Finite Element Modeling of an Aluminum Tricycle Frame

B. Chine'[1], A. Rodríguez[1], J. Alberto Ramírez [1]

[1]School of Materials Science and Engineering, Costa Rica Institute of Technology, Cartago, Costa Rica

Abstract

As a sustainable urban transport system, the tricycle can represent an adaptive mobility vehicle used to transport people and bulk load. This transport system must warranty the security of its end users, thus experimental and modeling works are very useful tools in order to evaluate the mechanical performance of its frame. Finite-element analysis is usually used to fine-tune the geometry of a design that is still on the drawing board, before working models are built and tested.

In this work we develop a finite element model of an aluminum tricycle frame by using COMSOL Multiphysics®. The geometry of the tridimensional frame is imported in COMSOL Multiphysics by means of the CAD Import Module capabilities. Aluminum 6063-T83 with the predefined properties of the standard material data base is the selected material for the tricycle. The static analysis of the tricycle is carried out with the Structural Mechanics Module by applying appropriate loading conditions. Stress and deformation distributions have been evaluated for different combination of loads and the analysis of the structural characteristics of the tricycle frame has been carried out. The computational simulations have provided useful insights in defining the mechanical performance of the tricycle.

Reference

[1] D. Covilla et al., Parametric Finite Element Analysis of Bicycle Frame Geometries, Procedia Engineering, Vol. 72, p. 441 (2014)
[2] Comsol AB, Structural Mechanics Module User’sGuide, Version 5.2 (2015)
[3] B. J. MacDonald, Practical Stress Analysis with Finite Elements, Glasnevin Publishing, Dublin (Ireland) (2007)

Figures used in the abstract

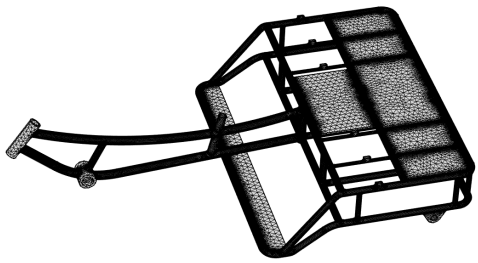

Figure 1: Mesh of the tricycle frame.