World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:11, No:05, 2017

Modeling the Effect of Thermal Gradation on Steady-State Creep Behavior of Isotropic Rotating Disc Made of Functionally Graded Material

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Abstract : In this paper, an attempt has been made to study the effect of thermal gradation on the steady-state creep behavior of rotating isotropic disc made of functionally graded material using threshold stress based Sherby’s creep law. The composite discs made of aluminum matrix reinforced with silicon carbide particulate have been taken for analysis. The stress and strain rate distributions have been calculated for the discs rotating at elevated temperatures having thermal gradation. The material parameters of creep vary radially and have been estimated by regression fit of the available experimental data. Investigations for discs made up of linearly increasing particle content operating under linearly decreasing temperature from inner to outer radii have been done using von Mises’ yield criterion. The results are displayed and compared graphically in designer friendly format for the above said disc profile with the disc made of particle reinforced composite operating under uniform temperature profile. It is observed that radial and tangential stresses show minor variation and the strain rates vary significantly in the presence of thermal gradation as compared to disc having uniform temperature.

Keywords : creep, isotropic, steady-state, thermal gradation
Conference Title : ICSM 2017 : International Conference on Solid Mechanics
Conference Location : London, United Kingdom
Conference Dates : May 25-26, 2017