity factor, i.e. fracture toughness, is a characteristic parameter for fracture conditions. Evaluation of this parameter is therefore of primary importance in the study of structures containing cracks. Due to its significance numerous research work have been carried out to provide dynamic stress intensity descriptions under cyclic, impulse and impact loading conditions. These methods are mainly based on numerical analyses and / or experimental techniques as well as approximate analytical models. This paper firstly provides a review of fatigue failure due to impact loading and explains the principles of impact mechanics concepts including impact loading, stress wave equation and resulting stress distributions. Then, based on available experimental studies on developing and propagating cracks under impact loading, suggests a simple model leading to an approximate analytical solution for determination of dynamic stress intensity factor, k_d under high strain rate loading. Calculated values based on the suggested solution compare well with experimental data.