

Prediction of Standing Wave Phenomenon under High-Speed Rotation Condition of Tire using Beam Model

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빔 모델을 이용한 타이어 고속회전 시 발생하는 스탠딩 웨이브 현상 예측

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Abstract

As consumers' demand for high-speed driving increases, many research has been actively conducted to understand the standing wave phenomenon in tires. Standing wave means a wave that occurs on the side of a tire called a sidewall when the tire rotates at a high speed exceeding a critical speed. When standing waves occur, the temperature of the tire increases, and the durability of the tire decreases rapidly as the temperature increases. Therefore, it is very important to accurately predict when standing waves occur in order to secure the durability of the tire during high-speed driving. Non-linear finite element analysis is widely used to accurately predict this phenomenon. The standing wave prediction method using the finite element method has the advantage of being able to accurately analyze the deformation of the tire under high-speed rotation conditions. However, since the analysis results using the finite element method are presented by a combination of various design factors, a theoretical approach is required in the design step for improving high-speed durability performance. In this study, the critical speed according to the design change was calculated using various beam theories for standing wave prediction. In addition, the critical speed was compared with the test results and the direction for improving the tire high-speed durability performance was set.

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