

下更明显,此外还可提高胎肩刚性,缓解轮胎肩部磨损问题。

3 结论

通过测试分析了HE钢丝帘线的特性,并以某规格全钢载重子午线轮胎为例,跟踪测试0°带束层钢丝帘线在生产过程中的残余变形,比较线弹性模型和修正模型两种表征方式对轮胎有限元仿真结果精度的影响等,主要得到如下结论。

(1) 采用考虑残余变形的修正模型表征HE钢丝帘线更合适。

(2) 与无0°带束层设计方案相比,有0°带束层设计方案带束层端部的应变能密度和剪应变幅值的差值均减小15%~20%,证实0°带束层具有减

小带束层边部变形、降低生热和提高胎肩刚性等作用。

需要注意的是,不同规格、不同花纹深度的轮胎在生产过程中的残余变形量不同。此外,本研究所用修正模型主要用以表征HE钢丝帘线的“高模量”和“高伸长”特性,而该模型本质上是一种超弹性模型,用于表征钢丝帘线也不是很适宜,可以选择开发更合适的模型表征HE钢丝帘线的特性。

参考文献:

- [1] 宿晓峰,付平,丁忠军,等. 基于Abaqus软件的轮胎有限元模型建立及仿真分析[J]. 橡胶工业,2019,66(2):121-127.
- [2] Gent A N, Walter J D. The Pneumatic Tire[M]. Washington, USA: NHTSA,2005:89-99.

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Effect of Material Characteristics and Characterization of High Elongation Steel Cord on Results of Tire Finite Element Simulation

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Abstract: Taking $3 \times 7 \times 0.20$ HE steel cord as an example, the stress-strain relationship of high elongation (HE) steel cord under cycles of loading and unloading with constant load and constant elongation were investigated, the residual deformation after unloading at different elongation was analyzed, and the static loading contact footprint and belt steel cord tension of the tire were studied using a certain type of truck and bus radial tire. The results showed that the modified constitutive model considering residual deformation was more suitable for characterizing HE steel cord. Compared with the design without 0° belt, the differences of extreme values of strain energy density and shear strain at the belt end in the design with 0° belt were smaller by 15% ~ 20%. With the 0° belt, the deformation at the edge of the belts decreased, the heat build-up was reduced and the rigidity of tire shoulder was improved.

Key words: truck and bus radial tire; high elongation steel cord; stress-strain curve; residual deformation; cord tension; finite element simulation

一种白度稳定的白色胎侧胶及其制备方法

由赛轮集团股份有限公司申请的专利(公开号 CN 110396253A, 公开日期 2019-11-01)

“一种白度稳定的白色胎侧胶及其制备方法”, 胎侧胶配方为: 天然橡胶 15~75, 氯化丁基橡胶

20~50, 三元乙丙橡胶 5~50, 硫黄预分散胶母粒 1~5, 高岭土 10~50, 碳酸钙 0~50, 氧化锌 1~10, 硬脂酸 0.5~2, 高温防护蜡

0.5~2.5, 低温防护蜡 0.5~3.5, 防老剂 0.5~3.5, 二氧化钛 10~50, 群青 0~3, 硫化剂 0.5~5, 促进剂 1~3。其中硫黄预分散胶母粒由天然橡胶、硫黄、脂肪酸酯类分散剂组成。胎侧胶采用脂肪酸酯类分散剂, 可以有效提高硫黄分散度, 保证硫黄活性, 有效防止白色轮胎胎侧变色。

(本刊编辑部 储 氏)