Chaiyapol Songsithichoke 2014: Analysis of Thermal Residual Stress Singularity Field in Dissimilar Material Joint using 3D-FEM. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Mr. Attaporn Wisessint, D.Eng. 77 pages.

The purpose of this research is to determine and analyze the effects of thermal residual stress and the impact from interlayer thickness of three bonded dissimilar materials. These materials differ greatly in Young's modulus coefficients, Poisson's ratio and thermal expansion coefficient. Because of the dissimilar properties of these materials, when exposed to thermal and mechanical load might cause damaged due to high level of stress (Stress Singularity Field).

In this study, the characteristic of stress singularity field around the interface of bonded dissimilar materials is determined by using 3D finite element method. To conduct, first is to create a finite element model that consists of three different materials. Second step is to assign the thermal and mechanical load to the model. Next is to determine the stress that occurs on the edge of interfacing materials by using finite element program. Finally, the intensity of stress value is estimated to analyze the risk assessment of interface fracture.

Ultimately, this paper proves that thermal loading is the main cause of the increasing of stress that occurs between dissimilar material joints. Moreover, the interlayer thickness is also affect the level of stress at the interface of bonded dissimilar material joints. The appropriate thickness of interlayer is between 1 to 2 millimeters.

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