

Analysis of Bike Spokes and Nipples

Student Name

Institution

Course Name

Instructor Name

Analysis of Bike Spokes and Nipples

Introduction

The wheel is defined as a load-bearing implement that has aided people and goods' conveyance for hundreds of years. The circular shape of the wheel is embraced in numerous machine utilizations such as pulleys. A bicycle is one of the vehicles which has employed wheels, and it is a classic example of how the wheels have evolved. The current wheel designs of a bicycle are quite sophisticated in design and functionality. The wheels of a bicycle comprise spokes radiating from the hub, located at the middle of the wheel, to the rim where the wires are tightened to it by nipples. Before creating the wheel laced with wire spokes, wagons had chunky spokes made of wood, which could withstand compressive forces (Balasubramanyam et al., 2015). A spoke rim consists of 36 spokes whose primary aim is to buttress the rim (Wanget al., 2012). Around the 1850s, wheels with wire spokes replaced chunky wooden wheels, as they were lighter, stronger, and more durable. Unfortunately, unlike chunky wooden wheels, wire spokes would buckle when subjected to heavier compressive forces. To conquer this hurdle, the spokes are pre-stressed. The spokes' tension is attributed to strength and stiffness to a supportive association between the spokes and the rim (Ford, 2018). Pre-stressing the spokes with tension ensures that the compressive forces result in a decrease in pretension.

Case Study

The global bicycle demand is forecasted to grow at a compound annual growth rate (CAGR) of six-percent from 2018 to 2025. People are increasingly opting for bikes as a form of leisure, which has catalyzed the growth (Grand View Research, 2018). The masses prefer bikes as a suitable form of exercise, which is expected to grow further.

The acceptance of dockless bike-sharing systems has been growing (Cannon, 2019). The system enables a user to find a bike and unlock it. The system has been embraced in European and Asian countries, and it is expected to be rolled out in other nations. The expansion of this system is expected to catalyze the need for cycles tremendously.

The bike industry's growth projections demand that bikes with better spokes and nipples be designed and implemented. To make the masses stick with bikes as their number one option, wheel spokes and nipples need to cater to human safety, speed and not getting damaged by prevailing weather conditions. Design parameters such as size, materials, rigidity, tolerances, and cost need to be addressed. The resulting bikes need to serve the masses for a long time while considering ergonomics.

Pegged on the difficulties facing current bicycle designs, the current research has been done. This paper aims to design and analyze bike spokes and nipples, which meet the needed lifetime, safety, and reliability.

References

- Balasubramanyam N., Prasanthi M., & Yugandhar M. (2015). Design and analysis of bicycle wheel spokes and their effects of the number of spokes on their stiffness. *International Journal of Allied Sciences and Engineering Research*, Vol. 4, No. 3, 300-306.
- Cannon, R. (2019). *Niche innovation dynamics and the urban mobility transition*. [Degree of Master Independent Thesis, Malmo University]. DiVA Portal.
<http://www.diva-portal.org/smash/get/diva2:1482076/FULLTEXT01.pdf>.
- Ford, M. (2018). *Reinventing the Wheel: Stress Analysis, Stability, and Optimization of the Bicycle Wheel* [Doctoral dissertation, Northwestern University].
- Grand View Research. (2018). Bicycle Market Size, Share & Trends Analysis Report by Product (Mountain, Hybrid, Road), by Technology (Electric, Conventional), by end user (Men, Women, Kids) by Region and segment Forecasts, 2018-2025. Market Analysis Report, Report ID GVR-2-68038-490-1.
<https://www.grandviewresearch.com/industry-analysis/bicycle-market#:~:text=Report%20Overview,anticipated%20to%20propel%20the%20growth>.
- Wang, C., Rahman, A. A. A., & Seliger, G. (2012). A Case Study: Feasibility and economic analysis for advanced automation in spoke rim assembly for motorcycle towards sustainability. In *Sustainable Manufacturing* (pp. 387-392). Springer, Berlin, Heidelberg.