Abstract

The wheel is an important component for all land transport vehicles and the following research report investigates the feasibility of a passenger car wheel manufactured from carbon fibre. Previous research, evaluated a strain gauged BlackStone Tek motorcycle Ducati rim loaded to 700 Nm on a dynamic cornering test machine. In the current study, these experimental results were used to validate an FEA model of the BlackStone Tek Ducati rim. The validated FEA was used to investigate the feasibility of using carbon fibre to manufacture a passenger car rim. The FEA model did not include the aluminium hub, and the analysis was therefore considered valid for the spokes and rim only. The FEA strains of the Ducati rim spokes were within an acceptable 25% correlation range with the experimental results. The FEA strains were generally higher than the experimental results. Having validated the FEA model, a carbon fibre passenger car rim, was analysed at a bending moment of 2000 Nm. The inverse of the factor of safety from the spoke to the rim section was below 1. This indicates that the newly designed rim should pass the dynamic cornering test, a vital standard proving that the rim is structurally durable to function on a small to medium sized passenger car. In comparison to aluminium rims of the equivalent size, a weight saving of 62.2% can be expected from a carbon fibre passenger car rim.