

Augmentation of the delamination factor in drilling of carbon fibre-reinforced polymer composites (CFRP)

Abstract

Carbon fibre-reinforced polymer (CFRP) composite materials play an increasingly important role in modern manufacturing, and they are among the more prominent materials used in aircraft manufacturing today. However, CFRP is highly prone to delamination and other damage when drilled due to it being extremely strong with a good strength-to-weight ratio and high thermal conductivity. Because of this problem and CFRP's growing importance in aircraft manufacture, research has focused on the entry and exit holes as indicators of damage occurrence during drilling of screws, rivets, and other types of holes. The inside of the hole was neglected in past research and a proper way to quantify the internal side of a hole by combining the entry and exit hole should be included. To fill this gap and improve the use of CFRP, this paper reports a novel technique to measure the holes by using the extension of the adjusted delamination factor (SFDSR) for drilling thick CFRP composites in order to establish the influence of machining input variables on key output measures, i.e., delamination and other damages. The experimental results showed a significant difference in interpretation of the damage during the analysis. Improvement was made by providing better perspectives of identifying hole defects.

Keywords

Carbon fibre-reinforced polymer (CFRP); Delamination factor; Drilling; Manufacturing operation