

Abstract

Design for Manufacturability: Off-Road Toyota Bumper

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The purpose of this project is to design a new off-road bumper that is improved from the stock form of a 1996-2002 Toyota 4Runner and a 1996-2004 Toyota Tacoma. The current state of the component is too weak to endure to off-road endeavors, and a kit bumper market is virtually untapped for these vehicles. The objectives of this project were met by redesigning the stock front bumper, conducting a finite element analysis on the model to test for strength, prototyping the bumper with CNC cut cardboard, and conducting a full cost analysis including the costs for waterjet and laser cutting of the steel. The new bumper was designed to improve performance, reliability, strength, and to increase the approach angle while staying under Design for Manufacturing/Assembly methodologies. By prototyping the bumper and speaking with various metal cutting facilities, a full cost analysis has also been conducted in order to determine the feasibility of small, medium, and large production volumes.