# Finite Element Analysis of Tyre-Rim with Different Nave Thicknesses

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The local industries often use manual calculations in the rim design and manufacturing process. The accuracy of these calculations has a significant effect on final products. With the help of modern computational power, the rims can be analysed to a greater depth at an early stage and product quality can be substantially enhanced. This work was initiated to analyse a rim and optimize the nave thickness allowing the rim to withstand higher loads even at lowest material requirements. As the first step, geometries of two rims with different naves (9 mm and 10 mm) were created as 2D surface geometries, in order to get an effective stress distributions. After modelling, material was assigned for different sections. Subsequently, boundary and loading conditions were applied. All displacements and rotations were set between the tire outer surface and a virtual road layer. At the beginning, the road layer was moved to 10 mm towards the tire and all other displacements and rotations were fixed. In the second step, all the displacements and rotations were fixed except the displacement in vertical direction. The virtual road layer causes to generate the pressure between tire and the rim. As a result of that stresses are generated within the tire and the rim components. At the end, stresses generated in four different points were compared with original rim of 10 mm nave and optimized rim of 9 mm nave. The results of the Finite Element Analysis (FEA) show that the maximum stress variation percentage is 15.62% and, the maximum stress generated in the optimized rim lies below the yield strength of the steel. Thus, it is verified that 9 mm nave thickness can replace 10 mm nave thickness. Although this is a single millimetre thickness reduction, it can save cost in large amounts at mass production. Therefore, it can be concluded that use of FEA techniques to optimize the rim nave thickness could bring distinct benefits in the rim manufacturing process.

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