Abstract No 7

Stress Analysis and Strength Estimation of Bonded Shrink Fitted Joints of Solid Shafts under Push-Off Forces

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Shrink fitted joints have been widely used in mechanical structures. Recently, joints combining a shrink fit with an anaerobic adhesive have been developed in order to increase the joint strength. Stress distributions in the adhesive layer of the bonded shrink-fitted joints subjected to push-off forces are analyzed using axisymmetrical theory of elasticity and finite-element calculation. The effects of Young's modulus of the shafts and the rings, the outer diameter and the height of the rings and the adhesive thickness on the stress distributions in the adhesive layer are clarified by numerical calculations. In addition, the size effect of joints was also examined taking into account the surface roughness and roundness experimentally. Using the stress distributions in the adhesive layer, a method for predicting joint strength is proposed. It is seem that a rupture initiates from the under edge of the adhesive layer. Experiments to measure the joint strength in the bonded shrink-fitted joints under push-off forces were carried out. The numerical results are in a fairly good agreement with the experimental results.