

Finite Element Analysis of Inflation Tyre Simulation Using Simulia Abaqus

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Abstract

Finite Element Analyses (FEA) are conducted in tyre industry either for a safety verification or prediction of the characteristics of virtual tyres. In the design stage of a tyre, it is impossible to determine its manufacturing performance. Therefore, modeling of a virtual tyre plays a significant role when predicting the performance and the characteristics of the tyre. At the end of the virtual simulation if the results do not satisfy the customer requirements, the tyre parameters can be easily changed without manufacturing a prototype sample. This inflation simulation is conducted to determine the outer diameter and the section width of the tyre after pressurizing it under given loading conditions. To obtain the required characteristics of the tyre, the input parameters are adjusted accordingly. It leads to analyze several versions of this virtual tyre simulations. Here, three different versions of virtual tyres are individually analyzed and, the best fitting parameters are determined. The accuracy of the FEA method is estimated by comparing simulation results with that of the prototype dimensions. In the method, three versions of the virtual tyres and the prototype tyres are individually compared to verify the results. As per the estimation, FEA of virtual model simulation shows low dimensional variance (2.38%) compared to that of the actual prototype simulation. Therefore, the results confirm the high accuracy of FEA method in virtual tyre simulation and the importance of implementing it in local industries. It would certainly cause to save precious time, unnecessary cost while increasing the quality of the products.

Keywords: *Finite Element Analysis, Inflation Simulation, Tyre Pressure*